IPGRI

Report of a Working Group on Forages

Seventh meeting - 18-20 November 1999 - Elvas, Portugal

L. Maggioni, P. Marum, N.R. Sackville Hamilton, M. Hulden and E. Lipman, *compilers*

ECP/GR

European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR)

IPGRI is a FUTURE HARVEST Centre

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The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization, supported by the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of genetic diversity for the well-being of present and future generations. IPGRI's headquarters is based in Rome, Italy, with offices in another 19 countries worldwide. It operates through three programmes: (1) the Plant Genetic Resources Programme, (2) the CGIAR Genetic Resources Support Programme, and (3) the International Network for the Improvement of Banana and Plantain (INIBAP). The international status of IPGRI is conferred under an Establishment Agreement which, by January 2000, had been signed and ratified by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

The European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) is a collaborative programme among most European countries aimed at ensuring the long-term conservation and facilitating the increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the participating countries and is coordinated by IPGRI, is overseen by a Steering Committee (previously Technical Consultative Committee, TCC) composed of National Coordinators nominated by the participating countries and a number of relevant international bodies. The Programme operates through ten broadly focused networks in which activities are carried out through a number of permanent working groups or through *ad hoc* actions. The ECP/GR networks deal with either groups of crops (cereals, forages, vegetables, grain legumes, fruit, minor crops, industrial crops and potato) or general themes related to plant genetic resources (documentation and information, *in situ* and on-farm conservation, inter-regional cooperation). Members of the working groups and other scientists from participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme.

The geographical designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of IPGRI or the CGIAR concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. Similarly, the texts and taxonomic definitions in these proceedings reflect the views of the respective authors and not necessarily those of the compilers or their institutions.

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Part I. Discussion and Recommendations

Introduction

The seventh meeting of the ECP/GR Working Group on Forages was held 18-20 November 1999 in the Estação Nacional de Melhoramento de Plantas (ENMP) in Elvas, Portugal. Thirty participants representing 24 ECP/GR member countries attended the meeting. Observers from Albania, Azerbaijan, Georgia and Ukraine also attended for the first time a meeting of the Working Group on Forages. Apologies were received from delegates of Armenia, Austria, Greece, Ireland, Russian Federation and Switzerland for being unable to attend. ASSINSEL and FAO also expressed interest in the results of the meeting, but were unable to send their representatives. Delegates from Morocco and Egypt were also invited to participate as observers. Although A. Birouk from Morocco announced his participation, he was eventually unable to attend.

Welcoming addresses

Dr Francisco Cortes Bagulho, Director ENMP, welcomed the participants and said that he was proud to receive such a diverse, large and motivated Working Group. At a time when the importance of genetic resources is widely recognized, this meeting will provide an excellent opportunity to reflect on the conservation and use of forage genetic resources. Dr Cortes Bagulho expressed his pleasure at being able to contribute in celebrating IPGRI's 25th anniversary and his appreciation of the work undertaken by the Institute in conservation and utilization of biodiversity. He wished IPGRI a long and successful life and wished all participants a stimulating meeting and pleasant stay in Portugal.

Petter Marum, Chair of the Working Group, also welcomed the participants and especially new members attending a Working Group meeting for the first time and observers from non-member countries. He then asked the participants to introduce themselves briefly.

The agenda of the meeting was then approved.

A new mode of operation of the ECP/GR

Lorenzo Maggioni emphasized that this meeting has a wider attendance than all previous meetings of the Working Group on Forages in terms of number of countries represented. For the benefit of newcomers who may be unfamiliar with the ECP/GR, he reviewed its historical background since its creation under the auspices of FAO in 1980 and its major outputs: an information system about collections maintained in Europe, established international cooperation, enhanced joint project proposals prepared, emergency situations addressed (thanks to contacts established within the programme) and development of national structures for plant genetic resources facilitated. He presented a summary of activities of the past Phase V of the Programme. The new Phase VI – decided at the Steering Committee meeting in Braunschweig, Germany, July 1998 – has slightly different objectives: to facilitate *in situ* and *ex situ* conservation and use of plant genetic resources, to strengthen collaboration in Europe, including emphasis on NGOs. L. Maggioni presented the structure of the Programme showing relations between National Programmes, Crop and Thematic Networks, Secretariat and Steering Committee. He explained that the new system of operation will be based on increased coordination at the network level, as guaranteed by the Network Coordinating Groups. Main objectives characterizing Phase VI continue to be facilitating long-term conservation and use of PGR; new emphasis is, however, given to *in situ* conservation, the integration of countries which are not members of ECP/GR, collaboration with NGOs and encouragement for sharing of conservation responsibilities in Europe. He informed the Group that no further meetings are planned for the Working Group on Forages during Phase VI. Further information on Phase VI of ECP/GR is available from the ECP/GR Web site (<http://www.ipgri.cgiar.org/ecpgr>).

Chairperson's report

P. Marum reviewed the activities carried out and the work accomplished since the last meeting held in Norway in March 1997.

Network Coordinating Group

The Steering Committee of ECP/GR made some changes to the operational structure in Phase VI of the Programme. To achieve greater coordination within all the Crop Networks, Network Coordinating Groups (NCG) will be activated to establish priority actions for the extended scope of crops covered by the Networks. Working Groups will no longer necessarily meet several times during the phase, but they will continue to be the main implementing bodies of the Network's activities. The NCG will be composed of the Working Group Chairpersons and Vice-Chairpersons or Database managers. The Forages Network is a little special because it contains only one Working Group and many "smaller" databases. Despite this, we will also create a Network Coordinating Group consisting of a smaller group of people. After discussion between Lorenzo Maggioni and myself we created a temporary Network Coordinating Group that has functioned up to this meeting. The Network Coordinating Group consisted of Lajos Horváth, Morten Hulden, Valeria Negri, Ruaraidh Sackville Hamilton, Magdalena Ševcíková, Evelin Willner and Petter Marum. A new Network Coordinating Group will be elected at the end of this meeting.

European forage databases

The Working Group on Forages manages many databases, but even with this large number of databases not all forage species can be attributed to a specific database. Therefore it was suggested to establish three new European databases: one for minor forage grasses, one for minor forage legumes and one for minor *Trifolium* species.

Considering that the forage databases are already dispersed among many institutes, those that are already managing a forage database were asked to extend their responsibility to one of the new databases. The Institute of Agrobotany, Hungary has taken the responsibility for the European minor forage legumes and the Nordic Gene Bank has taken the responsibility for the European minor forage grasses.

Since our last meeting the number of databases available on the Internet in a searchable form has increased considerably. The following databases are now searchable on-line: *Agrostis, Bromus, Dactylis, Festuca, Lathyrus, Lolium, Phalaris, Phleum, Poa, Trifolium repens* and *Trifolium pratense*. The perennial *Medicago, Trifolium repens* and *Lolium* databases are available for downloading. The *Bromus, Dactylis, Festuca, Lolium, Trifolium pratense* and *Trifolium repens* databases are temporarily placed on the NGB server.

During the last two years several of the databases have been updated using the Forages Descriptor List and other modified lists. Reports about the updating will be given later during this meeting.

European Forage Collection

At the last meeting the Group recommended the establishment of a decentralized European Forage Collection based on the principle of sharing of responsibilities. The Seventh Meeting of the ECP/GR Steering Committee in 1998 discussed the principles of sharing of responsibilities and encouraged Working Groups to develop a proposal for the sharing of responsibilities and seek to implement these. I believe we have a good proposal. It is now time to implement it.

Standards for regeneration

Following the presentation and discussion at our last meeting, Ruaraidh Sackville Hamilton made a great effort to complete the *Guidelines for the regeneration of accessions in seed collections of the main perennial forage grasses and legumes of temperate grasslands*. The guidelines are

published in the proceedings of our last meeting.[1]

Lolium perenne *Core Collection*

The evaluation of the *Lolium* Core Collection was carried out at 16 locations in 1995 and two locations in 1996, in a total of 17 countries. The field trials are now completed. A large amount of data has been generated. In April 1999 Ruaraidh Sackville Hamilton, François Balfourier and myself met in Clermont-Ferrand, France and discussed how to proceed with analyzing the data. On the same occasion R. Sackville Hamilton and F. Balfourier spent about 10 days working on the data. I believe it is a major achievement to have got so far without special project money. We will hear more about the core collection later in the meeting.

EU projects on genetic resources (EC1467/94)

At the last meeting we discussed several possible project applications. It was agreed that the previous project on *Lolium* and *Festuca* would be revised to only focus on *Lolium* and be resubmitted. Dirk Reheul, Belgium offered to coordinate the new proposal. In the spring of 1998 news reached us that there was little money available and that most of the available funds would go to projects on animal genetic resources. This did not create a lot of enthusiasm among the potential participants. Finally we had to give up the efforts to resubmit the proposal. For the other possible projects it was not possible to find people interested in coordinating a proposal.

Presentations about the Working Group

At the International Grassland Congress in Canada, June 1997, two posters were presented: the first, presented by P. Marum, gave an overview of the activities of our Group and the second, presented by R. Sackville Hamilton, provided information on the work on the *Lolium* Core Collection. The latter was mentioned during the closing session as a good example of international cooperation.

Information about the databases and preliminary results from the core collection were also presented at the International Grassland Congress and at the EUCARPIA Fodder Crops and Amenity Grasses Section Meeting in Switzerland, September 1997. At the EUCARPIA meeting there were three presentations about the core collection.

Reconstruction of the Albanian forage collection

The Working Group on Forages was informed at the end of 1997 that the Albanian collection of forage genetic resources was entirely lost during recent civil unrest. It was suggested that, to avoid duplication of efforts, the Working Group on Forages coordinate the requests for material to reconstruct the Albanian collection. The managers of the forage databases have searched for genebanks holding accessions from Albania and other relevant material. A number of accessions have been identified in several genebanks and seed samples have been sent to Albania.

Mid-term progress report

An internal mid-term report with inputs from the members of the Group was compiled in the spring of 1998. The report was distributed to all members of the Working Group providing summaries of activities implemented since the previous meeting of the Group. The report was also used by the Secretariat in Rome and by the ECP/GR Steering Committee for their review of progress during Phase V.

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[1] Sackville Hamilton, N.R., K.H. Chorlton and I.D. Thomas. 1998. Appendix III. Guidelines for the regeneration of accessions in seed collections of the main perennial forage grasses and legumes of temperate grasslands. Pp. 167-183 *in* Report of a Working Group on Forages. Sixth meeting, 6-8 March 1997, Beitostølen, Norway (L. Maggioni, P. Marum, R. Sackville Hamilton, I. Thomas, T. Gass and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.

EU Proposal - The Fifth Framework

Ruaraidh Sackville Hamilton (IGER, UK), has coordinated a proposal with the title *Improving germ-plasm conservation methods for perennial European forage species (ICONFORS)*. In addition to the UK, Czech Republic, Denmark, the Netherlands, Norway and Portugal are participating in the proposal. The main objective is to develop a seed multiplication protocol to suit different environments and economic constraints.[2]

Report of the Forages Network Coordinating Group Meeting

P. Marum briefly reported on the meeting of the Network Coordinating Group held on 17 November. The Coordinating Group was concerned about the low frequency of meetings planned for Phase VI. P. Marum asked the Working Group whether they agreed that the recommendation of the Coordinating Group be forwarded to the Steering Committee for a higher meeting frequency (2 meetings in 5 years) and this was approved. The Coordinating Group also made comments on the Crop Working Group Process Analysis matrix proposed by the Steering Committee.[3] Some modifications were suggested to better meet specificities of the Working Group on Forages (a full report of the Forages Network Coordinating Group meeting is given as Appendix II).

The European Central Forages Databases

New databases

European Minor Forage Grasses Database

M. Hulden reminded the Group that in order to handle passport data for accessions of European forage plants that do not yet have their own databases, the creation of a European Minor Forage Grasses and of a European Minor Forage Legumes has been proposed. The suggested name European Minor Forage Crops was changed to European Minor Forage Grasses in order to avoid confusion with the European Minor Crops database.

If the content of the file is to correspond to its name, the European Minor Forage Grasses database would only contain forage accessions belonging to the family Poaceae. As a result, still another database would be needed in order to cover all the forage plants held by European institutes. Forage plants that are neither legumes (family Fabaceae) nor grasses would be covered by neither of the two new databases. The Working Group may want to reconsider the proposal and instead create one single new database, or alternatively rename the databases to Minor Forage Legumes and Minor Forage Non-Legumes so that all remaining forage plants are covered.

Collection of data for the Minor Forage Grasses database has not started yet. A literature inventory was given of the list of genera with potential interest. Some of the genera mentioned are tropical and may be of minor interest in Europe. Others (e.g. *Hordeum* or other cereals) could be included though they already have ECP/GR databases of their own,

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[2] On 13 April 2000, the Director of the Life Sciences Directorate of the European Commission informed the ICONFORS coordinator that the ICONFORS proposal had been favourably evaluated by the Commission services with the help of independent experts, and that accordingly the Commission services wished to proceed to contract negotiations. The participating institutes and their respective ICONFORS team leaders are IGER, UK (Ruaraidh Sackville Hamilton), NCRI, Norway (Petter Marum), Oseva Pro, Czech Republic (Magdalena Sevcíková), PRI, Netherlands (Rob van Treuren), ENMP, Portugal (Manuel Tavares de Sousa) and DLF-Trifolium, Denmark (Niels Christian). Subject to satisfactory conclusion of contract negotiations and the completion of the formal selection process, it is hoped to start work on the 4-year project in 2001.

[3] Maggioni, L. and T. Gass (eds.). 1998. Report of the Steering Committee. Seventh meeting, 29 June and 4-5 July 1998, Braunschweig, Germany. International Plant Genetic Resources Institute, Rome, Italy.

but they have limited use as forage plants. The best strategy to follow is probably to ask the institutes to provide information on *all* the material they have in their possession and then sort out which are already included in other databases.

Some species used as forage plants also have other uses, for instance as ornamentals, spices or environmental (soil-binding etc) plants. Institutes dealing exclusively with forage plants are likely to have accessions suitable only for forage use, while institutes with a more general scope, e.g. national genebanks, may store a wider range of forms, something that should be kept in mind when asking for contributions to the database. Finally, though not of great economic importance, forage plants for animals other than mammals (e.g. birds and bees) may also be considered for inclusion in the database.

European Minor Forage Legumes Database

L. Horváth reminded the Group that the "Other perennial forage legumes database" – which included the cultivated biennial and perennial species and their close relatives of the genera *Anthyllis, Onobrychis, Lotus* and *Melilotus* – was the predecessor of this database. In 1999 the ECP/GR Forages Network decided to expand the scope of this former database. The Minor Forage Legumes Database (MFLDB) is intended to include data of all forage legumes that do not have a separate database. The compilation of MFLDB is in process and in its present status the database contains the passport data of 1209 genebank accessions of 128 species from 13 genera. So far nine institutions have contributed to the MFLDB. The precise list of genera and species to be included in the MFLDB is still to be decided. Minor *Trifolium* species have been included. Taxonomy problems were mentioned: for the time being the original terminology is being kept. Regarding the degree of completeness of descriptors, only very few are complete.

Status reports from the database managers

Representatives from the countries hosting the ECP/GR Forages databases presented an update of the status of these databases. Since the last meeting of the Working Group, updating has proceeded for several of these. Summaries of the presentations are given below, full reports are published in Part II of this volume.

European Phleum, Agrostis *and* Phalaris *Databases*

M. Veteläinen presented the status of the European *Phleum*, *Agrostis* and *Phalaris* Databases. These databases are maintained by the Nordic Gene Bank (NGB), a regional genebank for Denmark, Finland, Iceland, Norway and Sweden. The databases are searchable on-line at the Internet server of the NGB (<http://www.ngb.se/Databases/ECP/>). They contain passport data on 378 217 and 4259 accessions respectively. The *Agrostis* database contains accessions from 25 countries or regions, the *Phalaris* database from 17 countries and the *Phleum* database from 35 countries. Eighteen percent of accessions are unduplicated by accession name. They have missing data for the following important passport descriptors: accession number (0.7%), status of sample (6.4%) and country of origin (7.5%).

European Poa *Database*

E. Willner indicated that as a result of recent updating, the European *Poa* Database contains data on 3003 accessions from 14 institutes in 11 countries. Data from Lithuania, Hungary, Slovakia and Germany were recently updated. The remaining data were retained and transformed into the structure agreed at the last meeting. ECCDB fields are not completely identical with the new structure, but this work will be completed.

The list of descriptors used was presented. Complete data were received only for Accession Number, Genus, Species, Institute Code and almost completely for Country of Origin, Status of Sample, Collecting Site. The other data still show a very low coverage (5-30%).

The accessions included in the database belong to 29 different species, the most frequent being *Poa pratensis* with 2676 accessions, followed by *P. bulbosa* (70) and *P. nemoralis* (49). Eight species are represented by only one accession each. Forty-two accessions came without a species designation, they are designed as 'sp.' A table giving an overview of the species and their frequencies in the database was presented.

The accessions in the database are reported to originate from 46 different countries. Almost 50% of the accessions (1455 accessions) originate from Poland, followed by 318 from Germany, 137 from the Netherlands and 131 from Hungary. Eleven countries are represented by one accession each. Only 207 accessions came without information about the country of origin.

Status of samples is as follows: most accessions are landraces or traditional cultivars (44%). A large part (24%) belongs to advanced cultivars or breeder's lines. There are 494 accessions without status, because the status is unknown or has not been checked yet.

European Lolium *and* Trifolium repens *Databases*

R. Sackville Hamilton reported on these two databases managed at IGER, Aberystwyth, UK. The European Central Crop Databases (ECCDBs) for annual and perennial *Lolium* species have been combined into one. Updates have been requested from all institutes. Data have been updated for Belgium, Germany, Italy, Slovakia and Turkey. Additional data were received from Lithuania in October 1999 but have not yet been incorporated. The ECCDB for *Lolium* has been made available on the Internet in both searchable and downloadable forms. Tables showing the current contents of the ECCDBs for *Lolium* (total 9543 accessions) and *Trifolium repens* (1415 accessions) were presented.

Problems continue with completeness and accuracy of the data, e.g. the comparison of country of origin and data on latitude/longitude shows many inconsistencies. This raises the problem of data check at entry level.

Based on concrete examples, the methods followed for the determination of the "derived" status of the accessions (using the status of data in the fields for "collector's institute" and "breeder's institute"), and for the assessment of the originality of accessions and identification of the most original samples (MOSs) (based on Institute codes), were presented.

European Dactylis *and* Festuca *Database*

W. Majtkowski presented the status of these databases on behalf of the database manager, G. ðurek. Since the meeting in Norway (March 1997) new data were added to both databases. The *Dactylis* database now contains 8793 records and the *Festuca* database 7597. These numbers include inputs from new institutions from Belgium, Lithuania and Latvia. Tables providing the current status of both databases were presented. Analyses were carried out to identify duplicated accessions in a selection belonging to the following types of accessions: unique accessions (accessions without duplication); 'primary holder' accessions (accessions duplicated more than once, country of origin matches holder country); 'secondary holder' accessions (accessions duplicated more than once, country of origin does not match holder country); status undefined (accessions duplicated or not but undefined country of origin). The results show that more than 70% of all cultivars and breeder's lines stored in Europe are duplicated at least once. On the other hand, less than 30% are unique for the entire European collection. In the next step the same analysis will be done on wild ecotypes. On average, less than 90% of wild and semi-natural ecotypes are stored in the country of origin. The above analysis is only an estimation of the possible number of 'primary holder' accessions. Further work will provide lists of priority accessions for conservation by each of the contributing genebanks.

European Perennial* Medicago *Database

B. Montegano presented the status of the database on behalf of the database manager, V. Gensollen. The database includes data received from 22 genebanks in 17 countries. It records a total of 2888 accessions with 37 passport descriptors for 32 different subtaxa from 50 countries. Tables showing subtaxa repartition and completeness of descriptors were presented. The database is available at <http://www.ipgri.cgiar.org/ecpgr/platform/Crops/Medicago.htm>. The last edition of the Perennial *Medicago* spp. catalogue was printed in 1995. A raw DBF table is available through FTP on the ECP/GR Platform and can also be provided on diskette or by e-mail upon request. On-line access to the database is planned. The database was updated for the last time in 1995. Requests will be sent to the 22 former contributors and to 14 other possible partners holding accessions of perennial *Medicago*. Additional information requested includes type of storage, location of safety-duplicates and date of safety-duplication. Duplications have been screened and results show the need for a standardization of the taxonomic description.

European* Arrhenatherum elatius *and* Trisetum flavescens *Databases

M. Ševcíková indicated that the structure of these databases was renewed in 1998 according to the FAO/IPGRI Multicrop Passport Descriptors (1997) and the Forage Passport Descriptors (1998). The databases have been updated in 1999. Updates or verification of checked data have been requested from all 15 institutions holding relevant germplasm. So far only four institutes have responded. The *Arrhenatherum* database contains passport data of 276 accessions of 3 taxa and 1 subtaxon belonging to 15 institutes. The *Trisetum* database includes passport data from 12 institutes and 79 accessions of 4 taxa and 2 subtaxa.

European* Bromus *and* Trifolium pratense *Databases

L. Horváth reported on the databases maintained by the Institute for Agrobotany (ABI), Tápiószele, Hungary. The databases are searchable on-line at the Internet server of the Nordic Gene Bank.

After the last update in 1999 the European *Bromus* Database (BDB) contains passport data on 609 accessions of 46 *Bromus* taxa stored in 11 European genebanks. The collections recorded in the BDB contain accessions from 37 countries or regions, 13 of them outside Europe, and include commercial varieties and breeding or research materials (55), ecotypes or semi-wild material and material of unknown type (554).

In 1995, the European *Trifolium pratense* Database was transferred from the Federal Agricultural Research Station of Changins, Nyon, Switzerland, where it was started in 1984, to ABI. After the last update in 1999 the *Trifolium pratense* database contains the passport data of 2316 red clover accessions stored in 21 genebanks or other institutions of 16 European countries. The collections include commercial varieties (912), breeder's lines (101), primitive or local cultivars (480), wild or semi-natural ecotypes (583) and material of unknown type (240). The duplicates within the database are marked with the same ECP number.

European* Agropyron *Database

D.P. Shamov reported on the database on behalf of the manager S. Angelova. The decision to establish the *Agropyron* database was taken at the fifth meeting of the Working Group on Forages in Bulgaria (1995). At the sixth meeting in Norway (1997) S. Angelova requested information from four institutions holding *Agropyron* collections (Hungary, Italy, Turkey, Russian Federation). No replies have been received yet. The collection of *Agropyron* spp. currently contains a total of 56 accessions: 23 cultivars (10 from USA, 9 from Canada and 4 from Kazakstan), and 33 wild ecotypes (14 from Bulgaria, 8 from the Czech Republic, 9 from Kazakstan and 2 from Russia). Thirty-nine accessions are kept in long-term storage at the genebank of the Institute of Introduction and Plant Genetic Resources “K. Malkov”, Sadovo.

European Trifolium alexandrinum *and* T. resupinatum *Database*

H. Aylanem presented the European database on *Trifolium alexandrinum* and *T. resupinatum*. The database is now maintained at the Israeli Gene Bank, Agricultural Research Organization (ARO), Volcani Center, Bet Dagan, Israel. The database should be updated soon and will be available on a floppy disk. A table providing information on the accessions of *T. alexandrinum* and *T. resupinatum* recorded in the database was presented.

European Trifolium subterraneum *and annual* Medicago *Databases*

C. Bueno presented the status of these databases on behalf of their manager, F. González López. Since the last report the databases have been updated and contain records of 3175 accessions of *Trifolium subterraneum* and 1879 accessions of *Medicago* (annual species) from 11 institutes where the accessions are maintained. The main task was to update the passport descriptors with those recommended by the Sixth Meeting of the ECP/GR Working Group on Forages. The databases are available as Microsoft Access and Excel files.

European Lathyrus *Database*

B. Montegano presented the database on behalf of the database manager, D. Combes (IBEAS, University of Pau, France). The *Lathyrus* database includes six species: *L. cicera (*776 accessions), *L. heterophyllus* (80), *L. latifolius* (331), *L. sativus* (2354), *L. sylvestris* (668) and *L. tuberosus* (237). Europe, North Africa, Ethiopia, Syria and India are represented. There has been no search for duplicates yet, since the species concerned are mostly wild species and therefore real duplicates should be rare. A table showing the completeness of descriptors was presented. The *Lathyrus* database can be provided upon request on floppy disk or as a print-out. It is also freely accessible through Internet at the Pau University site: <http://www.univ-pau.fr:8888/lathy/lathyrus>.

European Vicia *spp. Database*

V. Negri informed the Group that no updated information on this database was received before the meeting.

European Other Vicieae Database

R. Sackville Hamilton reported that the manager, Prof. F.A. Bisby, records no change in the status of this ECCDB since the previous meeting. Further progress depends on the availability of additional specific funding.

Comparison between the number of accessions reported in the European Central Crop Databases (ECCDBs) and in National Collections in 1997

P. Marum indicated that in 1997 the Working Group on Forages conducted a survey of the National Collections in member countries. Information was received on the most important genera: *Trifolium, Medicago,* Vicieae*, Lolium, Festuca, Phleum, Dactylis* and *Poa.* There appeared to be differences in the number of accessions in the ECCDBs and the National Collections and P. Marum had a closer look at these data. He noted large variations between countries and genera in the percentage of accessions included in the ECCDBs. On average only 50% of the accessions existing in National Collections were included in the ECCDBs in 1997. Ideally the number of accessions in the ECCDBs should be equal to the number of accessions in the National Collections. With the present way of updating the ECCDBs this is difficult to achieve. New ways of updating/maintaining the ECCDBs should be sought.

An alternative method of organizing and updating the forage databases

M. Hulden used a tridimensional graphic to show a representation of all the ECP/GR databases, where the data from contributing genebanks (on the first axis) are collected for the different crops (second axis) and for all the respective descriptors (third axis). He showed the inefficiency of the system currently used to achieve this final result, since genebanks are

sending several crop-specific files to several central crop database managers. In the case of the Forages group only, an estimated 416 files are passed from genebanks to database managers.

He said that the system would gain in efficiency if each genebank could export data only once and for all crops, and if integrity checks were applied before data export. Moreover, the utilization of primary and secondary publishers would allow updates in 24 hours. A proposed strategy to increase the efficiency of database compilation was outlined as follows.

Data exchange strategy: methods for data exchange will vary according to the level of access to the Internet of the institute: none, temporary or permanent. Each institute will identify a primary publisher for their data. The institutes with permanent Internet access will normally become the primary publishers of their own data, but may also be primary publisher for other institutes that do not have permanent Internet access. For each institute there can be only one primary publisher.

Descriptor list strategy: a standardized descriptor list is essential for the central crop databases. The Forages Network is using a modified version of the IPGRI Multicrop Descriptor List. Further modifications may be necessary in the future.

File format strategy: the dBase file format (DBF) is currently used for file exchange. This file format is supported by most commercial database and spreadsheet programs. There are some restrictions in the DBF format that may suggest usage of a different file format in the future. Comma-separated-values (CVS) or pipe-separated-values may be candidates for alternative formats.

Character set strategy: database text fields are currently restricted to Latin alphabet letters A-Z. Use of the Unicode character set in ECCDBs would allow preservation of national characters.

In the discussion following, L. van Soest expressed his doubts about the continuing need for central crop databases in the future, considering that genebanks will be providing data on their collections on the Internet. He thought that the preferred system would be in the future to directly request germplasm from the genebanks, rather than through a central database.

However, R. Sackville Hamilton thought that the ECCDBs will remain an essential tool when data compiled from all the existing collections need to be analyzed, such as in the selection of European core collections.

L. Maggioni informed the Group that a collaborative project (EPGRIS) had recently been submitted to the EU Fifth Framework Programme, with the objective to:

1. support the creation of national PGR inventories by bringing the people responsible for each country together and offering technical support;
2. create a European search catalogue with PGR information (EURISCO), frequently and automatically updated from the national PGR inventories.[4]

P. Marum made the proposal to establish a central database for all the minor forage crops at the NGB, and to use this opportunity to test a more efficient system of data flow, whereby data for all the minor forage crops would be delivered to the central database.

Recommendation and workplan

The Group agreed that:

1. *The compilation process of the Minor Forage Crops Database will be used to test an alternative method of compiling ECCDBs.*
2. *The ECP/GR Secretariat, in collaboration with the NGB, will send by February 2000 a letter to all the Working Group members, asking that a passport database file of all forages accessions be submitted by each institute that is holding forages accessions in the respective countries.*

[4] In April 2000 the EC approved the EPGRIS project for funding.

3. *In the above letter, the institutes will be asked to respond to the request before June 2000, in two possible ways:*
   - *either by providing a URL (Universal Resource Locator) to a site on the Internet where the passport data file can be downloaded. This URL will become the primary publisher of the passport data from the institute in question;*
   - *or by sending or uploading a passport data file to an address given in the letter. The site receiving the file will become the primary publisher of the passport data from the institute in question. (The location of the primary publisher can be changed later if an institute gets permanent Internet access and possibilities to publish their own data).*

The letter will specify that data from several institutes within the same country can be submitted in the same file, provided that a field GBKINSACR containing the unique acronym for the holding institute and the unaltered GBKACCNUM containing the accession number used by the holding institute, are included for each record in the file.

Most documented commercial database formats will be acceptable (except Microsoft formats, since they are liable to change and are incompletely documented, and cannot be used for automatic script-based processing). DBF (dBase) or CSV (comma-separated values) are preferable.

4. *The data providers should be prepared to submit the file repeatedly, ideally every time the content of the file has changed, and therefore no manual processing of the file should take place during export. Conversion scripts that make automatic conversions and integrity checks will be worked out by the Minor Forage Database managers and suggested to the data providers.*
5. *The receiving party (NGB), before the end of 2000, will do the following with the data:*
   - *publish on the NGB Internet FTP server a 'raw' version that exactly corresponds to the file submitted by the contributor;*
   - *work out conversion scripts that convert the institute-specific format to the ECP/GR Forage Network format, at the same time applying integrity checks to the file. The conversion scripts will also be published on the NGB FTP server;*
   - *publish the resulting 'converted' file on the NGB FTP server;*
   - *send feedback to the data provider on possible inconsistencies in the raw data file that should be resolved before the next update is submitted. The data providers will also be encouraged to download the conversion scripts and apply the integrity checks locally before the next updates;*
   - *work out a script that extracts the 'minor forage crops' records from the converted files to construct the Minor Forage Crops ECCDB;*
   - *provide the Minor Forage Crops Database as downloadable from the NGB FTP server and searchable at the NGB HTTP server.*

As an additional result of this exercise, other database managers will be able to update their ECCDBs by downloading the most recent versions of the institutes' data files from the Nordic Gene Bank FTP server.

Status of National Collections

(for more details see also Part II, Presented Papers)

Albania

K. Tahiraj presented the status of forage genetic resources in Albania, a Mediterranean country rich in wild forage plants. The Forage Research Institute at Fushë-Krujë is responsible for the collecting, evaluation and description of this material, in collaboration with the National Center of Seed and Seedling (NCSS) at Tirana. The genebank of the Forage Research Institute holds 24 accessions of *Medicago*, 13 accessions of *Trifolium*, 4 accessions of *Melilotus officinalis*, 2 accessions of *Lotus corniculatus*, 18 accessions of *Glycine*, 32 accessions of

Vicia, 23 accessions of *Pisum*, 11 accessions of *Lathyrus*, 18 accessions of *Avena*, 14 accessions of *Hordeum*, 2 accessions of *Lolium*, 2 accessions of *Festuca*, 1 accession of *Dactylis* and 2 accessions of *Phleum*. Collecting activities provided three precious landraces: 'Tomin' (*Medicago* sp.), 'Shishtavec' (*Trifolium* sp.) and 'Voskopoja' (*Pisum* sp.).

The Group was pleased to learn that the Albanian Forages collection recovered after the 1998 effort of the Working Group on Forages to help in its restoration.

The ECP/GR Coordinator wished to thank the Group for its prompt response to the call for help received from Albania. He informed that the extensive search of the European Databases resulted in the identification of several accessions of Albanian origin held in European genebanks. Subsequently, as far as the ECP/GR Secretariat was informed, germplasm was sent to Albania by CGN, the Israeli Gene Bank, the Lithuanian Gene Bank, NGB and VIR.

Austria

The representative of Austria was unable to attend the meeting but indicated in subsequent correspondence that due to limited resources, no progress had been made in the Austrian collection.

Azerbaijan

Z.I. Akperov reported that a large number of cultivated and wild species of fodder crops grow in all regions of Azerbaijan, from the lowlands to the alpine belt. He gave an overview of the characteristics (habitats, uses, etc.) of fodder plants belonging to the following groups: grasses (Poaceae): *Phleum* L. (timothy), *Dactylis glomerata* L. (cocksfoot), *Poa* L. (meadow grass), *Festuca* L. (fescue), *Zerna* P. (brome grass), *Bromus* L. (brome grass), *Agropyron* Gaertn. (quack grass); sedge plants (Cyperaceae J. et Hil.): *Carex, Kobresia persica, Elyna;* legumes (Fabaceae): *Medicago* L. (lucerne), *Trifolium* L. (clover), *Onobrychis* Adans. (sainfoin), *Vicia* L. (vetch), *Trigonella* L. (trigonella), *Melilotus* Adans. (sweetclover, melilot), *Glycyrrhiza glabra* L. (liquorice); Russian thistle (Chenopodiaceae): *Salsola, Atriplex, Chenopodium* L., *Kalidium* Mog., *Kochia* Koth., *Halostachis* C.A.M., *Halocnemum* Bib., and motley grass. In spite of the high diversity of plant genetic resources in Azerbaijan, the collection of fodder crops has not been increased but reduced in the last years, and therefore the collecting and multiplication of fodder crops and the strengthening of breeding activities are very necessary.

Belgium

A. Ghesquière indicated that there have been no changes since the last meeting.

Bulgaria

D.P. Shamov indicated that enrichment of the collections, evaluation and conservation are the main tasks of the National Programme for plant genetic resources at the Institute of Introduction and Plant Genetic Resources "K. Malkov"in Sadovo. The forage collections in Bulgaria hold a total of 3223 accessions. As a result of exploration missions in six regions, 124 samples of forage grasses and legumes were collected.

Cyprus

D. Droushiotis reported on the forage collecting activities carried out from 1978 to 1999 in collaboration between the Agricultural Research Institute in Nicosia (ARI) and various organizations (IBPGR/ICARDA, WADA, FAO, FCPI) and gave an overview of the occurrence of annual medics in Cyprus according to rainfall and altitude.

Czech Republic

M. Ševčíková reported that there are two institutions holding forages collections in the Czech Republic, responsible for the gathering (including collecting missions), documentation,

characterization, evaluation and regeneration of genetic resources: the Grassland Research Station in Zubří (1885 grasses) and the Research Institute for Forage Crops in Troubsko (1220 legumes). The forage collections thus total 3105 accessions. The long-term storage of seed samples of seed-propagated species and operation of the national documentation system EVIGEZ have been provided by the National Gene Bank, Prague (2366 accessions stored). Safety-duplication has been provided in the framework of a bilateral contract with the Gene Bank in Piešťany, Slovakia (only 2.5% forages).

France

B. Montegano summarized the national strategy for the conservation of genetic resources in France: there are 26 networks of voluntary partners coordinated by a national structure, BRG (Genetic Resources Board). *Ex situ* conservation of forage and turf species is the task of a network associating public (INRA, GEVES) and private (ACVF) partners. The purpose of this network is to manage forage collections which have been identified, classified and located and are available. The National Collection is a subset of the Network Collection. A central relational database called RGFour was established in 1996 using MS-Access. The information was structured with passport, cultivar-specific, ecotype-specific, characterization, evaluation and sample identification descriptors, and data were recorded in 1997. So far 2054 accessions of 51 legumes and grasses species have been identified. The National Collection consists of 547 of these accessions and includes 31 species. The active and long-term genebanks are located at GEVES Le Magneraud. The primary holders of the accessions provide for safety-duplications. There are common keys allowing links between RGFour and these genebanks' management databases. Ongoing activities concern cultivars removed from the list of registered cultivars: updating of the list, searching for duplicates, screening of samples in imminent need of regeneration, completeness of the characterization and evaluation descriptors. Requests for seeds or information on the National Collection should be sent to the Network coordinator. Future plans include on-line access through the BRG platform and publication of the catalogue.

Georgia

A. Korakashvili focused his presentation on grass landraces of the arid pastures of Georgia, represented by various associations typical of semi-deserts and dry steppes. Located at altitudes of 90-900 m above sea level, they occupy an area of more than 300 000 ha in the lowland and pre-mountainous zones and partially in the foothills of eastern Georgia, and are used as seasonal pastures in winter and for cattle and sheep breeding in spring and autumn. The climate of arid pastures is basically dry subtropical. The topsoil of arid pastures of Georgia is diversified, as is the grasslands vegetation. The most important species associations were listed and their various uses as pastures and for haymaking described. Data on the productivity of semi-desert pastures were given. Improvement works should be carried out on plains and slightly steep slopes of arid pastures (irrigation and in some cases desalination) and cultivated, irrigated fodder fields should be created by planting cereals, leguminous crops and perennial herbs, like alfalfa, orchard grass, meadow fescue, awnless bromegrass. Numerous experiments showed the low efficiency of sowing perennial grasses with shrubs. Good results were obtained in sowing of a yellow alfalfa, and intermediate and crested wheatgrass in semi-desert zones. The best results were obtained with sowing of the above-mentioned natural old varieties and landraces.

Germany

E. Willner presented the developments in fodder crop collections in Germany since 1997. The number of accessions was presented for the eight genera *Trifolium, Medicago, Vicia, Lolium, Festuca, Phleum, Poa* and *Dactylis*. The highest number of accessions are held by the genus *Vicia* for forage legumes and by the genus *Lolium* for grasses. In total there are 12 876 accessions in

German collections. All accessions are stored under long-term conditions; in Gatersleben and Malchow only –15°C is used. The number of accessions for regeneration varies very strongly each year and depends on personnel and technical facilities. Regeneration is sometimes supported by breeders or other institutes. Safety-duplication was started between Malchow (holder of primary collection) and Gatersleben (holder of safety-duplicates). A total of 570 accessions of *Lolium perenne* and 63 accessions of *Dactylis glomerata* are stored under 'black-box' arrangements. The number of accessions available for distribution was presented. A total of 9781 accessions are available, i.e. 76% of all accessions in collections. Almost a quarter of the whole collection (3095 accessions) is in urgent need of regeneration.

Greece

A report on the status of the national collection was received from T. Vaitsis (unable to attend the meeting) and is included in Part II of this volume.

Hungary

L. Horváth presented the institutes involved in PGR activities in Hungary: the Institute for Agrobotany, Tápiószele is the coordination centre for all crop genetic resources activities; the Research Center of the University of Agricultural Sciences Debrecen, Nyíregyháza, the Research Center of the University of Agricultural Sciences Debrecen, Karcag, and the Pannon University of Agricultural Science, Mosonmagyaróvár, are responsible for maintenance of germplasm collections to facilitate breeding programmes; the R. Fleischmann Agricultural Research Institute, University of Agricultural Sciences Gödöllő½, Kompolt, maintains working collections and lines to facilitate ongoing breeding programmes; the Agricultural Research and Development Institute P.U.C., Szarvas maintains working collections of ecotypes to facilitate breeding programmes. A table summarizing the collections held by each institute was presented.

Israel

H. Aynalem indicated that the Israel Gene Bank (IGB) started the evaluation and regeneration of forage plants at the Volcani Center during the 1998-99 crop season. More than 200 minor *Trifolium* accessions and other crops have been regenerated and characterized for various morpho-agronomic characters. This work is being continued during the 1999-2000 winter season. A number of rescue plant collection programmes have been carried out in Israel owing to genetic erosion. A table showing data on forage plants collected in Israel under the rescue collection programme in collaboration with the Hebrew University of Jerusalem and the Tel Aviv University from 1997 to November 1999, and a list of some of the forage plants conserved at the IGB were presented.

Italy

V. Negri presented the information made available from the Italian institutes holding forage collections: Centro di Studio sui Pascoli Mediterranei, c/o Istituto di Agronomia Generale e Coltivazioni Erbacee, Università degli Studi di Sassari, Sassari; Istituto Sperimentale per le Colture Foraggere, Lodi; Department of Plant Biology and Agro-environmental Biotechnology, Plant Genetics and Breeding section, (former Istituto di Miglioramento Genetico Vegetale), Università degli Studi di Perugia, Facoltà di Agraria, Perugia. Data from the Istituto del Germoplasma, Consiglio Nazionale delle Richerche, Bari, were received subsequently to the meeting and are included in Part II of this volume.

Latvia

B. Jansone informed the Group that there is no national PGR programme in Latvia. This work is undertaken by plant breeding stations, research institutes and universities. The main objectives of the agricultural crops PGR project were defined as follows: establish an

inventory of the origins and conditions of PGR existing in the different Latvian collections; create a computerized database on PGR in Latvian collections; develop criteria to include accessions in Latvian PGR collections; evaluate the most important features for accessions included in Latvian PGR collections; organize a long-term safety storage system for Latvian PGR collections; organize expeditions for collecting wild relatives of cultivated plants. A computerized PGR information centre was established at the Institute of Biology of the Latvian Academy of Science in 1994. A Latvian PGR database is being developed. It now contains basic data of 8743 accessions from 96 species stored in most of the PGR collections in Latvia; 2898 accessions are of Latvian origin, including 1526 of forages. Latvia now has its own genebank, which has been equipped in the framework of the Nordic-Baltic project with dehumidifiers and other tools to dry and pack seeds for long-term storage. Seeds from the 1997 harvest were the first to be placed in storage. Priority criteria for inclusion of accessions in the genebank were defined. The highest priority will be given to modern varieties of Latvian origin and also to landraces and accessions collected in natural conditions. The most valuable material of the first level of priority will also be stored in the Nordic Gene Bank as a safety-duplication collection.

Lithuania

N. Lemezienë reported on the collection maintained at the Institute of Agriculture, Dotnuva, consisting of 423 accessions of 18 forage species. All accessions are held in long-term storage conditions. Twenty-eight accessions have been safety-duplicated at NGB, Sweden; 405 accessions of 15 forage grass and legume species have been documented for passport data.

The Netherlands

L. van Soest indicated that since the last meeting of the ECP/GR Working Group on Forages the CGN forages collection increased by 176 accessions. Mainly old Dutch varieties of grasses, no longer listed on the Dutch variety list, and ecotypes of white clover collected in old pastures in the Netherlands were included in the collection. The collection consists at present of 641 accessions of 10 forages species.

In the future old Dutch cultivars of *Festuca* and *Agrostis* species will be regenerated and included in the collection. Furthermore the collection will be enlarged with ecotypes of different grasses, particularly *Lolium perenne* previously collected (1967 to 1982) by private breeders in old meadows in The Netherlands. It is expected that around 2005 the collection of grasses will be extended to approximately 750 accessions.

The legume collection will be enlarged with another 25 accessions of *Trifolium repens* collected in the Netherlands in 1997 and 1998, and 22 accessions of *T. pratense* (12) and *T. repens* (10) collected in 1999 in Central Asia.

Since April 1998 passport data of most of the CGN collections can be searched on-line or downloaded by crop on CGN's Web site (<http://www.plant.wageningen-ur.nl/about/Biodiversity/Cgn/collections/>).

Nordic countries

M. Veteläinen presented the NGB collection status. Between 1979 and 1983 NGB collected forage crops in all the Nordic countries (Finland, Denmark, Iceland, Norway and Iceland) including Greenland. Since then, forage species have been collected more sporadically. NGB also has Nordic material collected in the 1970s before NGB was established. Today, seeds from 2478 accessions are available at NGB. Information on forage accessions is provided in the Accession Database at <http://www.ngb.se/Databases/Accson.html>.

Poland

W. Majtkowski reported on the status and utilization of the national forage collection in Poland. Owing to current research activities, new genera and species and new groups of species have been included: tufted hairgrass (*Deschampsia caespitosa*), junegrass (*Koeleria* sp.), brome grass (*Bromus* sp.) and crested dog's tail (*Cynosurus cristatus*), and new species from 'botanical' (species from native and foreign floras) and 'ecological' (species for reclamation, energy crops, etc.) groups were also included in the collection. Tables showing the recent status of the Polish forage collection were presented: the legume collection contains 498 wild or semi-natural ecotypes, 499 advanced cultivars and breeder's lines, total 997; the grass collection contains 16 233 wild or semi-natural ecotypes, 561 unknown, 1545 advanced cultivars and breeder's lines, total 18 339. Nearly 90% of the collection are wild and semi-wild ecotypes. Only 3.1% of collected grass accessions are of unknown status, i.e. insufficiently documented. Forages represent nearly 30% of the total number of accessions in the Plant Genetic Resources Preservation Programme. Since the last report (1996), 5874 forage accessions (5627 grasses) representing 30.4% of the total collection have been distributed to many users in Poland and abroad, either as small seed samples or in the case of grass breeders as living plants from the field collection. All accessions are stored in long-term storage (except wild ecotypes of perennial ryegrass stored in medium–term storage in Bydgoszcz according to the Core Collection Programme needs). Owing to current financial conditions it is not possible to undertake any regeneration procedure.

Another paper focused on the collection of native and foreign grass species in the Botanical Garden of the Plant Breeding and Acclimatization Institute in Bydgoszcz. This is the biggest grass collection in Poland and it was developed on the basis of seed exchange between botanical gardens and expeditions. The collection of decorative grasses was evaluated for their general aesthetic value and the suitability of grass species for various 'ecological' purposes (i.e. reclamation, soil erosion protection, energy crop, etc.) was evaluated in highly devastated areas. Tables listing rare and protected grass species from the Polish flora, ornamental species in the grass collection of the Botanical Garden in Bydgoszcz, and "ecological" and alternative species in the grass collection of the Botanical Garden in Bydgoszcz were provided.

Portugal

M. Tavares de Sousa presented an overview of the collections held in Portuguese institutes: Banco Português de Germoplasma Vegetal (BPGV), Braga; Estação Agronómica Nacional, Oeiras; Universidade de Trás-os-Montes e Alto Douro, Vila Real; Universidade dos Açores, Ponta Delgada, S. Miguel, Açores; Jardim Botânico da Madeira, Funchal, Madeira; Estação Nacional de Melhoramento de Plantas, Elvas; Banco de Genes de Infestantes, Endémicas e em Perigo, Departamento de Protecção de Plantas e Fitoecologia, ISA, Lisboa.

Romania

T. Marusca gave a general presentation of grasslands biodiversity in Romania (61 grasses genera with 963 taxa, and 21 legumes genera with 581 taxa), and provided details on the collections held at the Grassland Research Institute (GRI), Brasov (715 accessions), and at the Suceava Genebank (937 accessions). Besides these seed collections, clones are also kept in the following institutes in the Academies of Agricultural Sciences and Forestry: Grassland Research Institute, Brasov; Grassland Research Station, Timisoara; Grassland Research Station, Vaslui; Grassland Research Station, Jucu-Cluj; Research Institute for Cereals and Industrial Crops, Fundulea; Agricultural Research Station, Suceava; and Agricultural Research Station, Caracal. Other collections are kept at the Agricultural University in Cluj-Napoca and at the University in Iasi. Many of these species of grasses and legumes are conserved *in situ* in 263 official natural reserves and in Botanical Gardens.

Russian Federation
A report on the status of the national collection was received after the meeting and is included in Part II of this volume.

Slovakia
J. Drobná presented tables summarizing the collections held by the three institutes dealing with forage genetic resources in Slovakia: Research Institute of Plant Production (RIPP), Piešťany (collecting, study, evaluation, characterization and conservation of species of the Fabaceae family), Breeding station Levočské Lúky (breeding of grasses), and Breeding station Horná Streda (breeding of forage legumes). Details were provided on the maintenance of collections and regeneration, availability and utilization of genetic resources, and evaluation and documentation status. There is no safety-duplication so far but in the future the RIPP accessions will be duplicated at the Gene Bank of the Research Institute of Crop Production (RICP) in Praha-Ruzyně, Czech Republic.

Slovenia
V. Meglič indicated that the Slovene genebank system consists of two working collections for forage grasses and clover species housed at the Biotechnical Faculty of the University of Ljubljana (91 legume accessions) and at the Agricultural Institute of Slovenia (224 legume accessions and 284 of grasses). The whole collection contains 638 accessions of 20 different forage species and includes material of economically important forage species. Most of the accessions were collected through short collecting missions throughout Slovenia. In 1999 a cooperative project was initiated with the Czech Gene Bank for several collecting expeditions in Slovenia and the Czech Republic. Evaluation of 39 white clover and 13 timothy accessions was started last year. In 1999 an information and database management system for the Slovenian genebank was developed. All forage accessions are well documented for IPGRI minimum passport descriptors, although some minor gaps exist. So far no characterization/evaluation data are included. Storage conditions are medium-term but it is planned to start storing seed samples on a long-term basis as soon as the collection grows enough for this activity to become economically feasible.

Spain
J.A. Oliveira Prendes reported on the collections of forage grasses in northern Spain. There are two organizations that maintain collections of forage grasses: the Misión Biológica de Galicia (MBG) at Pontevedra and the Centro de Investigaciones Agrarias de Mabegondo (CIAM) at A Coruña. The MBG maintains 500 Galician *Dactylis glomerata* accessions. The CIAM collection has 140 Spanish accessions of *Lolium* (perennial and Italian ryegrass) and *Festuca arundinacea*. A National Coordination Project which includes both the above-mentioned collections is presently being carried out in Spain.

Switzerland
A report on the status of the national collection was received from B. Boller (unable to attend the meeting) and is included in Part II of this volume.

Ukraine
V. Buhayov indicated that activities related to the study and conservation of forage crops in Ukraine are coordinated by the National Centre for Genetic Resources, Kharkiv. The programmes are performed by research organizations situated in various zones of Ukraine, namely the Feed Research Institute, the Institute of Land Cultivation, the Institute of Irrigated Land Cultivation, the Institute of Land Cultivation and Animal Biology and Ustimovka Plant Experimental Station. The collection of the National Centre for Genetic

Resources holds 2515 accessions of more than 50 species. The most numerous crops in these collections are *Trifolium* spp. (460 accessions), *Medicago* spp. (359), *Bromus inermis* Leyss. (256), *Lolium* spp. (236), *Festuca arundinacea* Schreb. (197), *Festuca pratensis* Huds. (163) and *Dactylis glomerata* L. (159). In 1998, 201 entries have been added to this collection, most of them native from Ukraine. A significant part of the forage crops genepool in Ukraine is represented by registered cultivars. Unfortunately, the national collections of forage crops in Ukraine contain few native wild populations of many species of leguminous and cereal perennial grasses. This is due to the difficult economic situation in Ukraine and corresponding limited funding for these activities. In 1991-99, only four expeditions were conducted aimed at the prospection of forage populations.

United Kingdom

R. Sackville Hamilton reported on the status of the three forage collections in UK: the Vicieae collection moved to the University of Reading with its curator Prof. F.A. Bisby and is now stored in freezers; the Royal Botanic Gardens (RBG) Kew Seed Bank continues to maintain the collections listed in the last ECP/GR forages catalogues but has added relatively little new relevant material since then, owing to the concentration of efforts on conservation of wild plant germplasm from the tropical and subtropical drylands. This effort is currently being expanded by the Millennium Seed Bank Project which, through a major international collaborative programme, aims to collect and conserve seed samples from 10% of the world's seed-bearing species; the IGER Genetic Resources Unit (GRU) is the major UK active forages genebank. It holds approximately 9000 accessions of approximately 350 species. Genebank activities since 1997 were summarized (accessions distributed, regenerated, new accessions). The regeneration programme has been intensified. Priorities have been established and the maximum annual regeneration capacity has now been reached. A breakdown of accessions regenerated by species was presented. The GRU is making increased use of core collections to improve the efficiency of utilization. In addition to the classical UK core collection already established for the European *Lolium* core collection, the GRU has identified a set of "targeted core collections" to support breeding and research on specific objectives. These new targeted core collections have been identified by analyzing passport and available evaluation data, specifically to maximize the expected genetic variance for the relevant characteristic.

Yugoslavia

Z. Tomić indicated that in Yugoslavia, three institutes deal with forage crops: Agricultural Research Institute "Serbia", Center for Forage Crops, Kruševac; Center for Agricultural and Technological Research, Zaječar; and Agricultural Research Institute, Novi Sad. Activities on collecting, evaluation and characterization carried out on legumes and grasses by these institutes were described. Regeneration of the existing collection of autochthonous grasses populations, stored in the National Gene Bank since 1992, was carried out in 1998 and 1999. All projects are now at the final stage. It is hoped that in the near future there will also be projects on further collecting of new plant material from the wild flora intended for selection and for the Gene Bank.

Collecting activities

Cooperation on collecting activities after Rio Convention: difficulties

E. Willner introduced her presentation by stating that the new conditions of access to plant genetic resources – on the one hand the property rights of the countries of origin, and on the other hand free access for all *bona fide* users – are making access more difficult. A situation where nobody is sure how the principles of the Convention are being implemented is creating uncertainty which can negatively affect international collaboration and in particular collecting missions. Experiences from the last collecting missions (Croatia, Bulgaria, Spain) carried out

by her institute (IPK, Malchow, Germany) are taken as examples. The organization of the collecting mission requires undertaking the following steps: (1) find a partner institution in the country where collecting will be undertaken; (2) if there is an interest in common collecting on the same material, species, etc. work must be planned on the basis of mutual trust; (3) it is important to find an interpreter and to identify the right places/sites for the collecting. Subsequently, for the implementation of collecting activities it is necessary that: (4) both partners participate in the collecting, tasks are divided and in the end the material as well as the information are shared; (5) ideally, after the collecting mission common work with the new accessions is developed (multiplication, characterization and evaluation). In conclusion, collaboration for collecting activities involves timely preparation and making contacts, precise arrangements (Material Transfer Agreement), sharing of responsibility (who is responsible for what?), division of labour, and common continuation of work on the collected material in order to increase the value of PGR.

Discussion

L. Maggioni commented by reminding the Group of the existence of the International Code of Conduct for Plant Germplasm Collecting and Transfer (FAO 1994). This voluntary code sets a number of guidelines to facilitate the definition of authorities for issuing permits and the request and granting of permits. The responsibilities of collectors, sponsors, curators and users are also clearly defined.

During the following discussion, E. Willner added that the re-distribution of acquired material remains a problem after her genebank signed bilateral acquisition agreements, since permission to transfer material to third parties needs to be requested from the country of origin for every accession.

R. Sackville Hamilton suggested that bilateral agreements could be signed that try to avoid a clause of restraint in further distribution.

L. van Soest commented that a Material Acquisition Agreement (MAA) was signed between CGN and Uzbekistan and Kyrgyzstan. This MAA allows the use of material for breeding, but not for direct commercial purposes, while the sharing of the benefits needs to be negotiated on a case-by-case basis. The material can also be distributed to third parties provided they agree with the conditions of the MAA.

Collecting landraces and wild relatives in the Czech Republic and bordering regions

M. Ševčíková indicated that in the past, insufficient attention was paid to the collecting of wild species and maintenance of old landraces. Domestic landraces represented only 1.5% and domestic wild relatives only 0.5% of the total germplasm in 1991. To fill the gaps in germplasm collections two projects were accepted in the Czech Republic. During a 7-year expedition activity, various phytogeographic regions of the country were visited. Altogether, over 3400 samples of forages have been collected. The missing materials are searched for, mostly in the germplasm collections of the neighbouring countries (Austria, Germany, Poland and Slovakia).

Collecting forages in Central Asia

L. van Soest presented on behalf of V. Chapurin the results of a second multicrop expedition in Central Asia conducted in August 1999 following the first expedition to Uzbekistan in 1997. This expedition was a joint mission between the Academia of Sciences of Uzbekistan and Kyrgyzstan, the N.I. Vavilov Research Institute of Plant Industry (VIR) and the Centre for Genetic Resources, the Netherlands (CGN).

The team collected in Uzbekistan, particularly areas of the Fergana Valley, and in mountainous areas of East Kyrgyzstan surrounding this valley. The mission collected 52 accessions of 10 forage species. Some of the accessions need further taxonomic identification. The collected material will be regenerated by VIR and CGN and thereafter made available to potential users.

Collecting activities in Finland during 1998-99

The Working Group on Forages at the Nordic Gene Bank initiated a collecting mission together with Boreal Plant Breeding in Finland in 1998 in response to the threat of disappearance of the locally cultivated forage material. Traditionally, Finnish farmers have used home-produced seed for pastures because of their local adaptations. However, with the EU membership, subsidies for cultivars outside the official list of varieties disappeared. Therefore there was an urgent need to collect local material from southern Finland. The mission resulted in approximately 170 locally cultivated forage accessions. This material will be preserved in the Nordic Gene Bank. A similar collecting mission will be organized in Sweden in 1999.

Collecting forages in Italy and Wales

R. Sackville Hamilton presented the collecting activities undertaken by IGER, UK. (1) Italy: as a result of collaborative research between the Clover Breeding Group of IGER and the Servizio Agricoltura-Aziende Sperimentali-Dimostrative in the Provincia di Pordenone, Italy, a gap in forage collections was identified in the northeast of Italy and a collecting expedition was planned to fill the gap and undertaken in 1998 in Italy. A total of 109 accessions was collected. (2) In Wales, accessions are collected from local sites where particular populations are identified as filling gaps in the collection. Nineteen accessions were collected during 1997-98, with emphasis on *Poa annua* in support of newly developing breeding and research objectives for amenity grasses.

Collecting in Abruzzo (Italy)

V. Negri reported on a study dealing with collection, conservation and evaluation of forage legumes in Abruzzo (Italy). Twenty-four accessions of lucerne (*Medicago sativa*) and 39 accessions of leguminous species belonging to the genera *Medicago, Trifolium, Anthyllis, Onobrychis, Lotus* and *Vicia* were collected. The study concerns agronomic traits (dry matter yield) and genetic variability as measured by molecular markers (AFLP) in local populations of lucerne in comparison with commercial cultivars. The main purpose of the agronomic characterization was to find interesting materials for breeding new varieties adapted to that environment. The genetic analysis showed that about 50% of landraces represents a distinct core group with more than 91% of genetic similarity. This information will be used in the breeding programme.

Collecting activities in Lithuania,1997-99

N. Lemezienë reported that during 1997-99 eight expeditions were organized to natural habitats of various geographic locations of 16 Lithuanian administrative regions. A total of 557 seed accessions of forage grasses and legumes were collected in 103 habitats. Altogether 24 species of grasses and 17 species of legumes were collected. Most of the accessions (more than 70%) belong to the species involved in the breeding programmes.

Collecting activities in Poland

W. Majtkowski presented the forage collecting activities in Poland, 1997-99. As of 1997 international cooperation was developed between neighbouring countries: Poland, Czech Republic, Slovakia and Ukraine. Several international expeditions were organized by institutes of these countries. Tables providing details of collecting missions and collected accessions in 1997, 1998 and 1999 were presented: the Centre for Plant Genetic Resources, IHAR, Radzików collected 201 local and 921 foreign accessions; the Botanical Garden, IHAR, Bydgoszcz, a total of 579 accessions.

Collecting activities in Slovakia, 1997-99

J. Drobná reported on forage-collecting activities in Slovakia, 1997-99. Several collecting

expeditions were carried out in various locations in Slovakia covering the west-Carpathian flora (*Carpaticum occidentale*) and Pannonian flora (*Pannonicum*). Collecting activities also include participation in a collecting expedition in the Crimean peninsula organized by IHAR, Radzików, Poland and the National Centre for Plant Genetic Resources in Kharkiv in 1998, and in a collecting expedition in Poland organized by IHAR in the area of Ponidzie in 1999. From 1997-99 a total of 768 accessions were collected: 228 samples in 1997, mostly species of *Trifolium* (60) and *Festuca* (33); 291 samples in 1998, with a majority of grasses (178); 249 samples in 1999, mostly grasses and clovers; forage legumes were collected in a relatively small number. The collected samples will be stored in the Gene Bank of RIPP Piešťany after multiplication.

Collecting activities in Spain and Portugal

M. Tavares de Sousa and F. Gonzalez Lopez reported on the joint collection and characterization of forage and pasture germplasm in Portugal and Spain. This activity was included in a joint Portuguese-Spanish research project, whose main objective is to collect material from species of natural pastures to be introduced in degraded areas with the same ecology. In April 1998, the sites to be prospected were defined in order to be included in the savannah of *Quercus rotundifolia* and *Q. suber*, located southwest of the Iberian Peninsula, where soils are often acid, thin, with low levels of phosphorus and organic matter with natural pastures. The collecting took place in July 1998 in 83 sites. Passport data were recorded according to IPGRI passport descriptors. Photos and soil samples were taken. The 32 species collected can have some forage value and contribute to improvement of these degraded pastures. In 1998-99 the first seed multiplication and morphological characterization were carried out and in 1999-2000 the second year of morphological characterization and first agronomic evaluation will be made simultaneously in ENMP (Elvas) and Finca la Orden (SIAEx-Badajoz). Next spring and summer another collecting mission should be undertaken in the same sites where some seeds were lost.

Collecting activities in Bulgaria

A report was provided subsequently to the meeting and is included in Part II of this volume.

Underutilized forages

Based on the definition of underutilized species according to FAO, and the justification for their special treatment by S. Padulosi, L. Horváth underlined the need to focus more on minor forage crops which have wide potential benefits, some with immediate effects such as landscape improvement and soil protection and others obtained through transmission, i.e. via animal husbandry. The status of the Minor Forage Legume Database (MFLDB) which is far from exhaustive (small number of accessions, few contributing institutes so far) (see above, p. 5) reflects the need to better focus on this group of species, many of which are also endangered species.

Recommendation

The Working Group agreed *on the importance of the issues outlined by L. Horváth and recommended that genebanks pay more attention to the conservation of minor forage crops.*

Sharing of responsibility

P. Marum informed the group that the Network Coordinating Group (NCG) had discussed the possibility to agree on a simplified mechanism for sharing responsibilities in the conservation and management of the European collections. A document developed during the meeting of the NCG held on 17 November was distributed to the participants as a basis

for discussion. As a result of the discussion following, the group agreed on the recommendations given below. A procedure proposed by R. Sackville Hamilton for the identification of most original samples (MOSs) is attached as Appendix I.

Recommendation

The Group agreed *on a mechanism whereby responsibility would be accepted for the maintenance of the Most Original Samples (MOSs) identified in the Forages collections. The completion of this exercise would allow all the collections holders to focus their priorities on the MOSs for characterization, evaluation and multiplication for distribution.*

The proposed mechanism is the following:

Thanks to data analysis with the algorithm described in Appendix I, all accessions will be provisionally marked as either MOS or "one step away from MOS", "two steps away from MOS", "with MOS", or "unknown". The Database managers of the Central Crop Databases will provide to all the Forages collections curators the information on their accessions including the provisional status, by the end of April 2000. Curators will be asked to check the validity of these categories and to provide comments and corrections by the end of November 2000.

Whenever the provisional MOS status is accepted, curators will also be asked to provisionally accept the accompanying responsibility for the maintenance of those accessions.

Specific responsibilities for the MOS maintainer, the database manager and the genebank hosting safety-duplicates are agreed as follows:

The responsibility of the maintainer of a MOS is defined as follows:

- *ensure that the accession is maintained under long-term conservation condition in compliance with the international standards and that seed increase guidelines standards agreed within the Forages Group (see report of the sixth meeting, p. 162) are followed;*
- *ensure that an appropriate safety-duplicate is deposited in a genebank, preferably within another ECP/GR member country;*
- *facilitate access to the accessions to* bona fide *users;*
- *in case of impossibility to honour the commitment for long-term conservation and regeneration, inform the database manager.*

The responsibility of the Central Crop database manager would be:

- *facilitate the repatriation of material by distributing relevant information about accessions conserved in countries other than the country of origin;*
- *update the database when informed of changes by the national information systems and make the database available to the collection holders, both as a searchable and downloadable database on the Internet, and as a diskette upon request;*
- *forward to MOS maintainers any request for seeds;*
- *provide the collection holders and the Working Group on Forages with information about the degree of safety-duplication of the collection.*

The responsibility of the genebank hosting safety-duplicate:

- *maintain the safety-duplicated germplasm in long-term storage in compliance with international standards and under a 'black-box' arrangement (i.e. not distribute the germplasm and the related information; immediately notify the MOS maintainer in case of any problem with the safety-duplicate; not carry out viability tests; not regenerate the safety-duplicated germplasm).*

Experiences with the minimum standards for regeneration discussed at Beitostølen

R. Sackville Hamilton introduced a discussion by summarizing the objectives of regeneration and highlighting the main issues that have arisen since the previous meeting.

Issues

The high cost of the minimum regeneration standards, in terms of both human resources and facilities, is a matter of concern. As a result, the number of accessions being regenerated each year at some locations has had to be reduced. Would it be better to reduce the standard of regeneration to enable more accessions to be regenerated?

Two particular questions of concern include the relative advantages of isolation chambers vs. field plots, and the high cost of harvesting individual plants in order to obtain a balanced bulk.

Objectives

Three distinct targets may be identified for minimizing the genetic impact of regeneration. First, we may wish to minimize the genetic change in each accession. Second, we may wish to maximize the total genetic diversity conserved in the collection. If we raise the standard of regeneration too high in the interests of reducing genetic change of each accession, we risk losing accessions by not being able to regenerate all accessions in time, and so we risk reducing the total diversity conserved. Third, we may wish to maximize the genetic diversity between accessions. Regeneration methods that maximize genetic diversity within accessions will not contribute to this third objective.

The second objective is the most appropriate for individual genebanks where conservation of diversity is the only requirement. However, from the point of view of utilization of the germplasm, the third objective is the most appropriate: evaluation trials are undertaken mainly on the basis of whole plots, and variation between plots is the most easy to exploit. Where accessions are of particular value in themselves – for example, good genetic data are available for them, or they are designated MOSs - then the first objective is most appropriate.

This implies that it may be appropriate to vary standards of regeneration between objectives.

Genetic impacts

Genetic impacts may be categorized into three forms: contamination with genes from other populations (e.g. by cross-pollination), systematic genetic shift toward certain genotypes, and random genetic drift.

The first decreases variance between and within accessions, and so is highly undesirable for both conservation and utilization purposes. The use of isolation chambers is recommended as the only way of guaranteeing zero contamination with pollen from other plots. Although relative costs vary between locations, the cost of regeneration in field plots at IGER (UK) was estimated to be over 10 times more expensive than the cost of regenerating in isolation chambers, even allowing for the high cost of the capital equipment. In this case, isolation chambers are clearly preferable in terms of both genetic and economic impacts.

Genetic shift is also a major problem for genebanks, since regeneration is undertaken in uniform plots and all accessions are multiplied in the same environment. There is substantial evidence in the literature that genetic shifts can be large even in a single cycle of regeneration. In a uniform environment, the shifts will tend to be toward a single common genotype. As such, shift will result in a loss of genetic variance both within and between accessions. The recommendation to harvest plants separately is based on the important need to reduce genetic shift. Taking a balanced bulk at least ensures that each plant makes an equal maternal contribution of genes to the progeny generation.

Random genetic drift is regarded as a relatively minor problem. Since the direction of change is random, there is no systematic loss of genetic variance between populations. There will be some loss of genetic variance within populations, but mainly through the loss of rare alleles. Alleles that are rare within an accession are difficult to utilize. If any compromises are to be made, they should be in the direction of permitting drift if they help reduce contamination and shift. For this reason the recommended standards accept a relatively small number of parental plants, such that harvesting plants individually becomes an economically achievable proposition.

NGB's experience with the minimum standards for regeneration

P. Marum reported that NGB started in 1998 to establish new regeneration plots according to the recommendations for minimum standards for regeneration discussed at the last meeting at Beitostølen in 1997.

For grasses, 49 (7 × 7) plants per accession are used. The plants are planted 0.5 m apart. Usually four different species are put together in an isolation block. To reduce the weed problem, in Norway regeneration plots are established on woven plastic.

The new method requires much more time for seed handling. The total cost of regeneration for one accession will increase from about 200 EURO to about 500 EURO (Norwegian figures). Without an increase in resources to do this work, the number of accessions regenerated every year will have to be reduced by more than 50%.

Discussion

E. Willner reported that minimum standards are not realistic in their experience. It is considered more urgent to multiply more accessions with lower standards rather than fewer with higher standards. L. van Soest suggested that using 50 plants and harvest as bulk will approximately result in the loss of 1-2% of the genes. This will give a better result than using 30 plants and harvesting them separately. R. Sackville Hamilton replied that this calculation is correct for the loss of rare alleles by drift, but this is considered less important than genetic contamination and genetic shift.

Recommendation

It was recommended that, pending further research, genebanks cooperating with the Working Group on Forages adopt the regeneration standards proposed in the report of the sixth meeting wherever possible, especially for MOSs. Institutes having difficulty in implementing the minimum standards may adopt lower standards for other accessions. In this case it is recommended that genebanks publish their own quality guidelines. Genebanks who have already developed internal protocols are encouraged to send copies to the ECP/GR Coordinator, to be used for further distribution and discussion within the Network. This recommendation may be revised in the light of future research on regeneration methods.

The *Lolium* Core Collection

Status – Results

R. Sackville Hamilton presented the progress in the analysis of the *Lolium* Core Collection (LCC) since 1997: field evaluation data were standardized, checked, corrections received from participants, and distributed for analysis; climate data were received but not standardized; AFLP analysis was performed in Belgium using six primer pairs.

The diversity of data formats and accession identifiers in the data received required a major effort in standardization. The data handling procedure adopted was: minimal file editing; construction of a translation table for accession identifiers and metadata tables for each variable describing data format. A visual basic progam was written to read the metadata and construct a corresponding SQL query for each variable. Each SQL query was

run to combine and standardize all data and the resulting data were exported for analysis.

In conclusion, an enormous amount of data was received (over 405 000 scores), needing a lot of manipulation. Since no special project money was received for this work, no more could be achieved so far. All contributors were thanked for their participation.

In reply to a question from A. Ghesquière, R. Sackville Hamilton confirmed that all data are available to the whole Group upon request, as they are common property.

The future of forage core collection(s)

The *Lolium* Core Collection

The future of the *Lolium* Core Collection was discussed. P. Marum has pointed out that priority should be given to ensuring that seed of core collections accessions are made available.

R. Sackville Hamilton noted that the *Lolium* core collection included important gaps, and that curators from different countries had used different procedures to identify their national contribution to the core, at a time when procedures for identifying core collections had not been well established. It is therefore considered appropriate to redefine the core, applying an appropriate algorithm to data in the ECCDB for *Lolium*, thus ensuring that all national contributions to the European core were truly comparable.

E. Willner noted that the composition of the core collection must be dynamic. It was agreed that any new *Lolium* core collection would be periodically re-assessed, removing and adding accessions as new accessions and new data are acquired. Currently, it is more appropriate to redefine the core in its entirety.

This means starting again from scratch. As such, it is appropriate to consider the establishment of core collections of other forages at the same time.

The need for core collections

L. van Soest commented that forming a core collection is not a valid activity in its own right: there must be an objective for forming and utilizing the core. This led to a discussion of the need for and objectives of forage core collections.

V. Negri commented that each genebank could define its own core of most diverse collections to meet its own objectives. This would meet a national need for core collections, which would not require European-level coordination through ECP/GR.

One objective of a core collection is to reduce the overhead costs of genebanks, making it more feasible to keep a set of accessions readily accessible for distribution. There was general agreement that most ECP/GR forage genebanks would benefit, so that this could form the basis of a European core.

L. Maggioni noted that a second objective is to increase utilization of germplasm by breeders, by providing them with a more manageable subset of the entire collection. R. Sackville Hamilton noted that at IGER untargeted conventional core collections were of relatively low interest to breeders; it is more useful to form a targeted working collection (which may be a targeted core collection) specifically relevant to breeding objectives. Conventional core collections were found to be more useful for meeting unexpected seed requests from new users whose objectives were not known to the genebank. This could also be an objective for a European core.

Proposals for new core collections

P. Marum suggested that a core collection should be constructed for *Medicago sativa*, as a species that is complementary to *Lolium perenne* in biology and distribution.

It was proposed that core collections should be developed simultaneously for both species. A task force comprising V. Negri, R. Sackville Hamilton, V. Meglič and T. Marusca

was designated to establish a preferred way to specify the core collection. The task force will consider how many accessions will be included, and how the number of accessions per country should be established. It was noted that this number could be varied in proportion to:

1. the area of the country,
2. the number of accessions collected from the country,
3. the diversity of habitats in the country, and
4. the proximity of the country to the Centre of Diversity.

Recommendations

- *It was recommended to establish a subgroup composed of V. Negri, R. Sackville Hamilton, V. Meglič and T. Marusca.*
- *The terms of reference of the subgroup are to establish a procedure for redefining the* Lolium perenne *core collection and for defining a new* Medicago sativa *core. The subgroup will consider the number of accessions to be included and the algorithm for choosing accessions.*

On-farm/*in situ* conservation

On-farm conservation in Finland

M. Veteläinen presented different aspects of a landrace project initiated in spring 1997 by the Seed Testing Department of the Plant Production Inspection Centre in Finland, and financed by the Ministry of Agriculture and Forestry. The aim of the project was to prepare a proposal on how varietal research, registration and on-farm maintenance of cereal, forage grass and legume landraces and old commercial cultivars could be undertaken in Finland. This project is not yet operating but it is hoped to start next year.

P. Marum made the comment that the most-used timothy cultivar ('Grindstad') in Norway today is a landrace owned by a farmer. The landrace 'Grindstad' has a history of more than 80 years. It has constantly had the opportunity to change according to the management practices used on the owner's farm. The result has been a landrace with good production capacity combined with good winterhardiness. So far plant breeders have not been able to develop cultivars that outyield this landrace in the southern part of Norway. This indicates that on-farm conservation/improvement can be a very effective complementary tool for plant breeders.

Research activities

Morphological and physiological variability of *Phalaris arundinacea* L. in Romania

T. Marusca presented a study on the morphological and physiological evaluation of five varieties and 20 Romanian populations of *Phalaris arundinacea* collected from wide geographic areas, from the Danube Delta up to Carpathians Mountains at 1100 m altitude. The research revealed a great genetic variability of the most important characters: plant height from 0.8 to 2.5 m, leaf length fom 20 to 45 cm, leaf width from 9 to 35 mm, disease resistance from 1.2 to 6.2, etc. Variation in phenological and productivity characteristics and correlations between some of them were also presented.

Ecogeographic classification of Mediterranean countries based on forage legumes

R. Sackville Hamilton presented the results of a project on the *ex situ* conservation of forage legumes in the Mediterranean in relation to their natural distribution. This has generated an ecogeographic classification of Mediterranean countries based on their native species of forage legumes. Data on the native distribution of forage legumes were obtained from ILDIS (International Legume Database and Information System). The similarities between pairs of

countries were calculated using Dice's "ecological similarity index", based on the presence or absence of 739 native species, and a cluster analysis was applied to the matrix of similarities. Four main clusters of countries were identified: a western cluster, a northeastern cluster, a southeastern cluster, and an eastern cluster. Maps were shown presenting the clusters according to the number of species in each zone/in all countries of each zone, and to the number of species occurring nowhere else in the Mediterranean/in the world.

The role of local germplasm in forage development

D. Droushiotis reported on research activities on forages at the Agricultural Research Institute in Nicosia, Cyprus. About half of the range and pasture lands in the Mediterranean region, including Cyprus, has deteriorated, mainly due to overgrazing, neglect and erosion. Their rehabilitation and improvement could be achieved only through reseeding and planting of appropriate pasture germplasm (legumes, grasses and shrubs). Unfortunately, species and cultivars obtained from abroad in most cases failed to adapt owing to lack of persistence under local conditions. Therefore, recognizing the potential agronomic value of the local plant material, Cyprus initiated genetic resources projects mainly to collect, evaluate, preserve and develop local forage and pasture genotypes using the local germplasm. As a result of this effort it was possible to produce and release varieties of wild barley for pasture development. Also, several populations of *Medicago sativa* (lucerne) and *Vicia sativa* belonging to the local varieties, were selected and evaluated under Cyprus conditions. Similarly, more than 100 various species of annual medics were collected and evaluated. Recently the wild genotypes of *Avena sativa, Dactylis glomerata* and *Cynodon dactylon* were collected around Cyprus and are under evaluation. The paper discusses results to date and hints at appropriate management of forages in arable land.

Research activities in Greece and Poland

Three research papers were received for inclusion in the present report (see Part II):

- Breeding perennial forages for drought resistance, persistence and forage productivity, prepared by T. Vaitsis (Fodder Crops and Pastures Institute, Larissa, Greece);
- Preliminary evaluation of small grain legumes collection in the Botanical Garden of IHAR, Bydgoszcz, Poland, by J. Schmidt and G. ðurek (Plant Breeding and Acclimatization Institute, Botanical Garden, Bydgoszcz, Poland);
- Evaluation and characterization of wild ecotypes of tufted hairgrass (*Deschampsia caespitosa* (L.) P.B.) collected from East Poland, by G. ðurek (Plant Breeding and Acclimatization Institute, Botanical Garden, Bydgoszcz, Poland).

International collaboration

Briefing on recent events in the area of plant genetic resources

L. Maggioni informed the Group on recent events in regional and international collaboration, with particular relevance for ECP/GR. These include:

- The revision of the International Undertaking (IU) (FAO Conference Resolution 8/83). The FAO Commission is the forum for negotiations among governments, with the objective to reach an agreed international policy and a legally binding framework for multilateral access to PGRFA and the sharing of the benefits in harmony with the Convention on Biodiversity.
  Within the framework of ongoing negotiations, an Expert Group meeting was held in January 1999 in Montreaux, Switzerland, where the following Chairman's Elements were accepted as the proposed basis for further negotiations:

A. **Multilateral system** to facilitate access and benefit-sharing for a list of crops, established on the criteria of food security and interdependence, and including the collections of the International Agriculture Research Centers (IARCs).
B. **Facilitated access** to minimize transaction costs and ensure expeditious access to PGR to be used in research, breeding and/or training for Food and Agriculture only, (not chemical, pharmaceutical, non-food and agro-industrial uses).
C. **Sharing of the benefits** to be implemented through, *inter alia*, transfer of technology, capacity-building, exchange of information, funding of the GPA priorities, under the guidance of a **Governing Body**. Benefits should flow primarily to farmers in developing countries.
D. **Farmers' rights** to fall under national governments' responsibility and include measures to give farmers the right to use, exchange and market farm-saved seed, to protect traditional knowledge, to equitably participate in benefit-sharing and to participate in making decisions at the national level.

Negotiations slowly progressed in April 1999 during the Eighth Regular Session of the CGRFA, Rome, Italy and in September 1999 at a "Contact Group" meeting (40 countries plus the European Union) held in Rome, Italy. Negotiations are planned to continue during the year 2000 with one or two meetings of the Contact Group, focusing on funding and on the crops to be covered by the Multilateral system. After an extraordinary meeting of the FAO Commission during the summer, the FAO Council of November 2000 is the target date to bring the negotiations to a successful end. However, the possible risk of the negotiations failing brings the danger that countries enact legislation that will require bilateral negotiation for access, which is equal to closing the doors to germplasm exchange.

- A number of projects submitted to the Third call of Council Regulation (EC) No. 1467/94 were approved for funding in 1999. These include projects on the conservation, characterization, collection and utilization of genetic resources of *Avena*, barley, *Brassica*, carrot, eggplant and melon. The risk for the future is that Regulation 1467/94 is not continued, in which case a protected budget for genetic resources and a coordinated action at Community level would cease to exist. Regulation 1750 on support for rural development (DGVI) and the 5th Framework Programme for Research and Technology (DGXII) are currently active programmes where genetic resources projects can be submitted for funding.
- A small group of international experts from the genebank community met in Wageningen, The Netherlands, September 1999, to discuss Germplasm Collection Management Strategies, with the objective to develop an analytical framework to enhance the management of *ex situ* collections and produce a publication on germplasm collection management concepts, strategies and practices.
- The ECP/GR initiative of a task force coordinated by B. Visser, CGN, who has been interacting with national coordinators regarding the establishment of Material Transfer Agreements (MTA). The objective of the task force is to produce a consolidated text which could be used by institutions as a model to compose their own MTA.

The Group briefly discussed the possibilities of establishing a cooperation with other regions and agreed on the following recommendation:

Recommendation

The Working Group recommended to explore the possibilities to invite representatives from other regions like North America, North Africa, Australia/New Zealand, etc., to the next meeting of the Working Group to learn more about their work on forage genetic resources and to improve cooperation with these regions.

Conclusion

Presentation of the report/adoption of recommendations

The report and its annexes were adopted with minor modifications.

Election of Chairperson

Selection of the Vice-Chairperson and of the Network Coordinating Group

Petter Marum was elected as Chairperson. He suggested R. Sackville Hamilton as Vice-Chairperson. The suggestion was approved by the Group. P. Marum proposed that the acting Network Coordinating Group (NCG) be confirmed. D. Droushiotis suggested that H. Aynalem be included among the NCG members, to increase the representation of the Mediterranean countries. The Chairperson and the Group approved this proposal.

Closing remarks

L. van Soest suggested two possible ways for the Group to continue its activities in the future: to apply for a concerted action within the EU Fifth Framework, or to apply for a COST programme. The first option would allow holding one meeting per year, if successful. The second option would require that 5-7 countries write a memorandum of understanding of about 10 pages. This would become possible after intense lobbying with the respective National Coordinators. He confirmed that several eastern European countries would be eligible to participate in both types of action.

P. Marum thanked L. van Soest for this suggestion and invited all the members to explore these possibilities in the near future. He also confirmed that the NCG would carefully look into it.

P. Marum finally thanked all the participants for their valuable participation in the meeting and extended special thanks to the hosting institute and its staff for their careful, flexible and very effective organization of the meeting.

Part II. Presented Papers

The European Central Forages Databases

European Minor Forage Grasses Database

Morten Hulden
Nordic Gene Bank, Alnarp, Sweden

In order to handle passport data for accessions of European forage plants that do not yet have their own databases, the creation of a European Minor Forage Grasses and of a European Minor Forage Legumes Database has been proposed. The suggested name European Minor Forage Crops was changed to European Minor Forage Grasses to avoid confusion with the European Minor Crops Database.

If the content of the file is to correspond to its name, the European Minor Forage Grasses database would only contain forage accessions belonging to the family Poaceae. As a result, still another database would be needed in order to cover all the forage plants held by European institutes. Forage plants that are neither legumes (family Fabaceae) nor grasses would be covered by neither of the two new databases. The Working Group on Forages may want to reconsider the proposal and instead create one single new database, or alternatively rename the groups to Minor Forage Legumes and Minor Forage Non-Legumes so that all remaining forage plants are covered.

Collection of data for input into the Minor Forage Grasses database has not yet started. A literature inventory gives the following list of genera with potential interest:

Alopecurus	*Elymus*	*Puccinellia*
Ammophila	*Eragrostis*	*Redfieldia*
Andropogon	*Eremochloa*	*Setaria*
Anthoxanthum	*Euchlaena*	*Sorghastrum*
Asterbla	*Hilaria*	*Sorghum*
Axonopus	*Holcus*	*Sphorobolus*
Boutelona	*Hyparrhenia*	*Stenotaphrum*
Buchloe	*Imperata*	*Stipa*
Calamovilfa	*Koeleria*	*Trichachne*
Chloris	*Muhlenbergia*	*Tridens*
Cynodon	*Oryzopsis*	*Tripsacum*
Cynosyrus	*Panicum*	*Uniola*
Digitaria	*Paspalum*	*Zizania*
Echinochloa	*Pennisetum*	*Zoysia*

Some of the genera mentioned above are tropical and may be of minor interest in Europe. Others (e.g. *Hordeum* or other cereals) could be included though they already have ECP/GR databases of their own, but in addition have limited use as forage plants. The best strategy to follow is probably to ask the institutes to provide information on *all* the material they have in their possession and then sort out which are already included in other databases.

Some species used as forage plants also have other uses, for instance as ornamentals, spices or environmental (e.g. soil-binding) plants. For instance *Anthoxanthum odoratum* is commonly used as a spice. Institutes dealing exclusively with forage plants are likely to have material of only forage forms of such plants, while institutes working with a more general scope, e.g. national genebanks, may store different forms, something that should be kept in mind when asking for contributions to the database.

Finally, although they are not of great economic importance, forage plants for animals other than mammals may also be considered, e.g. plants used as food by birds and bees.

European Minor Forage Legumes Database

Lajos Horváth and Attila Simon
Institute for Agrobotany, Tápiószele, Hungary

The "Other perennial forage legumes database", which included the cultivated biennial and perennial species and their close relatives of the genera *Anthyllis, Onobrychis, Lotus* and *Melilotus*, was the predecessor of this database. In 1999 the ECP/GR Forage Network decided to expand the scope of this former database. The Minor Forage Legumes Database (MFLDB) is intended to include data of all forage legumes that do not have a separate database. The compilation of MFLDB is in process and its present composition is displayed in Tables 1, 2 and 3. The precise list of genera and species to be included in MFLDB still has to be decided by the Network.

Table 1. Composition of the MFLDB – participating institutions, number of genera, species and accessions

Institute	No. of genera	No. of species	No. of accessions
CZE003	4	21	88
DEUBGRC	3	3	21
DEUIPK	4	41	155
ESPINIA	2	3	16
GBRRBG	6	51	163
HUNRCA	10	42	376
ISRIGB	3	18	307
LTU001	1	2	19
SVKPIEST	6	12	64
Total			1209

Table 2. Composition of the MFLDB – number of species per genus

Genus	No. of species
Anthyllis	10
Astragalus	4
Coronilla	1
Desmodium	1
Dorycnium	1
Lotus	47
Melilotus	23
Onobrychis	22
Ornithopus	1
Physanthyllis	1
Tetragonolobus	3
Trifolium	12
Trigonella	2

Table 3. Genera and species in the MFLDB

Genus	No. access.	Species	Total
Anthyllis	66	*lotoides*	1
		montana	3
		spp.	5
		tetraphylla	6
		vulneraria	51
Astragalus	16	*cicer*	13
		macroceras	1
		mongolicus	1
		pyrenaicus	1
Coronilla	1	*varia*	1
Desmodium	13	*canadense*	13
Dorycnium	1	*spectabilis*	1
Lotus	440	*angustissimus*	4
		arabicus	1
		arenarius	1
		borbasii	2
		caucasicus	3
		chihuahuanus	1
		coimbrensis	1
		collinus	1
		conimbricensis	4
		conjugatus	1
		corniculatus	271
		creticus	8
		cruentus	1
		cytisoides	3
		denticulatus	1
		drepanocarpus	1
		edulis	10
		halophilus	1
		hispidus	2
		krylovii	2
		macrothricus	1
		maroccanus	1
		micranthus	1
		ornithopodioides	18
		oroboides	1
		palustris	1
		pedunculatus	30
		peregrinus	4
		preslii	1
		purslinus	1
		spp.	16
		suavelous	1
		suaveolens	1
		subbiflorus	4
		subpinnatus	1
		tenuifolius	1
		tenuis	15
		tetragonolobus	1
		uliginosus	19
		villosus	1
		weilleri	2
Melilotus	341	*alba*	248
		altissima	4
		dentata	5
		gracilis	1
		indica	11
		indicus	3
		infesta	1
		infestus	1
		italica	3
		messanensis	5
		neopolitanus	1
		officinalis	36
		segetalis	4
		spp.	7
		sulcata	9
		wolgicus	2
Onobrychis	246	*aequidentata*	1
		altissima	8
		arenaria	21
		bobrovii	1
		caput-galli	2
		crista-galli	3
		cyri	2
		grandis	1
		inermis	2
		montana	2
		pallasii	1
		pulchella	1
		sativa	2
		spp.	7
		transcaucasica	12
		viciifolia	180
Ornithopus	1	*compressus*	1
Physanthyllis	1	*tetraphylla*	1
Tetragonol-obus	15	*maritimus*	4
		purpureus	10
		requienii	1
Trifolium	42	*angustifolium*	1
		arvense	2
		campestre	1
		diffusum	2
		fragiferum	7
		hybridum	15
		incarnatum	6
		lappaceum	1
		ochroleucon	2
		pannonicum	4
		spp.	1
Trigonella	26	*coerulea*	8
		foenum-graecum	18
Total			1209

European Agrostis, Phalaris *and* Phleum *Databases*

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Database statistics

The European Central Crop Databases for *Agrostis, Phalaris* and *Phleum* are maintained by the Nordic Gene Bank (NGB), a regional genebank for Denmark, Finland, Iceland, Norway and Sweden. The databases are searchable on-line at the Internet server of the NGB at <http://www.ngb.se/Databases/ECP/>. They contain passport data on 378, 217 and 4259 accessions respectively (Table 1). The database for *Agrostis* contains accessions from 25 countries or regions, the database for *Phalaris* from 17 countries and that for *Phleum* from 35 countries (Tables 2 and 3). The status of most accessions in these databases is 'wild'. However there are also many accessions without any status ('unrecorded') (Table 4).

Table 1. Accessions classified by taxa in the *Agrostis*, *Phalaris* and *Phleum* databases

Taxonomic name	No. of accessions
Agrostis	20
Agrostis canina	7
Agrostis capillaris	227
Agrostis castellana	15
Agrostis gigantea	23
Agrostis lachnantha	1
Agrostis nebulosa	3
Agrostis stolonifera	82
Total	378
Phalaris	12
Phalaris aquatica	75
Phalaris arundinacea	71
Phalaris canariensis	20
Phalaris coerulescens	4
Phalaris minor	28
Phalaris paradoxa	7
Total	217
Phleum	39
Phleum alpinum	35
Phleum arenarium	13
Phleum exaratum	1
Phleum hirsutum	3
Phleum montanum	6
Phleum paniculatum	1
Phleum phleoides	19
Phleum pratense subsp. *bertolonii*	92
Phleum pratense subsp. *pratense*	4045
Phleum subulatum	5
Total	4259
Grand Total	4854

Table 2. Accessions classified by country of origin

Taxon	ISO Country code	Number
Agrostis	–	65
	BLR	1
	CSK	8
	DDR	1
	DEU	6
	DNK	8
	FIN	19
	GBR	7
	HUN	23
	IRL	1
	ISL	5
	ITA	1
	LSO	1
	NPL	4
	NLD	17
	NOR	65
	NZL	5
	POL	22
	ROM	9
	SUN	2
	SVK	31
	SVN	1
	SWE	70
	USA	6

Taxon	ISO Country code	Number
Phalaris	–	78
	ALB	2
	CSK	2
	DDR	1
	FIN	3
	FRA	1
	GRC	11
	HUN	9
	ITA	29
	LBY	1
	NOR	37
	POL	2
	PRT	5
	SUN	1
	SVK	1
	SWE	8
	TUN	2
	TUR	24

Taxon	ISO Country code	Number
Phleum	–	339
	BEL	19
	BGR	2
	CAN	12
	CHE	2
	CHN	3
	CSK	21
	DDR	10
	DEU	736
	DNK	55
	ESP	2
	FIN	103
	FRA	35
	GBR	55
	GRC	20
	HUN	59
	IRL	34
	ISL	3
	ITA	44
	JPN	7
	LTU	40
	NLD	63
	NOR	211
	NZL	1
	POL	2155
	PRT	1
	ROM	30
	RUS	1
	SUN	33
	SVK	18
	SVN	6
	SWE	102
	TUR	21
	USA	9
	YUG	7

Table 3. Accessions classified by contributing institute

Taxon	Institute acronym	Number
Agrostis	AISLJ	1
	BGRC	9
	GAT	14
	GBSV	15
	NGB	152
	RCA	30
	VOSIVO	62
	WPBS	55
	ZUBRI	40
Phalaris	ARARI	62
	BGRC	4
	ENMP	5
	GAT	20
	IDG	60
	NGB	48
	RCA	12
	WPBS	3
	ZUBRI	3
Phleum	AFT	32
	AISLJ	6
	ARARI	21
	BGRC	620
	CLOGRVP	2
	FCPI	9
	GAT	25
	GBSV	34
	IDG	13
	IHAR	2532
	INRAMAG	28
	IPGR	9
	LIA	40
	NGB	369
	PERUG	11
	RBG	69
	RCA	108
	VOSIVO	88
	WPBS	130
	ZUBRI	113
Total		4854

Table 4. Accessions classified by status of sample

Taxon	Breeder's lines	Advanced cultivars	Landraces	Wild	Unrecorded	Total
Agrostis	8	97	8	219	46	378
Phalaris	3	15	1	49	149	217
Phleum	46	435	101	3560	117	4259

Unduplicated accessions and completeness of descriptors

The databases were screened for accession name in order to find the number of unduplicated accessions. Eighteen percent (895 accessions) of accessions are unduplicated by accession name. However, in many cases this field did not contain any data, which leads to a high number of possible duplicates (Table 5).

The databases have missing data for the following important passport descriptors: accession number 0.7%, status of sample 6.4%, and country of origin 7.5%.

Table 5. Examples of "duplicated" accessions by ACCESSION NAME in the *Agrostis, Phalaris* and *Phleum* databases

Taxnam	Gbkaccnam	Number
Phleum pratense subsp. *pratense*		3184
Phalaris aquatica		65
Phleum pratense subsp. *bertolonii*		65
Agrostis capillaris		51
Agrostis stolonifera		35
Phleum		29
Phalaris minor		28
Agrostis		20
Phleum alpinum		19
Phleum phleoides		18
Agrostis castellana		14
Phalaris canariensis		14
Phleum arenarium		13
Phalaris		12
Phleum pratense subsp. *pratense*	ABERYSTWYTH S48	11
Phleum pratense subsp. *pratense*	GEORGIKON	7
Phleum pratense subsp. *pratense*	ABERYSTWYTH S352	7
Phalaris arundinacea		7
Phalaris paradoxa		7
Phleum pratense subsp. *pratense*	CLIMAX	6
Phleum montanum		6
Phleum pratense subsp. *pratense*	VANADIS	5
Phleum pratense subsp. *pratense*	INTENSO	5
Phleum pratense subsp. *pratense*	HEIDEMIJ	5
Phleum pratense subsp. *pratense*	BILBO	5

European Poa *Database*

Helmut Knüpffer[1], Siegfried Harrer[2] and Evelin Willner[3]

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[3] *IPK, Genebank, Branch Station Malchow, Malchow/Poel, Germany*

As a result of recent updating, the European *Poa* Database contains data on 3003 accessions from 14 institutes in 11 countries (Table 1). Letters requesting new *Poa* passport data were not sent for this update. New data were received from Lithuania, Hungary, Slovakia and Germany (IPK, Malchow). The remaining data (belonging to institutions from which no updates were received) were retained and transformed into the new structure. The ECCDB fields are not completely identical to the agreed structure for central forages databases, but work is under way to complete it.

Table 1. Overview of genebanks contributing to the European *Poa* Database: number of accessions included in 1995, 1997 and 1999

Country		Accessions		
ISO code	**Acronym**	**1995**	**1997**	**1999**
BEL	CLOGRVP	29	29	29
CHE	RAC	17	60	60
CZE	ZUBRI	97	219	219
DEU	BGRC	115	135	135
DEU	GAT	42	44	44
DEU	IPKM	–	487	540
GBR	IGER	–	103	103
GBR	RBGK	19	35	35
HUN	RCA	52	52	167
LTU	LTU001	–	–	85
POL	IHAR	792	1452	1452
ROM	SUCEAVA	–	7	7
SVK	LLUKY	–	–	114
TUR	ARARI	7	13	13
Total		1170	2636	3003

Table 2 shows the list of descriptors used. The first column contains the field names adopted for the ECP/GR *Poa* Database compiled by E. Willner and H. Knüpffer in January-February 1997. It was compiled from the *Guide to European Forage Databases* (IBPGR 1991) and the draft of the ECP/GR Multicrop Passport Descriptors, as of January 1997. The second column contains the Forage Passport Descriptors agreed upon at the last Working Group meeting, compared with the field names presently used in the ECCDB (third column). Most fields correspond with each other, only Collecting Institute and Habitat have to be adapted. The ECP-Number is an additional field used for internal management.

The last column shows available data for each field. Complete data were received only for Accession Number, Genus, Species, Institute Code and almost completely for Country of Origin, Status of Sample, Collecting Site. Data for the other descriptors are hardly available (5–30%).

Table 2. Overview of descriptors for the *Poa* Database

MCPDL 1997	Forage Passport Descriptors 1997	ECCDB field name	ECCDB field label	Available data % (n=3003)
ACCNAME	ACCNAME	ACCNAME	Accession Name	29
ACCENUMB	ACCENUMB	ACCNUM	Accession Number	100
	BREEDINST (B)	BREEDINST	Breeding Institute	16
COLLDATE	COLLDATE	COLLDATE	Collecting Date	6
		COLLINST	Collecting Insitute	14
COLLNUMB	COLLNUMB	COLLNUM	Collecting Number	10
COLLSITE	COLLSITE	COLLSITE	Collecting Site	69
COLLSRC	COLLSRC	COLLSRC	Collecting Source	???
DONORCODE	DONORCODE	DONCODE	Donor Institute Code	36
DONORNUMB	DONORNUMB	DONNUM	Donor Number ECP_NO	10
		ECP_NO	ECCDB Number	100
ELEVATION	ELEVATION	ELEVAT	Elevation of Collecting Site	8
GENUS	GENUS	GENUS	Genus	100
		HABITAT	Habitat	52
INSTCODE	INSTCODE	INSTCODE	Institute Code	100
LATITUDE	LATITUDE	LATITUDE	Latitude of Collecting Site	15
LONGITUDE	LONGITUDE	LONGITUDE	Longitude of Collecting Site	15
ORIGCTY	ORIGCTY	ORIGCTY	Country of Origin	94
OTHERNUMB	OTHERNUMB	OTHERNUM	Other Number(s)	6
REMARKS	REMARKS	REMARKS	Remarks	30
SAMPSTAT	SAMPSTAT	SAMPSTAT	Status of Sample	88
	SEEDAVAIL (J)	SEEDAVAIL	Seed Availability	41
SPECIES	SPECIES	SPECIES	Species	99.7
SUBTAXA	SUBTAXA	SUBTAXA	Subtaxa	0.1
	COLLNAME (A)			
	BREEDMET (C)			
	GENHAB (D)			
	SPECHABIT (E)			
	GRAHABIT (F)			
	ASPECT (G)			
	SLOPE (H)			
	SITEPHYS (I)			
	ECF (K)			
	PRIMCOLL (L)			

The accessions included in the database belong to 29 different species, the most frequent being *Poa pratensis* with 2676 accessions, followed by *P. bulbosa* (70) and *P. nemoralis* (49). Eight species are represented by only one accession each. Forty-two accessions lacking a species designation are recorded as "sp." For an overview of the species and their frequencies in the database, see Table 3.

The accessions in the database are reported to originate from 46 different countries. Almost 50% of the accessions (1455 accessions) originate from Poland, followed by 318 from Germany, 137 from the Netherlands and 131 from Hungary. Eleven countries are represented by one accession each. Information about the country of origin is not available for only 207 accessions (see Table 4).

Table 5 gives a survey about the status of the samples. Most accessions are landraces or traditional cultivars (44%). A large part (24%) belongs to advanced cultivars or breeder's lines. The last column of this table shows that the status of 494 accessions is unknown, either because there is no knowledge about their status or because it has not been checked yet.

Table 3. Number of accessions per species

Species	Number
abyssinica Jacq.	1
alpigena (Fries) Lindman	1
alpina L.	9
ampla Merr.	2
angustifolia L.	12
annua L.	4
araratica Trau	3
asperiflora	1
badensis Haenke ex Willd.	5
binata Nees.	6
bulbosa L.	70
caesia Sm.	3
caespitosa Spreng.	2
cenisia All.	1
chaixii Vill.	7
compressa L.	27
fibrifera	1
iberica	2
lanuginosa	1
ligularis	6
nemoralis L.	49
palustris L.	28
pannonica A. Kerner	2
pratensis L.	2676
remota Forselles	5
serotina Ehrh.	1
sp.	42
subcaerulea Sm.	1
supina Schrader	6
trivialis L.	29

Table 4. Overview of accessions by country of origin

Country (ISO code)	Number	Country (ISO code)	Number
POL	1455	AUS	6
DEU	318	LSO	6
NLD	137	ESP	4
HUN	131	FIN	4
LTU	90	GRL	4
SUN	70	RUS	4
CSK	67	FRA	3
DNK	65	SVK	3
USA	63	NZL	2
CHE	59	PER	2
SWE	59	PRT	2
BEL	37	IRL	1
MNG	31	IRQ	1
TUR	29	JOR	1
HRV	23	JPN	1
NOR	21	KAZ	1
ROM	17	LBN	1
AFG	16	PAK	1
IRN	15	TKM	1
CAN	10	UKR	1
GBR	9	UZB	1
ITA	9	YUG	1
ARG	7		
GRC	7	EMPTY	207

Table 5. Overview of accessions by status of sample

Genebank	Advanced cultivar, Breeder's line (5, 4)	Traditional cultivar, Landrace (3)	Wild, Weedy (1, 2)	Unknown, Other (0, 99 = 6, 7 old version)
BELCLOGRVP	2	27		
CHERAC				60
CZEZUBRI	155		61	3
DEUBGRC	59	1	11	64
DEUGAT	8			36
DEUIPKM	228		90	222
GBRIGER	57	1	33	12
GBRRBGK				35
HUNRCA	11		107	49
LTU001	41		44	
POLIHAR	61	1297	94	
ROMSUCEAVA				7
SVKLLUKY	111		3	
TURARARI			7	6
Total	733	1326	450	494 (–369 empty)
Grand total	3003			

A first investigation of the *Poa* database shows that there are 864 named accessions with a total of 430 different accession names (if upper case and lower case letters are considered identical). Table 6 shows the most frequent accession names. Double or multiple occurrences exist for a total of 158 accession names.

Table 6. Most frequent accession names

Accession name	No. of accessions
No name	2139
Ecotype	106
P. pratensis L.	45
Skrzeszowicka	9
Primo	7
Roznovska	7
Merion	6
Monopoly	6
Baron	5
Barzan	5
Bristol	5
Cello	5
Fylking	5
Harmony	5
Mosa	5
Union	5
Alicja	4
Arista	4
Birka	4

Accession name	No. of accessions
Campus	4
Danga	4
Delft	4
Erte	4
Golf	4
Holt	4
Keszthelyi 1/56	4
Kimono	4
Leikra	4
Newport	4
Olymprisp	4
Ottos	4
Sheba	4
Sobra	4
Sydsport	4
Topfit	4
Trampas	4
Ziera	4

It seems that the most frequent "duplicates" are not real accession names, such as "Ecotype" and "*P. pratensis*" which are respectively "status of sample" and "species" data.

A total of 285 named accessions seem to be "unique". However, some of these include similar names, like ALICA–ALICJA; BROADWAY–BRODWAY; other accessions have double names like BALIN–BALIN, INGO; BERBI–BERBI, ALSA. The number of "unique" accessions will likely be reduced after further analysis. Therefore it is very important to check all data at the level of each national database, and report the updated information to the Central Database.

The database is accessible via the Internet at: <http://www.dainet.de/genres/eccdb/poa>. This has been achieved in cooperation between IPK and IGR-ZADI, Bonn. The IGR supports the updating of the data.

The authors of the database are highly interested in receiving *Poa* data from other institutions who, for different reasons, could not send their updates yet. Data should be sent to E. Willner, S. Harrer or H. Knüpffer by e-mail or on diskettes in the agreed format of forage passport descriptors.

A comparison between the number of accessions reported in the European *Poa* Central Crop Databases and in National Collections is given in the Annex below (see also Marum, this volume, p. 67).

Reference

IBPGR. 1991. A Guide to the European Forage Databases. European Cooperative Programme for Crop Genetic Resources Networks. International Board for Plant Genetic Resources, Rome.

Annex. Comparison between the number of accessions reported in European Central Crop Databases (ECCDB) and in National Collections (NC)

Table A. Comparison between ECCDB and National Collection for *Poa* in Germany

		NC	
Genebank	**ECCDB**	**Total**	**available**
Braunschweig	135	137	75
Gatersleben	44	60	22
Malchow	540	545	470
Total	719	742	567

Table B. Comparison between ECCDB and National Collection for *Poa*, all countries

Country	**ECCDB (1999)**	**NC 1997/(1999)**
Austria	0	60
Belgium	29	0
Bulgaria	0	53
Cyprus	0	0
Czech Republic	219	224
France	0	27
Germany	719*	651/(742)
Greece	0	0
Hungary	167*	172
Ireland	0	0
Italy	0	62
Lithuania	85*	7
The Netherlands	0	0
Nordic Gene Bank	0	342
Poland	1452	2408
Portugal	0	0
Romania	7	0
Russia	0	626
Slovakia	114*	232
Spain	0	0
Switzerland	60	114
Turkey	13	13
United Kingdom	103 + 35 (RBGK)	103
F.R. Yugoslavia	0	0
Total	3003	5094

* updated 1998–99

European Lolium *and* Trifolium repens *Databases*

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Introduction

The following developments have taken place in the European Central Crop Databases (ECCDBs) managed at IGER:

1. The ECCDBs for annual and perennial species of *Lolium* have been combined into one.
2. Updates have been requested from all institutes.
3. Data have been updated for Belgium, Germany, Italy, Slovakia and Turkey. Additional data were received from Lithuania in October 1999 but have not yet been incorporated.
4. The ECCDB for *Lolium* has been made available in both searchable and downloadable forms. Currently it is available at:
   <http://www.igergru.bbsrc.ac.uk/Welcome/ECCDB/databases/database.htm>.

The current contents of the ECCDBs, tabulated by institute, are given in Tables 1 (*Lolium*) and 2 (*Trifolium repens*).

Table 1. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by holding institute

Institute code	Institute	No. of accessions	Last updated
ABY-GBW001	Genetic Resources Unit, IGER, Aberystwyth, Wales, UK	3038	11/05/99
ABY-GBW015	Seed Production Unit, IGER, Aberystwyth, Wales, UK	412	21/12/95
BEL004	Rijksstation voor Plantveredeling, Merelbeke, Belgium	25	21/08/97
CZE122	Research Institute of Crop Production, Praha, Czech Republic	636	29/03/96
DEU001	Institut für Pflanzenbau (BAZ), Braunschweig, Germany	1180	05/01/96
DEU001	Institut für Pflanzenbau (BAZ), Braunschweig, Germany	78	21/06/97
ESP119	CIA de Mabegondo, La Coruna, Spain	191	23/09/96
GBR004	Physiology Unit, RBG Kew, Haywards Heath, England, UK	94	22/01/96
ISR002	Israel Genebank for Agricultural Crops, Bet Dagan, Israel	27	08/02/96
ITA004	Istituto del Germoplasma, Bari, Italy	279	21/06/97
LTU001	Lithuanian Institute of Agriculture, Dotnuva, Lithuania	65	29/01/96
NLD037	Centre for Genetic Resources, Wageningen, The Netherlands	134	08/01/96
POL003	Plant Breeding and Acclimatization Institute, Bydgoszcz, Poland	2374	05/10/96
ROM003	Grasslands Research Institute, Brasov, Romania	326	03/07/96
SVK001	Research Institute of Plant Production, Piešťany, Slovakia	247	30/07/96
SVN019	Agricultural Institute of Slovenia, Ljubljana, Slovenia	3	28/05/96
SWE002	Nordic Gene Bank, Alnarp, Sweden	170	02/06/96
TUR001	Aegean Agricultural Research Institute, Izmir, Turkey	260	27/09/96
TUR001	Aegean Agricultural Research Institute, Izmir, Turkey	4	21/06/98
Total		9543	

Table 2. Summary of holdings documented in the ECCDB for *Trifolium repens*, tabulated by holding institute

Institute code	Institute	No. of accessions	Last updated
ABY-GBW001	Genetic Resources Unit, IGER, Aberystwyth, Wales, UK	553	11/5/99
ABY-GBW015	Seed Production Unit, IGER, Aberystwyth, Wales, UK	229	21/12/95
BGR001	IIPGR "K. Malkov", Plovdiv, Bulgaria	118	24/07/96
CZE122	Research Institute of Crop Production, Praha, Czech Republic	190	29/03/96
DEU001	Institut für Pflanzenbau (BAZ), Braunschweig, Germany	29	05/01/96
ESP119	CIA de Mabegondo, La Coruna, Spain	1	23/09/96
GBR004	Physiology Unit, RBG Kew, Haywards Heath, England	45	22/01/96
ISR002	Israel Genebank for Agricultural Crops, Bet Dagan, Israel	8	08/02/96
LTU001	Lithuanian Institute of Agriculture, Dotnuva, Lithuania	35	29/01/96
NLD037	Centre for Genetic Resources, Wageningen, The Netherlands	1	08/01/96
ROM003	Grasslands Research Institute, Brasov, Romania	37	03/07/96
SVK001	Research Institute of Plant Production, Piešťany, Slovakia	65	30/07/97
SWE002	Nordic Gene Bank, Alnarp, Sweden	36	02/06/96
TUR001	Aegean Agricultural Research Institute, Izmir, Turkey	68	27/09/96
Total		1415	

Following merger of the ECCDBs for annual and perennial *Lolium* species, the combined ECCDB now contains data on 9042 accessions of 12 species, 165 accessions of one hybrid species, 1 accession that is a physical mixture of two species, and 335 unidentified accessions (Table 3).

Table 3. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by species

Species	Number of accessions
L. perenne	7348
L. multiflorum	1255
L. sp.	335
L. temulentum	185
L. rigidum	179
L. x *hybridum*	165
L. remotum	26
L. loliaceum	25
L. canariense	11
L. persicum	5
L. cylindricum	4
L. italicum	2
L. oldenburgicum	1
L. parabolicae	1
L. rigidum + *perenne*	1
Total	9543

Problems continue with completeness and accuracy of the data. Table 4 illustrates some problems for three fields: accession status, the country of origin, and the latitude and longitude of origin. Thirty accessions have invalid data on latitude and longitude. All botanic garden samples have no data on the origin of the material.

Table 4. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by the status of the accession, and the presence or absence of data on the country of origin and on latitude and longitude

Accession status	Status of data on the country of origin	Status of data on latitude and longitude			Total number of accessions
		Data present and valid	No data	Data invalid	
Wild	Data present	737	1202	5	1944
	No data	59	2371	15	2445
	Total	796	3573	20	4389
Weed	Data present		1		1
	Total		1		1
Semi-natural	Data present	937	24	1	962
	Total	937	24	1	962
Botanic Garden Sample	No data		119		119
	Total		119		119
Breeder's Line	Data present	8	16		24
	No data		429		429
	Total	8	445		453
Primitive Cultivar	Data present	5	76		81
	No data		34		34
	Total	5	110		115
Advanced Cultivar	Data present	34	208	1	243
	No data		1885		1885
	Total	34	2093	1	2128
Unknown	Data present	340	352	7	699
	No data		676	1	677
	Total	340	1028	8	1376
Grand Total		2120	7393	30	9543

The database records 58 distinct countries of origin, although the majority of accessions (5589) have no defined country of origin (Table 5). Eleven countries have over 100 recorded accessions originating in those countries. Fourteen countries are represented by 1 accession each.

Table 5. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by the country of origin and the status of the accession

Country ISO code	Wild / semi-natural	Bred	Unknown	Botanic Garden	Grand Total
DEU	656	61	14		731
IRL	500	3	14		517
ROM	244	13	83		340
TUR	52	6	272		330
FRA	263	8	12		283
GBE (GB England)	169	2	55		226
ITA	129	3	56		188
GBW (GB Wales)	123	21	13		157
NLD	7	105	9		121
PRT	112	1	2		115
POL	102	4	1		107
ESP	54		43		97
GRC	63		8		71
LBN	67				67
HUN	48	2	17		67
CSK	13	47	2		62
ARG	57		2		59
BGR	54		1		55
GBR		12	36		48
BEL	20	14	8		42
CHE	34	2	3		39
CZE	30				30
SUN	12	8	1		21
NOR	10	2	5		17
DNK	2	14	1		17
NZL	12	1	2		15
SAR	2		12		14
AUT	14				14
SVK	13				13
AUS	6	2	3		11
DDR	10				10
GBS (GB Scotland)			8		8
SWE		6	1		7
CNI (Canary Isl.)	6		1		7
MAR	4		2		6
LBY			4		4
IRN	3	1			4
ARM	4				4
USA		3			3
SVK	3				3
MAD (Madeira)	1		2		3
LUX	2	1			3
ZAF	1	1			2
JPN		2			2
YUG			1		1
UZB			1		1
URY			1		1
UKR	1				1
TUN	1				1
SVN	1				1
LSO	1				1
LES	1				1
KGZ		1			1
ISR			1		1
FIN		1			1
DZA			1		1
CAN		1			1
AFG			1		1
(blank)	2445	2348	677	119	5589
Grand Total	5352	2696	1376	119	9543

The "derived status" of each accession was determined using the status of data in the fields for collector's institute and breeder's institute; i.e. status is "collected" if a value present is present only for collector's institute, "bred" if a value is present only for breeder's institute, unknown if neither field has a value, and invalid if both fields have values. By this criterion, 6041 accessions have unknown origin, although most of these are documented as wild or semi-natural or bred (Table 6); 197 accessions are documented with unknown status but have a defined collector's institute or breeder's institute. Thirty-six accessions are declared as wild, weedy or semi-natural but have a breeder's institute with no collector's institute (Table 6). Conversely, 54 accessions, including 12 breeder's lines, are declared to be bred but have a collector's institute with no breeder's institute.

Table 6. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by the documented and derived status of the accession

	Derived status				
Documented status	**Collected**	**Bred**	**Unknown**	**Invalid**	**Total**
Wild/ semi-natural	1719	36	3596	1	5352
Bred	54	1495	1147		2696
Botanic garden			119		119
Unknown	181	16	1179		1376
Total	1954	1547	6041	1	9543

Institute codes were used to make a provisional assessment of the originality of accessions (Table 7). 1433 accessions are provisionally declared as MOS, and 10 more have been repatriated to the institute holding the MOS. The majority of accessions recorded as having been collected are MOS (58.7% of 1954). In contrast, most donated accessions are of unknown status and are at least 2 donations away from the MOS.

Table 7. Summary of holdings documented in the ECCDB for *Lolium*, tabulated by the documented and derived status of the accession

	Derived accession status				
Status	**Bred**	**Collected**	**Invalid**	**Unknown**	**Total**
MOS	286	1147			1433
With MOS	10				10
1 donation away from MOS	594	753			1347
2 or more donations away from MOS	531	10	1	4277	4819
Donor not documented	126	44		1764	1921
Total	1547	1954	1	6041	9543

European Dactylis *and* Festuca *Databases*

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Status

Since the meeting in Norway (March 1997) new data were added to both databases. The total number of records in the *Dactylis* databases is now 8793 and in the *Festuca* database 7597. These numbers include inputs from new institutions (from Belgium, Lithuania and Latvia) in the central databases. Tables 1 and 2 provide the current status of both databases.

Table 1. Status of the *Dactylis* European Database

Genebank INSTCODE	Cultivars, breeder's lines		Primitive cultivar, landrace or named accession		Natural and semi-natural ecotypes		Status unrecorded, unnamed accession		Total number of accessions for each genebank		
	Total	Original	Total	Original	Total	Original	Total	Original	Total	Original	%
BGR001	33	6	119	119	8	7	7		167	132	79.0
CHE001					11	6			11	6	54.5
CZE082	128	19	2						130	19	14.6
DEU001	112	9			669	660			781	669	85.7
ESP009			4		333	326			337	326	96.7
ESP119	1	1			22	22			23	23	100.0
FRA051	57				190	68			247	68	27.5
GBR004					58	12	7		65	12	18.5
ITA034	1	1							1	1	100.0
NLD037							28	15	28	15	53.6
POL003	28	2			1				29	2	6.9
POL022	102	47			5827	5148	134	5	6063	5200	85.8
PRT084	7				136	136	1		144	136	94.4
ROM003	32				17	17			49	17	34.7
ROM007	3	3	25	23	19	19			47	45	95.7
SVK012	48	1			111	113			159	114	71.7
SVN019	1	1			27	27			28	28	100.0
SWE002	34	6			177	177			211	183	86.7
TUR001					180	180			180	180	100.0
LTV001	11	2	20	17	34	34			65	53	81.5
LVA007	28	20							28	20	71.4
Total	626	118	170	159	7820	6952	177	20	**8793**	7249	82.5
(%)	100	18.8	100.(	93.5	100.(	88.9	100.(	11.3	100	82.5	

Table 2. Status of the *Festuca* European Database

Genebank INSTCODE	Cultivars, breeder's lines		Primitive cultivar, landrace or named accession		Natural and semi-natural ecotypes		Status unrecorded, unnamed accession		Total number of accessions for each genebank		
	Total	Original	Total	Original	Total	Original	Total	Original	Total	Original	%
BGR001	13						14		27		
CHE001					37	18			37	18	
CZE079	3								3		
CZE082	316	19	1		2	2			319	21	6.6
DEU001	132	40			529	527			661	567	85.8
ESP119					22	22			22	22	100.0
FRA051	59				116	46			175	46	26.3
GBR004					75	23	3		78	23	29.5
ITA034	1	1							1	1	100.0
POL003	134	17			106	106			240	123	51.3
POL022	110	17			4097	3729	159	8	4366	3754	86.0
PRT084							1		1		
ROM003	93	9			320	71	1	1	414	81	19.6
ROM007	2	2	38	37	35	35	13		88	74	84.1
SVK012	98	8			491	65			589	73	12.4
SVN019	3	3							3	3	100.0
SWE002	72	72			242	242			314	314	100.0
TUR001					28	28			28	28	100.0
BEL005					29	4			29	4	13.8
BEL087							80		80		
LTU001	70	70			20	20			90	90	100.0
LVA007	32	31							32	31	96.9
Total	1138	289	39	37	6149	4938	271	9	**7597**	5273	69.4
(%)	100	25.4	100	94.9	100	80.31	100	3.3	100	69.4	

Searching for duplicated accessions

The Convention on Biological Diversity states that each country is responsible for its own biodiversity. This means that the primary holder of each collected accession should normally be a genebank in the country of origin of the accession. The role of the central crop database manager is to provide each contributing genebank with some information about unique and 'primary holder' accessions. Identification of 'primary holders' is necessary as a means of prioritizing characterization, evaluation, regeneration and distribution. A genebank should assign top priority to accessions for which it has been designated 'primary holder' (Sackville Hamilton 1998).[5]

According to the recommendations given by Sackville Hamilton (*op. cit.*) we decided to select a few types of accessions:

- Unique accession: accession without duplication
- 'Primary holder' accession: accession duplicated more than once, country of origin matches holder country
- 'Secondary holder' accession: accession duplicated more than once, country of origin does not match holder country
- Status undefined: accession duplicated or not but undefined country of origin.

Tables 3 and 4 provide the results of our investigation in format 1 (cultivars, breeder's lines).

[5] Compilers' note: During the present meeting it was agreed that genebanks would be asked to accept the responsibility for the maintenance of the Most Original Samples (see Part I, p. 20, and Appendix I).

Table 3. Number of unique and duplicated accessions in the *Dactylis* database (cultivars and breeder's lines)

Holder genebank INSTCODE	No. of unique, unduplicated accessions	No. of accessions acc. to holder status			Total no. of accessions	Unique vs. total (%)
		Primary holder	Secondary holder	Status undefined		
BGR001	16	8	20	5	33	48.5
CZE082	39	18	110	0	128	30.5
DEU001	43	5	88	19	112	38.4
ESP119	1	0	0	0	1	100.0
FRA051	15	15	27	15	57	26.3
POL003	2	2	26	0	28	7.1
POL022	6	9	92	1	102	5.9
PRT084	3	0	4	3	7	42.9
ROM003	5	0	30	2	32	15.6
ROM007	0	0	0	3	3	0.0
SVK012	11	1	45	2	48	22.9
SVN019	1	1	0	0	1	100.0
SWE002	10	32	1	1	34	29.4
LVA007	28	28	0	0	28	100.0
Total	180	119	443	51	614	29.3
(%)	29.3	19.4	72.1	8.3	100.0	

Table 4. Number of unique and duplicated accessions in the *Festuca* database (cultivars and breeder's lines)

Holder genebank INSTCODE	No. of unique, unduplicated accessions	No. of accessions acc. to holder status			Total no.of accessions	Unique vs. total (%)
		Primary holder	Secondary holder	Status undefined		
BGR001	6		10	3	13	46.2
CZE079	1		1	2	3	33.3
CZE082	93	20	294	2	316	29.4
DEU001	22	34	84	14	132	16.7
FRA051	22	14	24	21	59	37.3
POL003	34	16	118		134	25.4
POL022	15	4	101	5	110	13.6
ROM003	18	9	80	4	93	19.4
ROM007				2	2	0.0
SVK012	14	5	85	8	98	14.3
SVN019	2	2		1	3	66.7
SWE002	25	66	6		72	34.7
LTU001		70			70	0.0
LVA007		32			32	0.0
Total	252	272	803	62	1137	22.2
(%)	22.2	23.9	70.6	5.5	100.0	

More than 70% of all cultivars and breeder's lines stored in Europe are duplicated at least once. On the other hand, less than 30% are unique for the entire European collection.

In the next step the same analysis will be done on wild ecotypes. On average, less than 90% of wild and semi-natural ecotypes are stored in the country of origin. This percentage varies from 0% to 100% depending on the genebank and genus (see Table 5).

Table 5. Number of accessions stored in the country of origin (estimation of 'primary holders')

	Genus *Dactylis*			Genus *Festuca*		
	Number of accessions from country stored in:			Number of accessions from country stored in:		
Country (ISO code)	Europe	Country of origin	%	Europe	Country of origin	%
CHE	17	6	35.3	20	18	90.0
CZE	37	0	0.0	6	2	33.3
DEU	1038	660	63.6	1216	527	43.3
ESP	396	348	87.9	24	22	91.7
FRA	173	68	39.3	91	46	50.5
GBR	13	12	92.3	22	22	100.0
POL	5167	5148	99.6	3851	3831	99.5
PRT	195	136	69.7	15	0	0.0
ROM	58	36	62.1	145	71	49.0
SVK	13	13	100.0	65	65	100.0
SWE (NGB)	259	177	68.3	265	239	90.2
Total	7366	6604	89.7	5720	4843	84.7

The above analysis is only an estimation of the possible number of 'primary holder' accessions. Precise work will be carried out in the near future to produce lists of priority accessions for each of the contributing genebanks.

Reference

Sackville Hamilton, N.R., K.H. Chorlton and I.D. Thomas. 1998. Appendix III. Guidelines for the regeneration of accessions in seed collections of the main perennial forage grasses and legumes of temperate grasslands. Pp. 167-183 *in* Report of a Working Group on Forages. Sixth meeting, 6-8 March 1997, Beitostølen, Norway (L. Maggioni, P. Marum, R. Sackville Hamilton, I. Thomas, T. Gass and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.

European Perennial Medicago *Database*

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Collaborating institutes: 22 genebanks from 17 countries

URL: <http://www.ipgri.cgiar.org/ecpgr/platform/Crops/Medicago.htm>

Dissemination of information

The last edition of the Perennial *Medicago* spp. catalogue was printed in 1995. A raw table [Medicago.dbf (992 Ko)] is available through FTP on the ECP/GR Platform and can also be provided on diskette or by e-mail upon request. We aim at providing on-line access to the database.

Database management system: MS-Access 97.

Database contents

The database records 2888 accessions with 37 passport descriptors for 32 different subtaxa from 50 countries. Subtaxa repartition is shown in Table 1 and completeness of descriptors in Table 2.

Table 1. Number of accessions per species or subtaxa

Perennial *Medicago* spp.	No. of accessions	Perennial *Medicago* spp.	No. of accessions
arborea L.	5	*marina* L.	1
cancellata M.B.	2	*media* Pers.	17
carstiensis Wulf.	2	*orbicularis* Bart.	9
cretacea M.B.	1	*papillosa* Boiss.	1
dzhawakhetica Bordz.	1	*polychroa* Grossh.	2
falcata borealis Grossh.	3	*prostata* Jacq.	2
falcata difalcata Sink.	2	*rhodopaea* Velen.	2
falcata falcata L.	44	*sativa agropretorum* Vass	1
falcata glandulosa David.	2	*sativa coerulea* Less.	16
falcata quasifalcata Sink.	4	*sativa* L.	1930
falcata romanica Prod.	3	*sativa transoxana* Vass.	1
glomerata Balb.	6	*suffruticosa leiocarpa* Benth.	3
glutinosa M.B.	7	*tianschanica* Vass	1
hemicoerulea Sinsk.	1	*trautvetteri* Summ.	2
hemicycla Grossh.	5	*tunetana* Vass.	2
lupulina L.	45	*varia* Martin	660

Table 2. Percentage of documented accessions per descriptor

Field names	Description	%	Field names	Description	%
ecp_numb	ECP number	100	ye_rege	Year of last regeneration	10
gen_des	Genebank designation	100	meth_rege	Method of regeneration	13
acc_num	Accession number	99	nb_t_rg	Number of regeneration	9
acc_sts	Accession status	97	locatio	Location	68*
acc_nam	Accession name	80	prov_st	Province state	72*
orig_ct	Origin country	80	gene_ha	General habitat	5*
don_ins	Donor institute	64	spec_ha	Specific habitat	12*
don_num	Donors number	11	gras_ha	Grassland habitat	1*
br_main	Breeding maintaining institute	23*	altitud	Altitude	55*
br_or_main	Breeder or maintainer	10*	latitud	Latitude	54*
br_meth	Breeding method	19*	longitu	Longitude	54*
coll_in	Collecting institute	41*	aspect	Aspect	0*
coll_num	Collecting number	20*	slope	Slope	0*
coll_da	Collecting date	44	site_ph	Site physiography	2*
pedigre	Pedigree	19*	com_inf	Complementary information	19
ploidyl	Ploidy level	53*	acc-yea	Accession year	67
subtaxa	Subtaxa	96	seed_av	Seed availability	55
orig_en	Original entry	20	core-coll	Core collection	10
cy_rege	Country of regeneration	3			

* the percentage only takes into account accessions concerned by the information

Ongoing updating

The database was updated for the last time in 1995. Requests will be sent to the 22 former contributors and to 14 other possible partners holding accessions of perennial *Medicago* by e-mail or letters plus diskette.

Identification of duplicates

Duplications have been screened and results are provided in Table 3. They show the need for a standardization of the taxonomic description. There are 2311 named accessions with a total of 1354 different accession names. Most of the duplicates belong to cultivar or landrace status and seem to be at least historical duplicates if not real biological duplicates. The duplicates within this database are marked with different ECP numbers and some changes will probably have to be made at the next update.

Table 3. Screening for duplicates

x	n	No. of accessions with n–1 apparent duplicate(s) in x different species or subtaxa	No. of different names
1	1	975	975
1	2	198	99
1	3	162	54
1	4	120	30
1	5	100	20
1	6	66	11
1	7	70	10
1	8	24	3
1	9	45	5
1	10	20	2
1	11	11	1
1	12	24	2
1	15	30	2
2	2	124	62
2	3	81	27
2	4	64	16
2	5	70	14
2	6	60	10
2	7	21	3
2	8	8	1
3	3	3	1
3	4	4	1
3	5	5	1
3	6	18	3
5	8	8	1
Total	2311	1354	

x: number of species or subtaxa.
n: number of accessions with the same name.

Safety-duplicates

In letters of request, we also ask for additional information about germplasm management with three new descriptors: type of storage (stor_type), location of safety-duplicates (dupl_site) and date of safety-duplication (dup_date).

European Arrhenatherum *and* Trisetum *Databases*

Manager: Magdalena Ševcíková
Oseva PRO Ltd., Grassland Research Station, Zubří, Czech Republic

Updating

The structure was renewed in 1998 according to the FAO/IPGRI Multicrop Passport Descriptors (1997) and the Forage Passport Descriptors (1998).

The databases were updated during 1999. Updates were requested from all 15 institutions holding relevant germplasm. Data were received only from the four following institutes: CZE082, DEU001, GBR016 and HUN001.

Computerization

The database management system is FoxPro for Windows.

Availability of the databases

The databases are available as .dbf files on diskettes or as computer printouts.

Arrhenatherum Database

Three taxa and one subtaxon were identified:

Arrhenatherum elatius (L.) Beauv. ex J. et C.Presl (98.6% accessions)
- subsp. *bulbosum* (Willd.) Hyland

Arrhenatherum parlatorei (Woods) Potzal

Arrhenatherum thorei Desm.

The database contains passport data of 276 accessions belonging to 15 institutes. In Table 1 accessions are classified by contributing institute and in Table 3 by country of origin and status.

Table 1. Accessions classified by contributing institute and status *(Arrhenatherum* spp.)

Institute	Wild	Landrace	Breeder's line	Advanced cultivar	Unrecorded	Total
AUT	0	0	0	0	2	2
CZE082	10	0	0	16	0	26
DEU001	1	0	0	1	0	2
DEU146	0	0	0	0	15	15
DEU271	35	0	0	12	28	75
FRA025	0	0	0	0	4	4
GBR004	3	0	0	0	2	5
GBR016	0	0	2	0	0	2
HUN003	50	4	0	3	38	95
LVA	0	0	0	1	0	1
POL003	0	0	0	3	0	3
ROM007	0	4	0	0	0	4
SUN001	0	0	0	0	11	11
SVK012	11	0	0	14	3	28
SVN019	0	0	0	1	2	3
Total	110	8	2	51	105	276

Trisetum Database

Four taxa and two subtaxa were identified:

Trisetum flavescens (L.)Beauv. (94.9% accessions)

- subsp. *pratense* (Pers.) Aschers. et Graebn. var. *villosum*. Čelak.

Trisetum distichophyllum (Vill.)Beauv.

Trisetum sibiricum Rupr.

Trisetum spicatum (L.)Richt.

- var. *villosissimus*

The database includes passport data from 12 institutes and 79 accessions. In Table 2 accessions are classified by contributing institute and in Table 3 by country of origin and status.

Table 2. Accessions classified by contributing institute and status (*Trisetum* spp.)

Institute	Wild	Landrace	Breeder's line	Advanced cultivar	Unrecorded	Total
CZE082	5	0	0	4	0	9
DEU001	0	1	0	5	0	6
DEU146	0	0	0	1	2	3
DEU271	19	0	0	4	8	31
FRA025	0	0	0	0	1	1
GBR004	1	0	0	0	0	1
GBR016	0	0	0	1	0	1
HUN003	0	0	0	0	2	2
ROM007	0	1	0	0	0	1
POL003	0	0	0	0	1	1
SVK012	18	0	0	2	0	20
SVN019	0	0	0	0	3	3
Total	**43**	**2**	**0**	**17**	**17**	**79**

Completeness of descriptors

For both databases, the completeness of descriptors is given in Table 4.

Research project

The project "Screening of tall oat-grass and yellow oat-grass germplasm held in the European Central Database" was accepted by the Grant Agency of the Czech Republic for the years 1999–2001. The aim of the project is to analyze the variability of European wild populations and cultivars, to define a representative European subset and to obtain information on gaps in the coverage of European areas for both genera. Twenty-three requesting letters were sent to the possible partners. A total of 141 accessions of *Arrhenatherum* spp. and 46 accessions of *Trisetum* spp. was received (including the Czech institute) for the evaluation.

Table 3. Accessions of *Arrhenatherum* spp. and *Trisetum* spp. classified by country of origin

Country of origin	*Arrhenatherum* spp.						*Trisetum* spp.					
(ISO code)	W	LR	BL	AC	UN	Total	W	LR	BL	AC	UN	Total
Unrecorded	4	4	2	4	57	71	1	1	0	5	12	19
ARM	0	0	0	0	2	2						
AUT							0	1	0	0	0	1
BGR	3	0	0	0	0	3						
*CSK	12	0	0	8	3	23	2	0	0	6	0	8
CZE	9	0	0	1	0	10	5	0	0	0	0	5
*DDR	23	0	0	1	2	26	17	0	0	0	0	17
DEU	1	0	0	10	0	11	0	0	0	4	0	4
EST	0	0	0	0	1	1						
FRA	1	0	0	0	3	4						
GBR	2	0	0	1	0	3						
GEO	0	0	0	0	1	1						
HUN	30	4	0	0	13	47	2	0	0	0	0	2
CHE	1	0	0	0	0	1						
ITA	2	0	0	3	0	5						
KAZ	0	0	0	0	1	1						
LVA	0	0	0	0	1	1						
NLD	1	0	0	1	0	2						
NOR	1	0	0	0	0	1						
POL	8	0	0	14	8	30	4	0	0	0	3	7
PRT	0	0	0	0	2	2						
ROM	0	0	0	1	0	1						
RUS	0	0	0	0	4	4						
*SUN	1	0	0	0	0	1						
SVK	10	0	0	2	3	15	14	0	0	2	0	16
SVN	0	0	0	2	0	2						
SWE	0	0	0	0	1	1						
UKR	0	0	0	0	3	3						
YUG	1	0	0	3	0	4						
Total	110	8	2	51	105	276	45	2	0	17	15	79

*: former states

W: wild; LR: landrace; BL: breeder's line; AC: advanced cultivar; UN: unrecorded

Table 4. Completeness of European *Arrhenatherum* and *Trisetum* Databases

	Arrhenatherum spp.		*Trisetum* spp.	
Field name	Number of records	% complete	Number of records	% complete
ECP_NUMBER	276	100.0	79	100.0
INSTCODE	276	100.0	79	100.0
ACCENUMB	272	98.6	78	98.7
COLLNUMB	14	5.1	6	7.6
GENUS	276	100.0	79	100.0
SPECIES	276	100.0	79	100.0
SUBTAXA	2	0.7	2	2.5
ACCNAME	95	34.4	22	27.8
ORIGCTY	205	74.3	60	75.9
COLLSITE	61	22.1	23	29.1
LATITUDE	22	8.0	2	2.5
LONGITUDE	22	8.0	2	2.5
ELEVATION	16	5.8	18	22.8
COLLDATE	29	10.5	22	27.8
SAMPSTAT	171	62.0	64	81.0
COLLSRC	8	2.9	0	0.0
DONORCODE	75	27.2	15	19.0
DONORNUMB	5	1.8	0	0.0
OTHERNUMB	51	18.5	1	1.3
REMARKS	73	26.4	34	43.0

European Bromus *and* Trifolium pratense *Databases*

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The Institute for Agrobotany (ABI), Tápiószele, Hungary maintains these European Central Crop Databases. ABI performs a full genebank activity on field and vegetable crops. It is the centre of the national genebank programme and represents Hungary in a number of international fora in the area of plant genetic resources conservation.

The databases are searchable on-line at the Internet server of the Nordic Gene Bank (<http://www.ngb.se/Databases/ECP/>).

European *Bromus* Database

After the last updating (1999) the European *Bromus* Central Crop Database (BDB) contains passport data on 609 accessions of 46 *Bromus* taxa stored in 11 European genebanks (Table 1). Passport data received from the Lithuanian Institute of Agriculture are the most recent contribution to the database.

Table 1. Composition of the *Bromus* database by institutes and species

Institute	Species	No. of accessions
DEUBGRC	2	16
DEUGAT	19	104
FRAINRALUS	3	4
FRAINRAMAG	3	5
GBRRBG	25	185
GRCFCPI	2	3
HUNRCA	26	152
ITAIDG	2	4
LTU001	2	26
POLBYDG	1	92
TURARARI	5	18
Total		609

The collections recorded in the BDB contain the accessions from 37 countries or regions, 13 of them outside Europe, and include commercial varieties and breeding or research materials (55), ecotypes or semi-wild material and material of unknown type (554).

European *Trifolium pratense* Database

The elaboration of the European *Trifolium pratense* Central Crop Database (TPDB) was started at the Federal Agricultural Research Station of Changins, Nyon, Switzerland, in 1984. In 1995, after two editions, the database was transferred to ABI. Since its former updating (1995, total 1901 accessions), three institutions (IGER, SVKPIEST, LTU001) have made their passport data available for the TPDB.

After the last updating (1999) the *Trifolium pratense* database contains the passport data of 2316 red clover accessions stored in 21 genebanks or other institutions of 16 European countries (Table 2).

Table 2. Composition of the *Trifolium pratense* database by participating institutes and number of accessions

INSTCODE	No. of accessions
BEL004	13
BGR001	119
CHE001	2
CHE002	12
CZE096	135
DEU001	96
DEU146	49
FRA018	85
GBR004	28
GBR016	214
GRC006	99
HUN003	380
ITA004	8
ITA008	13
LTU001	22
NLD037	137
POL003	114
SVK001	242
SVKPIEST	179
SWE002	306
TUR001	63
Total	2316

The collections include commercial varieties (912), breeder's lines (101), primitive or local cultivars (480), wild or semi-natural ecotypes (583) and material of unknown type (240).

The duplicates within the database are marked with the same ECP number.

European Agropyron *Database*

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The decision to establish the *Agropyron* database was taken at the fifth meeting of the Working Group on Forages in Bulgaria (1995). At the sixth meeting in Norway (1997) my colleague S. Angelova requested information from institutions holding *Agropyron* collections, listed in Table 1 below; however, no replies were received by the time of this meeting.

Table 1. Institutions requested to provide data to the European *Agropyron* database

Institute code	Institute acronym	City	Country	No. accessions
HUN003	HUNRCA	Tápiószele	Hungary	82
ITA004	ITAIDG	Bari	Italy	80
TUR001	TURARARI	Izmir	Turkey	80
RUS001	SUNVIR	St. Petersburg	Russian Federation	700

The collection of *Agropyron* spp. conserved in Sadovo is shown in Table 2, classified by country of origin. It contains a total of 56 accessions: 23 cultivars (10 from USA, 9 from Canada and 4 from Kazaksztan), and 33 wild ecotypes (14 from Bulgaria, 8 from the Czech Republic, 9 from Kazaksztan and 2 from Russia). Thirty-nine accessions are kept in long-term storage at the genebank of the Institute.

Table 2. Status of *Agropyron* spp. classified by country of origin

	Country of origin (ISO code)					
Species	**BGR**	**CAN**	**CZR**	**KAZ**	**RUS**	**USA**
A. cristatum	5w[†]			3c+6w	1w	2c
A. desertorum		1c[†]		2w		2c
A. fragile				1c		1c
A. pectinatum	8w	2c		1w	1w	
A. caninum			4w			
A. elongatum	1w	1c				
A. glaucum			1w			
A. intermedium		1c	2w			2c
A. riparium		1c				
A. smithii		1c				
A. spicatum						1c
A. trachycaulum		1c				1c
A. trichophorum		1c	1w			1c
Total	14w	9c	8w	9w+4c=13	2w	10c

[†] w (wild) = 33; c (cultivar) = 23; Total = 56.

European Database for Trifolium alexandrinum *and* T. resupinatum

Hailu Aynalem

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The Israel Gene Bank for Agricultural Crops (IGB) is responsible for the maintenance of the European Central *Trifolium alexandrinum* and *Trifolium resupinatum* database, under the initiative of the European Cooperative Programme for Crop Genetic Resources Networks (ECP / GR).

The two *Trifolium* species database is partially compiled and now maintained at the Israel Gene Bank, Agricultural Research Organization (ARO), Volcani Center, Bet Dagan, headed by Prof. A. Levy. It is hoped to update the database soon; it will be available on a floppy disk. Table 1 provides information on the accessions of *T. alexandrinum* and *T. resupinatum* recorded in the database.

Table 1. Accessions classified by contributing institutes

	No. ecotypes		Data entered in
Country	***T. alexandrinum***	***T. resupinatum***	**database in IGB**
GBR016	10	38	Yes
GBR (Kew gardens)	1	8	
DEU146	10	20	Yes
DEU001	2	7	Yes
TUR009	1	67	Yes
ISR002	105	32	Yes
ITA051	8	35	Yes
PRT005	38	10	–
HUN003	6	3	Yes
GRC005	90	35	–
FRA002	–	6	Yes
SVK001	6	6	Yes

European Trifolium subterraneum *and annual* Medicago *species Databases*

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Updating

The databases have been updated since the last meeting with contributions from the following institutes:

- BGR001 – Institute of Plant Introduction and Genetic Resources "K. Malkov", Bulgaria
- ESP010 – Servicio de Investigación y Desarrollo Tecnológico, Badajoz, Spain
- GBR016 – Welsh Plant Breeding Station, IGER, Aberystwyth, United Kingdom
- GBR004 – Seed Bank, Royal Botanic Gardens, Kew, United Kingdom
- ITA015 – Institute of Plant Breeding, University of Perugia, Perugia, Italy
- DEU001 – Institute of Crop Science, Braunschweig, Germany (data not entered yet).

The databases currently contain 3175 accessions of *Trifolium subterraneum* (Tables 1 and 2) and 1879 accessions of annual *Medicago* (Tables 3 and 4) belonging to 11 holding institutes.

The Passport Descriptors have been adapted according to the list approved at the sixth meeting of the Working Group on Forages. The institute ACRONYM has been replaced by the INSTCODE from the list of FAO's Institutions Codes.

The ECP number of the *Medicago* list also has been changed because it was previously assigned by species, and given the high number of species in this genus it was confusing. Therefore the ECP number has been unified into a single series assigned to the genus. Therefore, the numbers from the old catalogue are outdated.

Of all the accessions in the current database for *T. subterraneum*, 77% are held at the genebank of SIA (Table 1), and were collected mainly in Spain and Portugal. Conversely, only 31% of the *Medicago* database accessions are held at the SIA (Table 3) and had their origin in this area.

Completeness of descriptors

Besides the Forage Passport Descriptors, the databases are completed with several descriptors for soil characteristics and population abundance which are considered relevant for these species. The degree of completeness of these 53 descriptors in the databases is shown in Table 5 for subterranean clover and in Table 6 for *Medicago.*

Several site and habitat descriptors lack information; additional work, mainly on the old collections of the SIA, is needed to update these fields.

For the holder of primary collection (PRIMCOLL), location of safety-duplicates (DUPLISITE) and others, although the data have been recorded, it is now being verified whether they were entered in the databases. For instance, accessions from the SIA genebank are completely characterized, have been regenerated, and a safety-duplicate has been sent to the Centro Recursos Fitogenéticos (CRF–INIA), Madrid.

Database management system

The databases are available on Microsoft Access 7.0 and Excel.

Table 1. European *Trifolium subterraneum* Database accessions classified by contributing institute

Institute code	Advanced cultivars	Breeder's lines	Wild	Unknown	Total
AUS001	1	1	26	–	28
BGR001	26	–	4	5	35
DEU001	15	1	401	–	417
ESPO10	35	118	2293	1	2447
GBR016	6	–	1	6	13
GRC006	10	–	1	–	11
ITA004	–	–	10	–	10
ITA015	1	–	52	10	63
TUR001	–	–	12	–	12
USA027	1	4	134	–	139
Total	95	124	2934	22	3175

Table 2. European *Trifolium subterraneum* Database accessions classified by country of origin

Country of origin (ISO code)	Advanced cultivars	Breeder's lines	Wild	Unknown	Total
Not registered	–	4	322	9	335
AUS	30	12	1	5	48
BGR	–	–	4	–	4
CYP	–	–	18	–	18
DZA	–	–	10	–	10
ESP	7	82	1514	–	1603
FRA	–	–	39	1	40
GRC	–	6	66	–	72
ISR	–	1	1	–	2
ITA	–	1	111	4	116
MAR	–	2	425	–	427
MLT	–	1	–	–	1
NZL	–	–	–	1	1
PRT	–	6	202	2	210
TUN	–	2	47	–	49
TUR	–	–	6	–	6
USA	–	1	2	–	3
YUG	–	–	1	–	1
Total	37	118	2769	22	2946

Table 3. European *Medicago* Database (annual species) accessions classified by contributing institute

Institute code	Advanced cultivars	Breeder's lines	Landraces	Wild	Unknown	Total
BGR001	2	–	–	9	122	133
DEU001	1	–	–	370	–	371
ESPO10	14	2	–	559	13	588
GBR004	–	–	–	82	–	82
GBR016	1	–	–	23	29	53
ITA015	7	199	2	200	244	652
Total	25	201	2	1243	408	1879

Table 4. European *Medicago* Database (annual species) accessions classified by country of origin

Country of origin	Advanced cultivars	Breeder's lines	Landraces	Wild	Unknown	Total
Not registered	6	178	–	26	194	404
AFG	–	–	–	–	2	2
AUS	4	1	–	3	44	52
BGR	–	–	–	9	10	19
CAN	–	–	–	2	2	4
CHE	–	–	–	1	–	1
CHL	–	–	–	1	1	2
CSK	–	–	–	1	2	3
CYP	2	–	–	169	4	175
DDR	–	–	–	1	1	2
DEU	–	–	–	3	–	3
DNK	1	–	–	7	–	8
DZA	–	–	–	–	2	2
ESP	–	–	–	222	6	228
ETH	–	–	–	–	7	7
FRA	–	–	–	25	4	29
GBR	–	–	–	4	1	5
GRC	–	–	–	72	3	75
HUN	–	–	–	1	3	4
IRL	–	–	–	1	–	1
IRN	–	–	–	–	6	6
IRQ	–	–	–	–	2	2
ISR	1	–	–	3	13	17
ITA	–	20	2	251	29	302
JOR	–	–	–	–	1	1
LBN	–	–	–	–	4	4
LBY	–	–	–	–	2	2
MAR	–	–	–	373	13	386
MLT	–	–	–	–	1	1
NOR	–	–	–	1	–	1
PER	–	–	–	2	–	2
POL	–	–	–	–	2	2
PRT	–	–	–	55	8	63
SUN	–	–	–	1	4	5
SWZ	–	–	–	1	–	1
SYR	–	–	–	–	9	9
TUN	–	–	–	1	3	4
TUR	–	–	–	2	14	16
USA	–	–	–	2	10	12
YUG	–	–	–	3	1	4
Total	14	199	2	1243	408	1866

Table 5. List of descriptors used and % of accessions documented for *Trifolium subterraneum*

Descriptor	% documented	Descriptor	% documented
ECP	100	Spechabit	0.16
Instcode	100	Granhabit	0.76
Accenumb	100	Aspect	0.69
Collnumb	59.53	Slope	0.6
Collname	59.3	Sitephys	0.76
Collinst	66.42	SoilpH	0.82
Genus	100	Recthi	–
Species	100	Stoniness	0.63
Subtaxa	76	Soildepth	0.72
Ploidylev	71.21	Soiltex	0.82
Pedigree	88.38	Soildrain	0.13
Accname	1.73	Rainfall	0.22
Origcty	88.38	Sizepopul	–
Collsite	65.16	Abundance	0.13
Collprov	57.04	Assopec	0.13
Latitude	62.14	Seedavail	13.13
Longitude	62.14	Accesize	–
Elevation	51.11	Primcoll	–
Colldate	71.24	Duplisite	–
Sampstat	99.59	Dupdate	–
Collsrc	1	Passavail	1.95
Donorcode	0.41	Charavail	1.98
Donorname	29	Evalavail	1.98
Donornumb	22.43	Stortype	1.98
Breedinst	0.03	EFC	1.95
Breedmet	0.6	Remarks	2.29
Genhabit	0.16		

Table 6. List of descriptors used and % of accessions documented for *Medicago* (annual species)

Descriptor	% documented	Descriptor	% documented
ECP	100	Spechabit	1.49
Instcode	100	Granhabit	4.9
Accenumb	100	Aspect	2.82
Collnumb	35.12	Slope	1.33
Collname	30.97	Sitephys	24.43
Collinst	43.96	SoilpH	2.18
Genus	100	Recthi	–
Species	99.68	Stoniness	1.27
Subtaxa	0.37	Soildepth	1.8
Ploidylev	36.24	Soiltex	4.42
Pedigree	–	Soildrain	0.48
Accname	51.62	Rainfall	0.48
Origcty	70.02	Sizepopul	–
Collsite	45.66	Abundance	0.48
Collprov	19.64	Assopec	0.48
Latitude	27.73	Seedavail	58.7
Longitude	27.73	Accesize	–
Elevation	40.71	Primcoll	–
Colldate	55.98	Duplisite	–
Sampstat	90.1	Dupdate	–
Collsrc	5.64	Passavail	30.81
Donorcode	2.66	Charavail	34.75
Donorname	41.46	Evalavail	30.76
Donornumb	37.25	Stortype	30.76
Breedinst	–	EFC	34.43
Breedmet	–	Remarks	18.04
Genhabit	4.36		

European Lathyrus *Database*

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The *Lathyrus* database maintained in Pau, France, includes the following species: *L. cicera, L. heterophyllus, L. latifolius, L. sativus, L. sylvestris* and *L. tuberosus.* Europe, North Africa, Ethiopia, Syria and India are represented. The contents of the database are shown in Table 1.

Table 1. Number of accessions per species in the *Lathyrus* database as of 3.11.1999

Species	No. of accessions
L. cicera	776
L. heterophyllus	80
L. latifolius	331
L. sativus	2354
L. sylvestris	668
L. tuberosus	237
Total	4446

Duplicates

As previously mentioned, there has been no search for duplicates yet: we are mostly working with wild species and therefore real duplicates should be rare. A few populations from the region of Pau (Pyrenees) have been collected more than once (mostly twice) in different years. But since they are natural cross-pollinated populations, the different samples are almost certainly genetically different, especially since population sizes are generally big (100 or more) and we have generally not paid attention to which individuals have been sampled. Therefore the fact that different accessions have the same descriptors data does not mean that they are real duplicates, and we may have difficulties asserting it.

Completeness of descriptors

Data on the completeness of descriptors are provided in Table 2.

Database availability

The *Lathyrus* database can be provided upon request on floppy disk or as a print-out. It is also freely accessible through Internet at the Pau University site: <http://www.univ-pau.fr:8888/lathy/lathyrus>.

[6] Contact: Tel.: (33) (0) 559923147, Fax: (33) (0) 559808311, E–mail: daniel.combes@univ-pau.fr

Table 2. Completeness of descriptors in the *Lathyrus* database

Field name	Description	% accessions documented
ECPNO	ECP Number	100
IHA	Institute holding accession	100
ACC NO	Accession number	100
ANNEE	Year of accession	90
CTY	Country of collection	100
COL INST	Collection institute	79
COL NO	Collector's number	10
COL DATE	Date of collection	71
DON INST	Donor institute	10
DON NO	Donor identification number	8
DISPOGR	Internal availability of seeds (oui=yes / non=no)	100
SSPCULNV	External availability of seeds (oui=yes / non=no)	22
PROVINCE	Administrative subdivision	55
SITE	Nearest town or village	83
GENHABIT	General habitat	30
SPEHABIT	Specific habitat	26
GRASSHABIT	Grassland habitat	25
ALT	Altitude (elevation asl in m)	35
LAT	Degrees and minutes suffixed by N or S	73
LON	Degrees and minutes suffixed by E or W	73
SITEGEO	Site physiography	78
ORIGENTR	Original entry (oui=yes / non=no)	100
PAYSREGEN	Country of regeneration	62
ANDERREGEN	Year of regeneration	67
METREGEN	Regeneration method	44
NBREGEN	Number of regenerations	89
METOTEN	Obtention method	73

Comparison between the number of accessions reported in the European Central Crop Databases (ECCDBs) and in National Collections in 1997

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Introduction

In 1997 the Forages Working Group conducted a survey of the National Collections in member countries. Information was received on the number of accessions for the most important genera: *Trifolium, Medicago,* Vicieae*, Lolium, Festuca, Phleum, Dactylis* and *Poa.* We also obtained information about storage conditions and the number of accessions in great need for regeneration (Marum *et al.* 1998). These results were presented at the last meeting of the Working Group on Forages. At the same meeting information was presented on the different European Central Crop Databases (ECCDBs) (Maggioni *et al.* 1998).

It was apparent from the presentations that there were differences in the number of accessions entered in the ECCBDs and those recorded in the National Collections. I have looked a little closer at these data to find the extent and reason for these differences.

Genera that were included in this comparison were *Trifolium, Medicago, Lolium, Festuca, Phleum, Poa* and *Dactylis.* Vicieae were not included, because of some missing information. For each genus and country, information was included only if the number of accessions was available from both the National Collections and the ECCDBs. The data set was therefore balanced.

Results

There were large variations between countries and genera in the percentage of accessions included in the ECCDBs. In Table 1 the global figures are given for the different genera, and details per genus are provided in Table 2. Table 3 provides the figures for all genera tabulated by country.

Table 1. Comparison between the number of accessions in the ECCDBs and in National Collections for different genera in 1997

	Number of accessions		
Genus	**ECCDBs**	**National Collections**	**% included in ECCDBs**
Trifolium	6124	17121	36
Medicago	4227	14267	30
Lolium	7785	13315	58
Festuca	6860	12739	54
Phleum	4228	5852	72
Poa	2629	5094	52
Dactylis	8604	12954	66
Total	40454	81342	50

On the average for these genera only 50% of the accessions were included in the ECCDBs in 1997.

The highest number of accessions included in the ECCDBs were for the genera *Phleum* and *Dactylis* and the lowest for *Trifolium* and *Medicago.* One reason for the low percentage for *Trifolium* is that none of the minor *Trifolium* species is included in the ECCDBs.

Table 2. Comparison between the number of accessions in the ECCDBs and in National Collections in 1997 – details per genus

2a. *Trifolium*

Country	Number of accessions		% in
	ECCDBs	National Collections	ECCBDs
Austria	0	103	0
Belgium	13	0	
Bulgaria	254	357	71
Czech Rep.	325	363	90
France	85	686	12
Germany	610	1549	39
Greece	147	553	27
Hungary	380	1142	33
Ireland	0	246	0
Italy	33	2275	1
Lithuania	35	15	233
The Netherlands	138	142	97
Nordic Countries	374	388	96
Poland	114	246	46
Portugal	0	445	0
Russia	0	3692	0
Slovakia	242	307	79
Spain	2427	2800	87
Switzerland	14	55	25
Turkey	143	763	19
UK	790	920	86
F.R. Yugoslavia	0	74	0
Total	6124	17121	36

2b. *Medicago*

Country	Number of accessions		% in
	ECCDBs	National Collections	ECCDBs
Belgium	1	0	
Bulgaria	368	542	68
Cyprus	0	29	0
Czech Rep.	239	487	49
France	366	2793	13
Germany	1273	1259	101
Greece	165	573	29
Hungary	483	825	59
Italy	217	2383	9
Lithuania	0	3	0
Nordic Countries	31	23	135
Poland	20	20	100
Portugal	0	503	0
Russia	36	2950	1
Slovakia	15	252	6
Spain	507	564	90
Turkey	398	889	45
UK	101	109	93
F.R. Yugoslavia	7	63	11
Total	4227	14267	30

2c. *Lolium*

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	80	0
Belgium	0	60	0
Bulgaria	0	291	0
Cyprus	0	14	0
Czech Rep.	636	709	90
France	0	1740	0
Germany	1180	2135	55
Greece	0	182	0
Hungary	0	194	0
Ireland	0	605	0
Italy	0	716	0
Lithuania	65	10	650
The Netherlands	134	194	69
Nordic Countries	154	154	100
Poland	2374	2374	100
Portugal	0	138	0
Russia	0	732	0
Slovakia	0	276	0
Spain	191	213	90
Switzerland	0	4	0
UK	3051	2484	123
F.R. Yugoslavia	0	10	0
Total	7785	13315	58

2d. *Festuca*

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	80	0
Bulgaria	27	136	20
Czech Rep.	322	333	97
France	175	325	54
Germany	661	1522	43
Greece	0	183	0
Hungary	0	589	0
Ireland	0	20	0
Italy	1	343	0
Lithuania	0	17	0
Nordic Countries	314	542	58
Poland	4606	4606	100
Portugal	0	99	0
Russia	0	1856	0
Slovakia	589	709	83
Spain	22	18	122
Switzerland	37	98	38
Turkey	28	27	104
UK	78	1236	6
Total	6860	12739	54

2e. *Phleum*

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	50	0
Belgium	2	1	200
Bulgaria	9	37	24
Czech Rep.	113	118	96
France	28	34	82
Germany	644	886	73
Greece	9	12	75
Hungary	108	65	166
Ireland	32	31	103
Italy	24	65	37
Lithuania	0	3	0
Netherland	0	102	0
Nordic Countries	417	355	117
Poland	2532	2568	99
Russia	0	1267	0
Slovakia	88	105	84
Turkey	21	24	88
UK	201	129	156
Total	4228	5852	72

2f. *Poa*

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	60	0
Belgium	29	0	
Bulgaria	0	53	0
Czech Rep.	219	224	98
France	0	27	0
Germany	666	651	102
Hungary	52	172	30
Italy	0	62	0
Lithuania	0	7	0
Nordic Countries	0	342	0
Poland	1452	2408	60
Russia	0	626	0
Slovakia	0	232	0
Switzerland	60	114	53
Turkey	13	13	100
UK	138	103	134
Total	2629	5094	52

2g. *Dactylis*

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	47	0
Bulgaria	167	234	71
Czech Rep.	130	139	94
France	247	653	38
Germany	781	1268	62
Greece	0	252	0
Hungary	0	250	0
Ireland	0	55	0
Italy	1	444	0
Lithuania	0	16	0
The Netherlands	28	28	100
Nordic Countries	211	239	88
Poland	6092	6092	100
Portugal	144	331	44
Russia	0	1088	0
Slovakia	187	208	90
Spain	360	338	107
Switzerland	11	142	8
Turkey	180	178	101
UK	65	947	7
F.R. Yugoslavia	0	5	0
Total	8604	12954	66

Table 3. Comparison between the number of accessions in the ECCDBs and in National Collections for different countries in 1997

Country	Number of accessions ECCDBs	National Collections	% in ECCDBs
Austria	0	420	0
Belgium	45	61	74
Bulgaria	825	1650	50
Cyprus	0	43	0
Czech Rep.	1984	2373	84
France	901	6258	14
Germany	5815	9270	63
Greece	321	1755	18
Hungary	1023	3237	32
Ireland	32	957	3
Italy	276	6288	4
Lithuania	100	71	141
The Netherlands	300	466	64
Nordic Countries	1501	2043	73
Poland	17190	18314	94
Portugal	144	1516	9
Russia	36	12211	0
Slovakia	1121	2089	54
Spain	3507	3933	89
Switzerland	122	413	30
Turkey	783	1894	41
UK	4424	5928	75
F.R. Yugoslavia	7	152	5
Total	40457	81342	50

The Russian accessions are not included in the ECCDBs. Should all the Russian accessions (12 211) for these genera be included, the percentage would increase to about 65%. At the same time the large Polish collection (18 314 accessions) also has a large impact on the percentage included. Most of the Polish accessions are included in the ECCDBs. Without the Polish accessions the percentage would decrease to about 37%.

These comparisons are based on data presented at the last meeting of the Working Group in 1997. Since then, several of the databases have been updated with new accessions from several countries. At the same time several collecting missions have been carried out, which have increased the number of accessions in the National Collections. It is hoped that the percentage of accessions in the ECCDBs has increased during the last two years.

Ideally the number of accessions in the ECCDBs should be equal to the number of accessions in the National Collections. With our present system for updating the ECCDBs this is difficult to achieve. We should look into new ways of updating/maintaining our ECCDBs.

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Marum, P., I.D. Thomas and M. Veteläinen. 1998. Appendix IV. Summary of germplasm holdings. Pp. 184-189 *in* Report of a Working Group on Forages. Sixth meeting, 6-8 March 1997, Beitostølen, Norway (L. Maggioni, P. Marum, R. Sackville Hamilton, I. Thomas, T. Gass and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.

An alternative method to compile and update ECP/GR Central Crop Databases

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The ECP/GR Central Crop Databases (CCDBs) that have been compiled during the 1990s can be graphically depicted in a three-dimensional coordinate system (Fig. 1). The institutes holding the material (and also providing the information) are pictured on the x-axis, the crop groups managed by the ECP/GR database managers are pictured on the y-axis and the descriptor list on the z-axis.

The end result, a composite ECP/GR database, can be achieved in different ways. The current method to reach the result is rather inefficient: database managers ask the holders of material for information on the accessions *per crop group*, then combine that information into central crop databases. This means that every holding institute exports their data to n different database managers, each time splitting out the relevant crop information from their internal data sets. Each database manager receives information from m different holders, and combines the data sets into one single central crop database (Figs. 2a and 2b). The number of file transfers needed to perform a complete compilation or update is $n \cdot m$.

For the whole ECP/GR set of CCDBs (approximately):

~ 40 crop groups
~ 40 contributing institutes
= 1600 file transfers

For the Forage Network:

~ 16 crop groups
~ 26 contributing institutes
= 416 file transfers

Since the crop groups use the same passport descriptor lists, the same end result could be achieved in fewer steps if each holding institute exported their complete data set once. The number of file transfers needed would then equal the number of contributing institutes (currently about 26 for the forage network). Utilizing the Internet as a medium for information exchange, the process of compiling and updating the data sets can be speeded up even more.

A publisher is any institute providing a data set conforming to an agreed format for downloading through FTP (file transfer protocol) on the Internet. An institute on whose FTP server a new or updated data set will first appear is called a primary publisher. An institute who downloads a file from someone else and re-publishes it is called a secondary publisher.

All institutes contributing a data set to the ECP/GR will need a primary publisher. The institutes that have permanent access to the Internet, and can provide FTP services, can be the primary publisher for their own data sets. Through agreements they can also become primary publishers for institutes that do not have permanent access to the Internet. For each institute there should be one and only one primary publisher (Fig. 3).

Combining automated downloading scripts with a network of primary publishers, it is possible to achieve fast updating frequencies of the ECP/GR databases. The time from the moment a primary publisher's data set changes to the time when the changed data set has reached all the secondary publishers can be as short as 24 hours, or even shorter if necessary.

Software and database maintenance on the Internet today is commonly handled through networks of primary and secondary publishers. If the ECP/GR would apply similar procedures, updates would not only be faster, but resources spent by database managers on manual compilation and updates of passport data sets could be directed toward handling of crop-specific characterization and evaluation data.

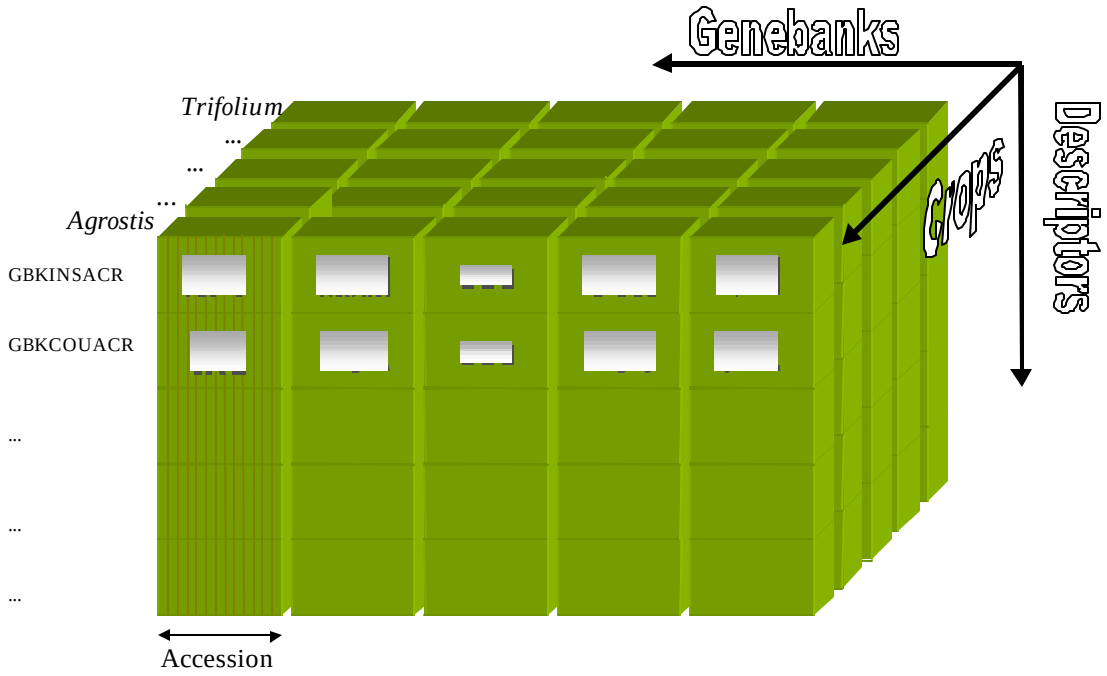
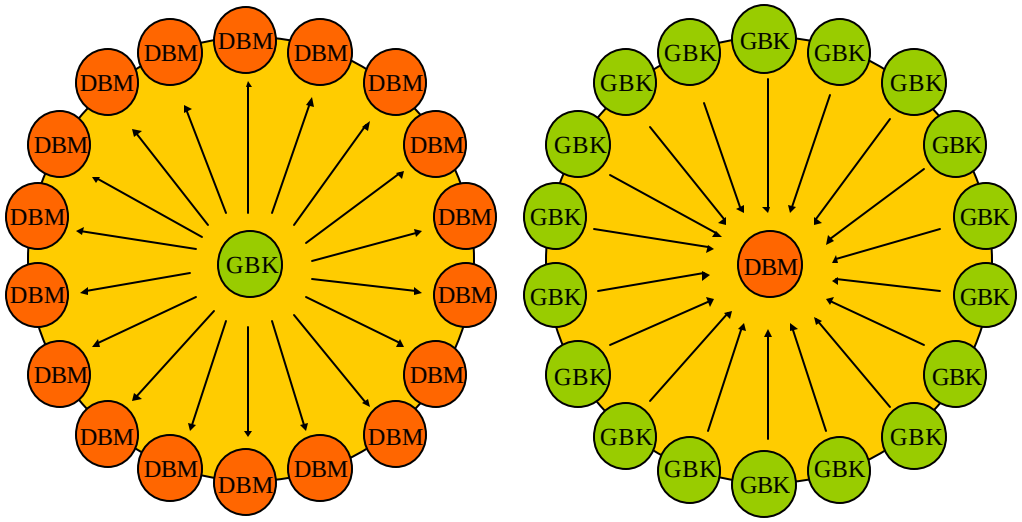


Fig. 1. The ECP/GR Central Crop Databases form a 'cake' cutting into their components by institute and by crop group.



Figs. 2a and 2b. Unnecessary work to compose and update ECP/GR Central Crop Databases is performed by both contributing institutes extracting and exporting data several times, and database managers repeatedly importing and combining data sets.

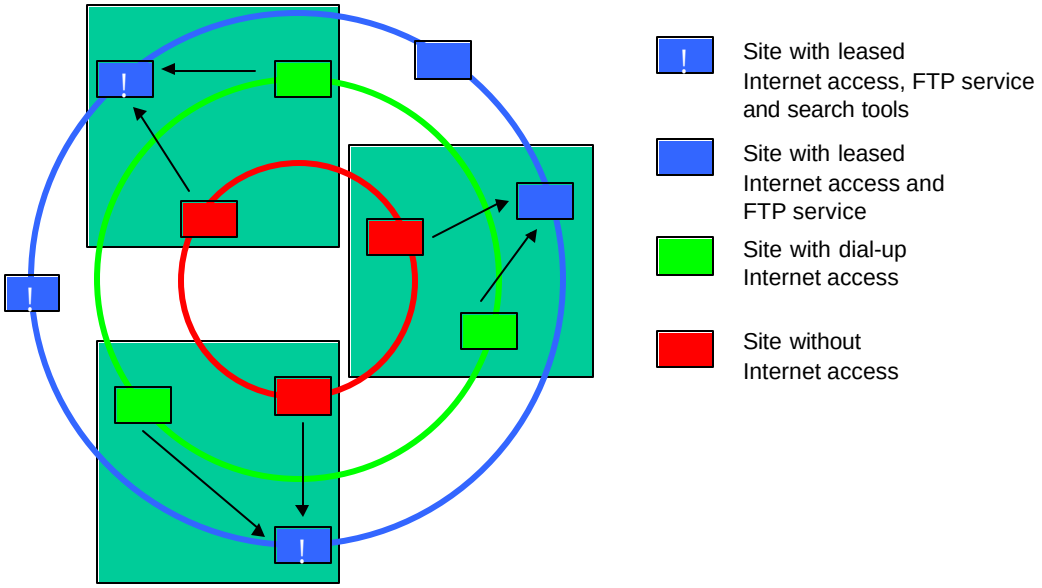


Fig. 3. An automated updating system with institutes in three classes (with permanent, temporary and no Internet connections) who pass files to each other so that data from all institutes will be up to date on all servers and search systems.

Status of National Collections

Forage genetic resources in Albania

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Introduction

Albania is a Mediterranean country very rich in valuable wild forage crops. The Forage Research Institute at Fushë-Krujë is responsible for the collecting, conservation and utilization of forage germplasm, in collaboration with the National Center of Seeds and Seedling (NCSS) at Tirana. Activities related to forage genetic resources started in 1975 in Albania; these studies are implemented within the framework of the genetic and breeding national programme.

The Forage Research Institute has taken the overall responsibility at national level in its capacity as project centre. From 1975 to 1986 collecting expeditions were organized with the main scope of identifying and describing Albanian forage flora (Demiri 1983). During this period the following species were described (Table 1):

Table 1. Wild Albanian forage genetic resources

Genus	No. of species
Medicago	26
Trifolium	70
Lotus	7
Melilotus	3
Pisum	2
Vicia	20
Lolium	4
Hordeum	4
Dactylis	1
Poa	3
Festuca	38
Phleum	10

The objectives of the Forage Research Institute are the survey, collecting, conservation (both *in situ* and *ex situ*), documentation and evaluation of indigenous and introduced plant genetic resources and plant diversity in Albania.

The genebank of the Forage Research Institute holds the following number of accessions: *Medicago* 24, *Trifolium* 13, *Melilotus* 4, *Lotus* 2, *Soja* 18, *Vicia* 32, *Pisum* 23, *Lathyrus* 11, *Avena* 18, *Hordeum* 14, *Lolium* 2, *Festuca* 2, *Dactylis* 1, *Phleum 2* (see Table 2 for list of species).

Table 2. Forage crops in the collections of the Forage Research Institute in Albania

Genus	Species	No. of accessions	Landraces	Advanced cultivars	Breeder's lines	No. of accessions stored in the genebank
Medicago	*sativa*	17	3	1	1	17
	polymorpha	2				2
	sativa x *varia*	1				1
	lupulina	1				1
	hybrida	1				1
	falcata	1				1
	nigra	1				1
	Total *Medicago*	24				24
Trifolium	*pratense*	4				4
	repens	3				3
	alexandrinum	2				2
	squarrosum	1				1
	incarnatum	1				1
	subterraneum	1				1
	sp.	1	1			1
	Total *Trifolium*	13				13
Melilotus	*officinalis*	4				4
Lotus	*corniculatus*	2				2
Soja	*hyspida*	18				18
Vicia	*faba*	17	3			17
	sativa	13	3			13
	ervilia	2				2
	Total *Vicia*	32				32
Pisum	*sativa*	22	7			22
	arvense	1	1			1
	Total *Pisum*	23				23
Lathyrus	*sativa*	3				3
	silvestris	6				6
	alpestris	2				2
	Total *Lathyrus*	11				11
Avena	*sativa*	18	2			18
Hordeum	*vulgaris*	14				14
Lolium	*multiflorum*	2				2
Festuca	*arundinacea*	2				2
Dactylis	*glomerata*	1				1
Phleum	*pratense*	2				2
Total		**166**				**166**

These samples were collected all over Albania, in 1975-98. Most of the collected accessions have been characterized and evaluated according to the IPGRI Descriptor List (Tyler *et al.* 1985), slightly modified (Fig. 1). A computerized database of forage genetic resources is not operational yet, but is under development.

Ex situ conservation

When possible, *ex situ* conservation is carried out in the Institute's fields as the best conservation and evaluation method.

In situ conservation

Our Institute collaborated with the National Centre of Seeds and Seedling (NCSS), and adopted a programme related to the applications of *in situ* conservation of forage crops resources in Albania (Xhuveli *et al.* 1995).

The main objectives are:

1. to test and develop new technologies for plant genetic resources conservation at their place of origin, and
2. to provide sustainable *in situ* conservation of wild forages genetic resources of *Medicago* sp. (landrace 'Tomin'), *Trifolium* sp. (landrace 'Shishtaveci') and *Pisum* sp. (landrace 'Voskopoja').

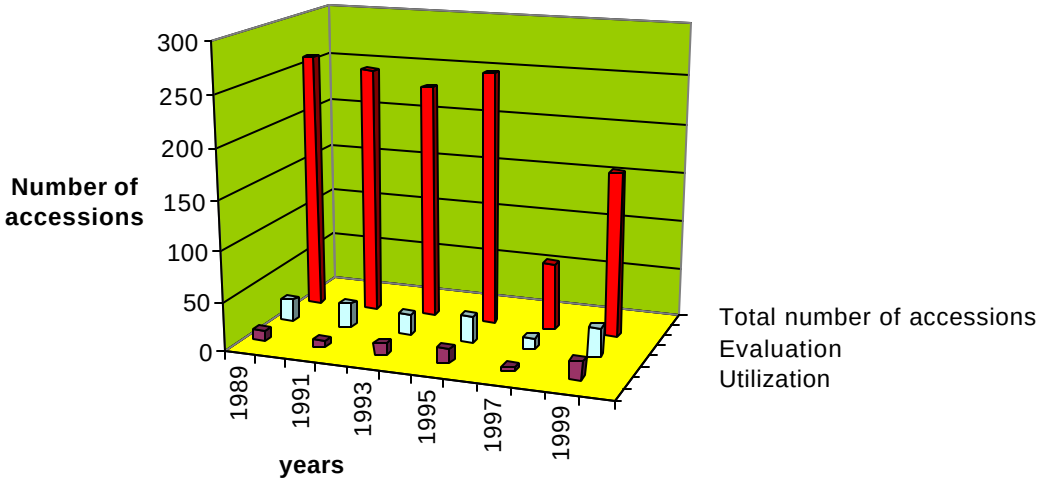

Fig. 1. Total number of accessions of forage crops evaluated and utilized, 1989-99. Note: the number of accessions was reduced in 1997 due to the situation in Albania. Work is in progress to increase this number again.

Research activities

The aim of research is to determine the differences between accessions within the national genepool's diversity.

Each accession is planted on 3 rows with one replication and a control variety planted after each 10 accessions (Allard 1960). All samples and measurements are taken on 10 labeled plants of the middle row. All measurements are recorded in the main register of the Institute. The characterization of the collections is carried out according to major characters (Bos and Caligari 1995).

Characterization of introduced accessions and landraces

Results of comparative evaluation studies carried out at our Institute and by the Albanian Test-Net (Shundi 1994) for different forage crops and over different periods indicate that our landraces (ecotypes) have more improved traits regarding yield and growth than the best introduced materials (Figs. 2, 3 and 4).

Cultivated area and accessions of forage legumes and grasses in Albania today

Of the area cultivated with *Medicago sativa*, 95% is with the landrace 'Tomin", and 5% with introduced cultivars. Of the cultivated forage grasses in Albania, 5% are landraces, and 95% are introduced cultivars.

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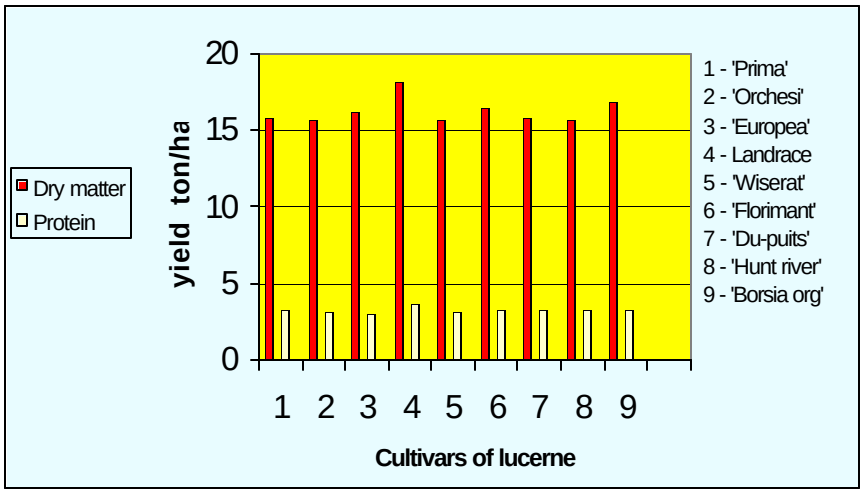

Fig. 2. Landrace 'Tomin' (*Medicago sativa*) compared with the eight best introduced materials of lucerne.

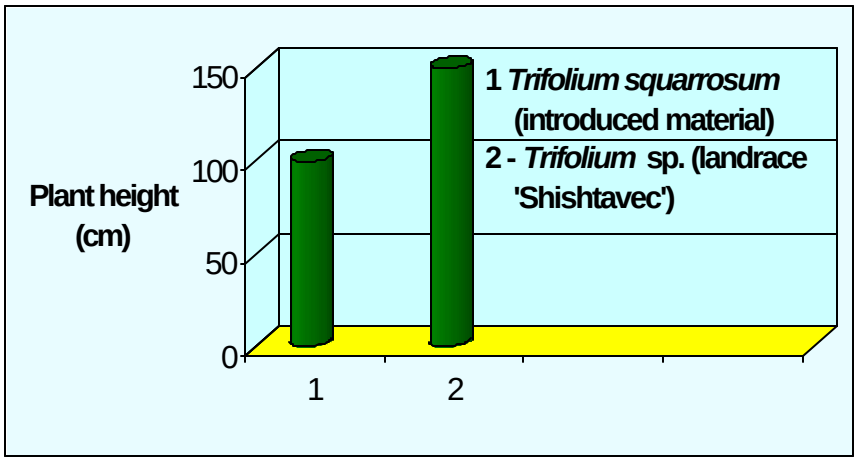

Fig. 3. Plant height of *Trifolium* sp. landrace 'Shishtavec' compared with *Trifolium squarrosum* (both are one year old, and one cutting).

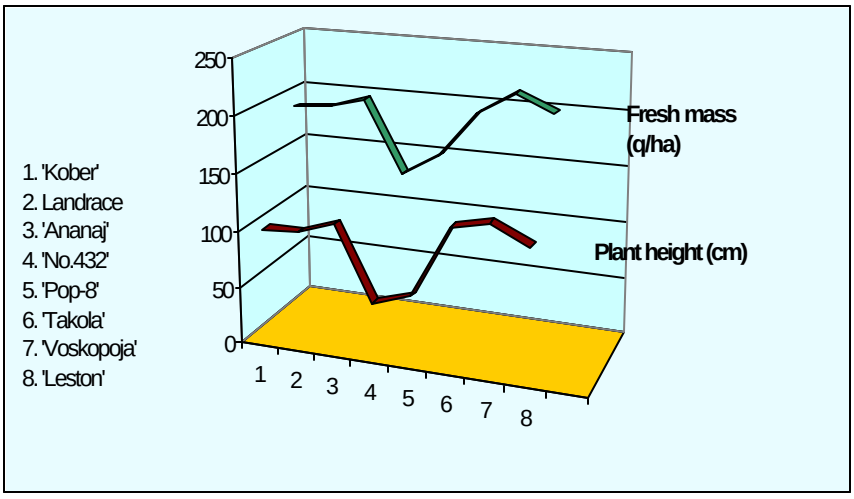

Fig. 4. Plant height and yield (fresh mass, q/ha) of 'Voskopoja' landrace (*Pisum arvense*) compared with six introduced *Pisum* spp. and another landrace.

Forage genetic resources in Azerbaijan

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A large number of cultivated and wild species of fodder crops grow in all regions of Azerbaijan, from the lowlands to the alpine belt. Fodder plants can be grouped as follows: grasses, sedge plants, leguminous plants, saline plants, various grasses, silage, unedible.

Grasses (Poaceae)

Phleum *L. (timothy)*

Five species are found in Azerbaijan: *P. phleoides* Sim., *P. pratense* L., *P. alpinum* L., *P. paniculatum* Huds. and *P. bertolonii* D.C. Among these, *P. pratense* L. *(*meadow plant) began to be cultivated in the middle of the century. It is more palatable when grazed fresh rather than as hay. The other *Phleum* species grow wild throughout the country. Five samples are available in the genetic resources collection.

Dactylis glomerata *L. (cocksfoot)*

Wild species are found all over Azerbaijan, from the lowlands to subalpine meadows, in high grasslands. *Dactylis* was first cultivated as a haymaking plant; it is well grazed by all types of cattle. There are numerous natural and cultivated varieties. Fifteen samples are available.

Poa *L.* (*meadow grass)*

Eighteen species are found in pastures and meadows. One species (*Poa pratensis* L.) is cultivated. It has very high fodder quality and after grazing grows very quickly. It is cultivated in a broad area as a haymaking grass.

*F*estuca *L.* (*fescue)*

In Azerbaijan 14 species of fescue are found, one of which is cultivated.

- *F. pratensis* Huds. (meadow fescue). A perennial plant, it is one of the best fodder crops for haymaking and pastures in the country. It is considered for introduction into cultivation owing to its high yield.
- *F. pratensis* L. grows over almost all regions from lowlands to alpine belt inclusively. Twelve samples are available. It is cultivated in meadows as a fodder crop.
- Other wild species of *Festuca* are found in mountain pastures and meadows and are regarded as valuable pasture plants.

Zerna *P. (brome grass)*

Eleven species are found in Azerbaijan. One species (*Zerna inermis* Lindeman) is found as a wild form in the eastern Great Caucasus, generally in middle- and upper-mountain belts, and in meadows.

Zerna variegata, Z. adjarica, Z. bieber-steinii, Z. riparia and others are considered valuable pasture plants. Twelve samples are available.

Bromus *L. (brome grass)*

Ten *Bromus* species grow in the wild in Azerbaijan. One (*B. japonicus*) is given much attention in winter pastures as forage for small-horned cattle.

Agropyron *Gaertn. (quack grass)*

Fifteen quack grass species are found in Azerbaijan. All of them are regarded as drought-resistant pasture plants. *Agropyron cristatum, A. desertorum* and *A. repens* are particularly recommended for the improvement of uninhabited pastures. They are all regarded as valuable fodder crops.

Sedge plants (Cyperaceae J. et Hil.)

There are 19 genera and 115 species.

Carex

Carex is represented by more than 40 species. Among them *Carex humilis, C. tristis, C. oreopilla, C. divisa, C. capillaris, C. inflata, C. silvatica* and many others are excellent fodder plants.

Kobresia persica

This species is of great importance as fodder in alpine and subalpine areas.

Elyna

Two species are widely spread in alpine meadows and are of great importance as fodder: *Elyna schoenoides* and *Elyna capillifolia.*

Legumes (Fabaceae)

There are 400 species of Fabaceae in Azerbaijan. This family includes many food, fodder, grain legumes and other useful plants, some of which were cultivated in ancient times (chickpea, lentil, pulses, bean, peas, peanut and many others).

Medicago *L. (lucerne)*

About 100 species belong to this genus, and 21 occur in Azerbaijan. One species is cultivated *(M. sativa)* and three species *(M. coerulea, M. glutinosa* and *M. falcata)* were tested on a large scale in various botanical-geographical zones.

- *M. coerulea* Less. is a perennial, wild-growing, promising, drought-resistant fodder crop, and is of great importance for the creation of a stable fodder base in rain-fed conditions of desert and semi-desert areas.
- *M. glutinosa* Bib. is an endemic species of the Caucasus. It occurs in meadows, on dry slopes of the Great Caucasus at a height of 1000-1200 m above sea level.
- *M. lupulina* L. is an annual or biennial plant. It occurs in almost all lowland and foothill zones, often in brushwoods, in dry meadows, on grassy slopes, in gardens along riverbanks. It is a good material for undersowing for the improvement of the productivity of degraded areas.
- *M. caucasus* Vass. is a perennial plant, occuring in almost all zones of the country from lowland to middle-mountain belt, mainly in low-mountain belt, on gray clayey and stony slopes and in steppe formations, in brushwoods, along river banks.

Caucasian lucerne, besides drought resistance, is characterized by its early maturity and important seed production. It is a good pasture plant and is considered for the improvement of grazing capacity in pastures and hay harvest in the highlands. There are 100 samples in the lucerne collection.

Trifolium *L. (clover)*

There are 43 cultivated species in Azerbaijan.

- *T. resupinatum* L., annual, occurs in all zones from lowlands to the middle-mountain belt, in meadows and brushwoods; it is widely cultivated in lowland zones. Var. *genuinum* Rouy. Fauc. occurs in moist sites, var. *majus* Boiss. in meadows. 'Shabdar' is an ancient fodder leguminous plant. It provides three hay-cuttings in a year, and is very useful in crop rotation with cotton.
- *T. repens* and *T. pratense* are perennial, widely spread all over Azerbaijan from lowlands to the upper-mountain belt. They are excellent fodder crops and are widely grown in irrigated lands, cultivated in moist meadows of western and eastern Europe since the 16th-18th centuries.

Onobrychis *Adans.* (*sainfoin)*

There are 22 species in Azerbaijan. Many types of *Onobrychis* are excellent fodder grass; the Caucasian species *O. transcaucasica* has been in cultivation since olden times. Sainfoin is widely cultivated in Azerbaijan. It does not need as much care as *Medicago*, requires less moisture and adapts to cooler climate. All species of *Onobrychis* are drought resistant. *Onobrychis* plays an important role in the composition of meadows and pastures of Azerbaijan, e.g. *O. biebersteinii* on mountain meadows, *O. transcaucasica, O. cyri, O. vaginalis, O. iberica* in more arid zones.

Endemic species and varieties are:

var. *purpurea* Grossh.	
O. heterophylla C.A.M.	perennial; endemic of Azerbaijan
O. vaginalis C.A.M.	perennial; endemic of Azerbaijan
O. petraea Fisch.	perennial; endemic of Azerbaijan
O. biebersteinii Sir.	perennial; endemic of Azerbaijan
O. iberica Grossh.	perennial; endemic of Azerbaijan
O. hajastana Grossh.	perennial; endemic of Azerbaijan
O. transcaucasica Grossh.	perennial; endemic of Azerbaijan
O. Komarovii Grossh.	perennial; endemic of Azerbaijan
O. bobrovii Grossh.	perennial; endemic of Azerbaijan

There are 18 samples in collection.

Vicia *L. (vetch)*

There are about 40 *Vicia* L. species in Azerbaijan. Many species of *Vicia* are excellent fodder crops and occur in grass stands, haymaking meadows and pasture stands of Azerbaijan. Among them *V. sativa, V. villosa* and *V. ervilia* Willd. are the most important. In spite of their importance as fodder, many species of this origin occur as weeds in grain fields.

The following species are widely spread:

V. pannonica Crant.	annual; endemic of Caucasus
V. angustifolia L.	perennial; endemic of Caucasus
V. hajastana Grossh.	perennial; endemic of Caucasus
V. alpestris Stev.	perennial; endemic of Caucasus
V. semiglabra Rupr.	perennial; endemic of Caucasus
V. rafigae S. Tam.	perennial; endemic of Caucasus
V. grossheimii Ekvitim.	perennial; endemic of Caucasus
V. iberica Grossh.	perennial; endemic of Caucasus
V. antiqua Grossh.	perennial; endemic of Caucasus

Cultivated species of *Vicia* are sown for grain and for cattle feed.

Trigonella *L. (trigonella)*

One species out of 20 is cultivated in Azerbaijan: *T. foenum-graecum* L. (shanbala) is an annual cultivated plant highly appreciated as a fodder crop. It is used for food before flowering. At flowering it smells of coumarin. It grows in the Nakhchivan.

Melilotus *Adans. (sweetclover, melilot)*

These species are annual and biennial, have medicinal and fodder properties. In this regard *M. albus, M. officinalis* and *M. caspius* were thoroughly studied. Other species have not been studied sufficiently yet.

Glycyrrhiza glabra L. (liquorice)

Out of five species occurring in Azerbaijan *G. glabra* L. was studied rather thoroughly. Wild forms of this perennial plant occur in almost all areas.

Russian thistle *(*Chenopodiaceae*)*

This group of plants is specific to winter pastures. Some Russian thistle species are widely spread and are considered as pioneer plants *(Salsola dendroides, S. nodulosa, S. ericoides).* All these species of *Salsola* form groups in the deserts. Russian thistle gains in fodder importance after the first autumn rains and frosts, when they leach and become edible. In the second half of winter they serve as security fodder stock in pastures when *Ephemeretum* is covered by snow or perishes due to winter frost and becomes inaccessible for cattle. *Salsola nodulosa* in particular is considered an excellent food for small cattle in winter.

There are about 22 *Salsola* species in Azerbaijan. Besides *Salsola,* species of *Atriplex, Chenopodium* L., *Kalidium* Mog., *Kochia* Koth., *Halostachis* C.A.M., *Halocnemum* Bib. and other genera also belong to fodder crops.

Motley grass *(*Herbosae*)*

Fodder grasses of various plant families belong to this group. From the feeding point of view motley grasses were less studied than cereal and leguminous fodder crops.

Although Azerbaijan is very rich in plant genetic resources, in recent years the collection of fodder crops has not been increased but reduced for various reasons. The collection of genetic resources of fodder crops, their multiplication and the strengthening of breeding activities are therefore very necessary.

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Status of forage collections in Bulgaria

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Two types of organizations are involved in the management and development of forage genetic resources in Bulgaria:

1. National Programme for Plant Genetic Resources at the Institute in Sadovo (IPGR)
2. Breeding Programmes for forage crops in Pleven, Troyan, Obrastzov Chiflic-Russe and General Toshevo Institutes.

The enrichment of the plant collections with new germplasm from Bulgaria and abroad is one of the main tasks of IPGR. The basic sources for enrichment of the collections are the following:

- seed samples of Bulgarian origin – enrichment with local germplasm containing the three basic types of material:
  - modern varieties and lines
  - primitive varieties, local forms and populations
  - wild crops relatives, ecotypes, endemics and rare types.
- introduction of seed material from abroad:
  - mainly according to free exchange with related genebanks, breeding institutions and botanical gardens
  - participation in collecting expeditions in foreign countries.

The forage collection consists of both legumes and grasses (Tables 1 and 2).

Grasses

The collection of grasses mainly includes economically important species, such as orchardgrass (*Dactylis glomerata*) with 236 accessions and perennial ryegrass (*Lolium perenne*) with 243 accessions. The long-term storage contains 247 accessions of introduced cultivars and 248 native ecotypes, including 165 of orchardgrass. There are 41 cultivars of tall fescue and 34 of bromegrass in the base collection. From a total of 889 accessions, 553 are in long-term storage.

Legumes

This collection consists of perennial (*Medicago sativa, Trifolium pratense, T. repens, Onobrychis viciifolia*) and annual species (*Vicia sativa* complex, *V. villosa, Lathyrus sativus*), as well as annual *Medicago* and *Trifolium* (Table 2).

The base collection contains 417 accessions of introduced cultivars of *Medicago sativa, Trifolium pratense, T. repens* and *Onobrychis viciifolia*. Only 216 of them are native – breeding material, cultivars, landraces and wild ecotypes. Most of the *Vicia* spp. are indigenous (492 accessions) – old cultivars, local forms, etc.

Table 1. Status of the national grasses collection maintained in the genebank at Sadovo, Bulgaria

		In long-term storage (–18°C)			
		Cultivars		Wild	
Species	**Total no.**	**Native**	**Introduced**	**Native**	**Introduced**
Agropyron cristatum	17		5	2	4
Agropyron pectinatum	12		2	5	2
Agropyron desertorum	5		3		2
Agropyron fragile	2		2		
Agropyron trichophorum	3		1		
Agropyron trachycaulum	2		1		
Agropyron spicatum	1		1		
Agropyron riparium	1		1		
Agropyron elongatum	2		1	1	
Agropyron smithii	1				
Agropyron glaucum	1				1
Agropyron caninum	4				1
Agropyron intermedium	5		2		2
Total *Agropyron*	**56**		**19**	**8**	**12**
Agrostis alba	5				
Arrhenatherum elatius	20		13	1	2
Alopecurus pratensis	3				
Bromus inermis	56	1	33	4	2
Bromus erectus	4		1		2
Bromus catharticus	3		3		
Bromus sitchensis	1		1		
Dactylis glomerata	236	1	52	165	15
Elymus junceus	9		5		
Festuca arundinacea	65	2	39	7	5
Festuca pratensis	31		10	10	5
Festuca rubra	30		9	5	2
Festuca ovina	4		1	1	
Lolium perenne	243		27	43	5
Lolium multiflorum	28		21		
Phleum pratense	38	1	7	2	
Poa pratensis	39				
Poa silvicola	2			2	
Poa nemoralis	3		1		
Poa compressa	4				
Phalaris aquatica	3		3		
Trisetum flavescens	6		2		
Total	**889**	**5**	**247**	**248**	**53**
Total in long-term			**553**		

Table 2. Status of the national legumes collection maintained in the genebank at Sadovo, Bulgaria

		Bulgarian origin			Introduced			Long
Species	**Total**	**CV BL**	**Local**	**Wild**	**CV BL**	**Local**	**Wild**	**term**
Medicago sativa, M. varia	403	35	22	17	212	57	43	228
Medicago falcata and other perennials	23	1		8	2	2	10	7
Medicago spp. – annuals	60			15	35		10	25
Trifolium pratense	160	6	4	32	68	35	15	65
Trifolium repens	116	7		36	55	12	6	80
Trifolium hybridum and other perennials	30			14	12		6	12
Trifolium spp. – annuals	110	1		45	25		39	54
Onobrychis spp.	91	1		12	50	20	8	67
Lotus corniculatus	56	1		22	18	5	10	18
Vicia sativa complex	598	32	130	119	207	6	104	490
Vicia villosa	88		1	18	51		18	86
Vicia pannonica	27			4	20		3	23
Vicia narbonensis	40			16	1		23	17
Vicia ervilia	32	1	2	2			27	30
Vicia spp. (22)	239			167			72	66
Total *Vicia*	**1024**	**33**	**133**	**326**	**279**	**6**	**247**	**712**
Lathyrus sativus	143	4	4		64	32	39	135
Lathyrus cicera	40				12		28	40
Lathyrus ochrus	36				2		34	36
Lathyrus spp.	42						42	42

Characterization/evaluation

Evaluation is the second step in our PGR Programme. Studies are carried out according to unified international descriptor lists for the respective crops and species with the purpose of establishing a database, initial material for breeding and selected varieties for the State Variety Testing Commission. About 60% of the accessions in the collections are evaluated for the most important morphological, biological and agronomic traits.

Storage

A total of 2074 accessions (1521 legumes and 553 grasses) are kept in long-term storage at -18°C, vacuum-packed in foil bags. The active collections are kept in medium-term storage at +5°C in the genebank and in the Breeding Institutes (Pleven, Troyan, Russe, General Toshevo).

Documentation

The accessions of the different forage species are documented for passport and some descriptive data using dBaseIII+.

Regeneration

We try to regenerate only accessions with low germination rate (80%). In 1997-99 we regenerated 45 legume and 28 grasses accessions.

Safety-duplication

At the moment no material of the forage collection is duplicated abroad. Only about 20% of accessions are available in Bulgarian institutes as follows:

- Institute of Seed Science and Seed Production, Obrastzov Chiflik–Russe (*Medicago*)
- Fodder Research Institute, Pleven (*Medicago, Onobrychis, Lotus, Vicia, Dactylis, Bromus, Lolium, Agropyron, Festuca arundinacea*)
- Institute of Upland and Stock Breeding, Troyan (*Trifolium, Lotus, Festuca, Phleum, Poa*)
- Institute of Wheat and Sunflower, General Toshevo (*Vicia, Lathyrus*).

Standard varieties

In Bulgaria we use native cultivars as standards. All varieties are stored in the genebank in Sadovo.

Medicago sativa	'Nadezjda 2', 'Prista', 'Victoria'
Trifolium pratense	'Sofia 52'
Trifolium repens	'Targoviste 1'
Onobrychis viciifolia	'Jubileyna'
Vicia sativa	'No 235', 'No 666'
Dactylis glomerata	'Dabrava'
Festuca arundinacea	'Albena', 'Elena'
Bromus inermis	'Nika'
Phleum pratense	'Troyan'

Future activities

The activities planned for the next few years can be summarized as follows:

- To enlarge the forage collections mainly with native material taken in natural habitats to be conserved in long-term storage
- Regeneration and characterization of 150 *Vicia* accessions not yet included in the collection
- Updating of the passport data of the collections.

Staff/Position

Dr Siyka Angelova, Curator *Vicia* and *Lathyrus*
Dr Yana Guteva, Curator legumes
Dr Dotchko Shamov, Curator grasses

Status of the national forage collection in the Czech Republic

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There are two institutions holding forage collections in the Czech Republic, responsible for the gathering (including collecting missions), documentation, characterization, evaluation and regeneration of genetic resources:

- Oseva PRO Ltd., Grassland Research Station (GRS), Zubří, dealing with grasses (including turf and ornamental grasses)
- Research Institute for Fodder Crops (RIFC), Troubsko, dealing with Fabaceae forage crops.

The long-term storage of seed-propagated species and operation of the national documentation system EVIGEZ are provided by the Research Institute of Crop Production (RICP), Department of the Gene Bank, Praha.

Safety-duplication is arranged in the framework of a bilateral contract with the Research Institute of Plant Production (RIPP), Piešťany, Slovakia.

The list of genera stored in the Gene Bank RICP-Praha is given in Table 1, and the status of the forage collection by sample type in Table 2.

Table 1. Forage genera stored in the Gene Bank, RICP-Praha by 31.10.1999

Genus/crop	Total no. of accessions	Active collection	Base collection	Safety collection
Agrostis	37	31	6	
Alopecurus	6	5	1	
Arrhenatherum	21	17	4	
Bromus	28	24	4	
Cynosurus	6	4	2	
Dactylis	84	73	11	2
Deschampsia	9	6	3	
Festuca	250	224	26	3
Lolium	485	435	50	6
Phleum	68	62	6	
Poa	183	155	28	
Trisetum	12	8	4	
Other grasses	43	31	12	5
Total grasses	**1232**	**1075**	**157**	**16**
Anthyllis	9	2	7	1
Astragalus	22	6	16	
Lathyrus	21	3	18	
Lotus	33	6	27	2
Medicago	389	343	46	10
Melilotus	41	6	35	
Onobrychis	16	4	12	1
Trifolium	543	332	211	23
Other legumes	60	32	28	3
Total legumes	**1134**	**734**	**400**	**40**
Total forages	**2366**	**1809**	**557**	**56**

Table 2. Status of the forage collection in the Czech Republic by 30.10.1999

Genus/species	Advanced cultivar	Landrace	Breeder's line	Wild	Not specified	Total
Agrostis spp.	43			3		46
Alopecurus spp.	6					6
Arrhenatherum elatius	15			6		21
Bromus spp.	7	2		12	5	26
Cynosurus spp.	1	1		4		6
Dactylis spp.	133	2	10	10	1	156
Deschampsia spp.	9					9
Festuca arundinacea	88			3	1	92
Festuca - other spp.	4		3	2		9
Festuca ovina s.l.	32		1	5	1	39
Festuca pratensis	70	1	1	6	1	79
Festuca rubra s.l.	154					154
Festulolium	12	3				15
Lolium x *hybridum*	30					30
Lolium multiflorum	187	2	7			196
Lolium perenne	350	2	11	171	3	537
Lolium - other spp.	1			1		2
Phalaroides arundinacea	4					4
Phleum - other spp.	8			3		11
Phleum pratense	99		9	4		112
Poa pratensis	134		2	61	3	200
Poa - other spp.	19		1	4		24
Trisetum sp.	4			5		9
Other grasses	42	7	28	21	4	102
Total grasses	**1452**	**20**	**73**	**321**	**19**	**1885**
Anthyllis spp.	1			8		9
Astragalus spp.	1		1	20		22
Coronilla spp.	2	2		15		19
Genista spp.				11		11
Lathyrus spp.				21		21
Lotus spp.	25		1	21	1	48
Melilotus spp.	12		5	43		60
Medicago lupulina	3			18		21
Medicago sativa	278	5	32	5	3	323
Medicago x *varia*	27	1				28
Medicago - other spp.	3			8		11
Onobrychis spp.	7			7	2	16
Trifolium pratense	137	3	45	40		225
Trifolium repens	132	11	25	47	4	219
Trifolium hybridum	17			17		34
Trifolium - other spp.	34			87	1	122
Other Fabaceae	15		5	10	1	31
Total Fabaceae	**694**	**22**	**114**	**378**	**12**	**1220**
Total forages	**2146**	**42**	**187**	**699**	**31**	**3105**

Status of the collection

Samples are stored in the National Gene Bank in RICP-Praha (see Table 1):

- active collection in medium-term storage conditions
- base collection in long-term storage conditions.

Working collections are stored temporarily at Oseva PRO, GRS, Zubří and at RIFC, Troubsko. Vegetatively propagated species of grasses are maintained in the field collection at GRS, Zubří.

Conservation

Temperature	active collection –5°C, base collection –18°C
Humidity	humidity of stored seeds 4–6% (depending on species)
Container type	sealed glass containers
Storage amount	50-250 g

Documentation

Passport data	up to 33 passport descriptors in accordance with the international standards; passport data are available at URL <http://genbank.vurv.cz/genetic/resources/>
Evaluation data	up to 110 descriptors, scoring on a 1-9 scale; national descriptor lists for the genera *Medicago* and *Trifolium*; descriptor list for forage grasses in preparation
Program	special user program EVIGEZ for central documentation of crop collections in the Czech Republic (FoxPro environment)

The French forage and turf species Network

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URL <http://www.brg.prd.fr/brg/pages/rgvBD_fourrageres>
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A national strategy for the conservation of genetic resources.

As explained in the previous meetings of this Working Group, the management of French genetic resources is based on networks of voluntary partners and coordinated by a national structure, BRG (Genetic Resources Board). There are 26 networks for plant genetic resources and charters have been written to define their organization, *modus operandi* and activities. The running of a network involves in a first step the curators, is organized by a coordination unit and supervised by a steering committee.

Ex situ conservation of forage and turf species

This is the task of a network associating public and private partners: INRA (National Institute for Agronomic Research) and GEVES (Variety and Seed Study and Control Group) for public institutes, and ACVF (Forage Variety Creators Association) for private companies. The purpose of this network is to manage forage collections which have been identified, classified and located and are available.

Forage collections (Fig. 1)

Each kind of collection is a subset of the former: the national collection (1), the network collection (2), and the working collections (3) of the different curators that constitute the whole resources.

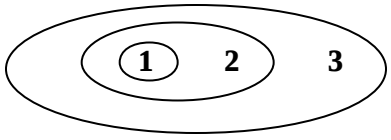

Fig. 1. Forage collections in France (see text)

Contents and documentation of the Network and National Collections

A central relational database called RGFour was established in 1996 using MS-Access. The information was structured with passport, cultivar-specific, ecotype-specific, characterization, evaluation and samples identification descriptors and data were recorded in 1997. So far 2054 accessions of 51 legumes and grasses species have been identified. The National Collection consists of 547 of these accessions and includes 31 species. So far, the main criteria of admission in these two collections have been the three following statuses:

- obsolete cultivars removed from the French official catalogue
- primitive cultivars or landraces
- ecotypes.

The number of accessions held in each collection is detailed by species in Table 1 and by status in Table 2.

Table 1. Number of accessions per species in National and Network collections

	No. of accessions in collection	
Species	**National**	**Network**
Agrostis stolonifera	1	1
Dactylis glomerata	75	206
Festuca arundinacea	59	70
Festuca ovina	1	3
Festuca pratensis	3	8
Festuca rubra	7	22
Lathyrus heterophyllus	1	1
Lathyrus latifolius	8	8
Lathyrus sativus	21	21
Lathyrus sylvestris	19	19
Lathyrus tuberosus	4	4
Medicago aculeata	3	56
Medicago arabica	8	10
Medicago disciformis	1	7
Medicago littoralis	5	13
Medicago murex	5	23
Lolium multiflorum	5	51
Lolium perenne	198	289
Phleum bertolonii	1	6
Phleum pratense	2	13
Poa pratensis	1	13
Medicago orbicularis	2	92
Medicago polymorpha	11	252
Medicago praecox	2	9
Medicago rigidula	12	117
Medicago sativa	43	252
Medicago truncatula	24	195
Onobrychis viciifolia	3	7
Trifolium pratense	7	63
Trifolium repens	5	21
Vicia sativa	10	11
Other species	0	191
Total	**547**	**2054**

Table 2. Number of accessions per status in National and Network collections

	No. of accessions in collection	
Status	**National**	**Network**
Cultivars removed from the official list	80	458
Landraces, local varieties	28	33
Ecotypes	439	1493
Breeder's lines	0	7
Unknown	0	63
Total	**547**	**2054**

Regarding the completeness of descriptors, the percentage of accessions documented is high except for characterization and evaluation data of varieties withdrawn from the official list which are available in draft catalogues but not yet fully computerized.

National Collection samples management

The active (5 ± 2°C and 30% HR) and long-term (–18°C) banks are located at GEVES Le Magneraud (FRAGVSMAG). Curators who are the primary holders of the accessions provide for safety-duplications (FRAINRALUS, FRAINRAMPG, FRAINRACLF, FRAIBEASPAU and private companies). There are common keys allowing links between RGFour and the management databases of these genebanks.

Ongoing activities

They concern removed cultivars:

- updating of the list
- searching for duplicates
- screening of samples in imminent need of regeneration
- completeness of the characterization and evaluation descriptors.

Availability of information and seed distribution

Requests for seeds or information on the National Collection should be sent by e-mail or letters to the Network coordinator. In the future, information will also be provided by on-line access through the BRG platform and a paper edition of the catalogue is also planned.

Acronyms used

Acronym	Genebank	Contact
FRAGVSMAG	GEVES Le Magneraud	gerard.sauvion@geves.fr

Acronyms	Institutes	Genus	
FRAINRALUS	INRA - Station d'Amélioration des plantes	*Dactylis*	mousset@lusignan.inra.fr
FRAINRAMPG	INRA - Station d'Amélioration des plantes	*Medicago*	prosperi@ensam.inra.fr
FRAINRACLF	INRA - Station d'Amélioration des plantes	*Lolium*	balfour@clermont.inra.fr
FRAIBEASPAU	IBEAS – Université de Pau	*Lathyrus*	daniel.combes@univ-pau.fr

Grass landraces of Georgian arid pastures

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The arid pastures of Georgia are represented by various plant associations typical of semi-deserts and dry steppes, and are located at altitudes of 90-900 m above sea level. Occupying an area of more than 300 000 ha in the lowland and pre-mountainous zones and partially in the foothills of eastern Georgia, these lands are used as seasonal pastures in winter and for cattle and sheep breeding in spring and autumn (Agladze 1988).

The climate of arid pastures is basically dry subtropical. The elevation of some massifs and different degree of penetration of continental air currents from the Aral-Caspian semi-deserts and deserts have considerable influence on climatic diversity.

The average annual precipitation varies from 250 (Samoukh semi-desert) to 390-430 mm (Shiraki, Udabno, Kara-Douz massifs). Very erratic distribution of precipitation is a common feature. The largest amount of precipitation comes in spring in the form of heavy showers, with less rain in winter and autumn.

The topsoil of arid pastures of Georgia is diversified. In floodlands and riverside terraces we find alluvial and also brown soils. In many massifs considerable areas are occupied by saline soils and salt-marshes. The plains and gentle slopes of table lands are occupied by black earth and partially by dark chestnut soils, and on steeper slopes by brown forest soil. Along with erosive and accumulative processes, the evaporation of moisture in summer that greatly exceeds saturation, and enrichment of top soil horizons with salts over considerable areas, have a significant impact on the environment (Fisiunov 1984).

The vegetation of grasslands is not less diversified. In the semi-desert zone various associations of wormwood (*Artemisia*) pastures prevail where *A. meyeriana* is dominant. There are considerable areas occupied by grasslands represented by *Salsola ericoides, S. nodulosa* and *S. dendroides.*

The most important for animal feeding are the following representatives of ephemeral grasses: *Poa bulbosa, Agropyrum pectiniforme, Bromopsis japonicus, Hordeum leporinum, Medicago minima, Veronica polita* and *Eremopyrum orientale.*

In dry-steppe belts, most of the territory is occupied by groups of *Bathriochloa* (*B. ischemum*), *Stipa* (*S. lessinglana, S. pulcherrima, S. joanis*) and *Festuca rupicola (*syn. *F. sulcata).*

The semi-desert vegetation has been used as winter pasture for sheep breeding from times immemorial. This can be explained mainly by the climate and soil conditions and biological specificities of the common plants of these pastures. Dry summers, very little precipitation, saline soils allowing no possibility for agriculture without preliminary land improvement, the existence of fodder plants, the precipitation distribution pattern, the fact that sheep eat the main fodder plant (*Artemisia meyeriana*) only after the first autumn frost – all these reasons determined the use of pastures only in winter time (Ketskhoveli 1971).

The vegetation of dry steppes is used as winter and transition (in spring and autumn) pasture, and in more rainy years for haymaking as well.

The productivity of semi-desert pastures varies greatly depending on weather conditions of the year and mostly on the amount of autumn and spring precipitation. The analysis of data accumulated through many years of study of the crop capacity and dynamics of wormwood and Russian thistle pastures shows two maxima of plant growth capacity, in autumn and spring. The autumn harvest is almost always better than the spring harvest. At the beginning of a winter pasturing season (end of November) the grass crop capacity of these pastures averages 0.8-0.9 t/ha of green edible mass. From the second half of March the plant growth capacity is about 0.5 t/ha and in the first half of April, by the end of the winter pasturing season, 1.0-1.2 t/ha.

The harvest of beard grasslands in the middle of November is on average 1.6-2.2 t/ha of green mass, of which approximately 0.9-1.4 t/ha is edible and can hardly be called "green" as almost 90% of it consists of dried stems and leaves of beard grass with total water content of 16-20%. During winter the grass harvest of beard grass pasture falls rather more sharply than in semi-desert pastures. The month-by-month dynamics of plant growth capacity from November to April is 1.12, 1.05, 0.87, 0.65, 0.51 and 0.76 t/ha of green edible mass. In May as beard grass, which is the main grass, starts its vegetative growth rather late, the crop capacity does not exceed 1.0-1.3 t/ha of green mass on average. The nutritional value of the basic fodder plants of the arid pastures of Georgia is rather high (Didebulidze 1997).

The present state of semi-desert and dry steppe pastures in Georgia is characterized by the development of erosive processes and destruction of plant stands. The grass cover density is decreasing and the pastures are full of stones and weeds. The most widely distributed weeds in semi-desert areas are: *Carduus acanthoides, C. hamulosus, C. seminudus, C. arabicus, Onopordum ocanthium, O. hetercathum* and *Artemisa schowiciana.*

The following weeds are found in beard grass pastures: *Daucus carota, Xerathemum squarrosum, Eringium biberstenianum, Centaurea solstitialis, Cirsium arvensis.* As these weeds are unused, ungrazed ballast, they cause great losses of soil fertility and spoil the quality of wool.

One of the specificities of natural fodder resources of Georgia is that the area under summer pastures greatly exceeds that of winter pastures: 1.3 million ha against 320 000 ha. Taking into consideration the long duration of the winter pasturing season, higher crop capacity and nutrition value, it becomes absolutely clear that the main task is to increase significantly the productivity of winter pastures, also through conversion of suitable parts of the summer pastures into hayfields.

The most radical way of improving the situation is to carry out land improvement works on plains and slightly steep slopes of arid pastures (irrigation and in some cases desalination) and create cultivated, irrigated fodder fields by planting cereals, leguminous crops and perennial herbs, like alfalfa, orchard grass, meadow fescue, awnless bromegrass (Barden and Halfacre 1987).

Numerous experiments showed the low efficiency of sowing perennial grasses with shrubs. Good results were obtained by sowing yellow alfalfa, and intermediate and crested wheatgrass in semi-desert zones. The best results were obtained by sowing the above-mentioned natural old varieties and landraces.

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Fodder crops in German collections

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Fodder crops are held at three different genebanks located in Braunschweig, Gatersleben and Malchow. Table 1 shows the number of accessions for the eight genera: *Trifolium, Medicago, Vicia, Lolium, Festuca, Phleum, Poa* and *Dactylis.* Genus *Vicia* has the highest number of accessions of the forage legumes, and *Lolium* has the highest number of accessions among the grasses. In total there are 12 876 accessions in German collections.

Table 1. Number of accessions in German collections

Genus	Braunschweig	Gatersleben	Malchow	Total
Dactylis	983	18	542	1543
Festuca	713	82	1030	1825
Lolium	1469	125	1305	2899
Medicago	507	297	521	1325
Phleum	618	28	361	1007
Poa	137	60	545	742
Trifolium	552	465	396	1413
Vicieae	220	1902	–	2122
Total	**5199**	**2977**	**4700**	**12876**

All accessions are stored under long-term conditions; (–18°C in Braunschweig, –15°C in Gatersleben and Malchow) (Table 2).

The amount of accessions regenerated each year varies greatly and depends on personnel and technical facilities (Table 2). The regeneration is sometimes supported from breeders or other institutes.

Table 2. Overview of developments in German collections

	Braunschweig	Gatersleben	Malchow
Regeneration	In cooperation with	Grasses/legumes	Only grasses
1997	breeders, own possibilities	116 + 135 = 251	236
1998	for around 20 acc.	183 + 168 = 351	391 + 296 = 687
1999		168 + 315 = 483	62
Storage			
temperature	-18°C	-15°C	-15°C
seed moisture	<7%	5-7%	5-7%
Safety-duplication	Not yet for fodder grasses and legumes	No	Yes for *Lolium perenne:* 570 acc., *Dactylis glomerata:* 63 acc

Safety-duplication was started between Malchow (holder of primary collection) and Gatersleben (holder of safety-duplicates). A total of 570 accessions of *Lolium perenne* and 63 accessions of *Dactylis glomerata* are stored under "black-box" arrangements.

The number of accessions available for distribution is given in Table 3. A total of 9781 accessions are available, 76% of all accessions in collections. Differences between Malchow, Braunschweig and Gatersleben are explained with a different analysis of "availability". In Braunschweig and Malchow accessions are available when the effective amount of seed (accession weight × germination rate) is more than a threshold of 5 or 2 g. In the future another key will be applied. Table 4 shows the need for regeneration. Almost 25% of the whole collection (3095 accessions) requires urgent regeneration.

Table 3. Number of accessions available for distribution

	Braunschweig		Gatersleben		Malchow		Total	
Genus	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Dactylis	896	91	7	39	482	89	1385	90
Festuca	693	97	14	17	797	77	1504	82
Lolium	1435	98	66	53	1264	97	2765	95
Medicago	149	29	150	51	385	74	684	52
Phleum	615	99	6	21	322	89	943	94
Poa	75	55	22	37	470	86	567	76
Trifolium	162	29	231	50	222	56	615	44
Vicieae	40	18	1278	67	–	–	1318	62
Total	**4065**	**78**	**1774**	**60**	**3942**	**84**	**9781**	**76**

Table 4. Accessions in urgent need of regeneration

	Braunschweig		Gatersleben		Malchow		Total	
Genus	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Dactylis	87	9	11	61	60	11	158	10
Festuca	20	3	68	83	233	23	321	18
Lolium	34	2	59	47	41	3	134	5
Medicago	358	71	147	49	136	26	641	48
Phleum	3	1	22	79	39	11	64	6
Poa	62	45	38	63	75	14	175	24
Trifolium	390	71	234	50	174	44	798	56
Vicieae	180	82	624	33	–	–	804	38
Total	**1134**	**22**	**1203**	**40**	**758**	**16**	**3095**	**24**

Fodder crops collection in Malchow

The specificity of this collection is that in more than 30 years a comprehensive collection of fodder plants was created through systematic collecting missions in former German Democratic Republic and eastern European countries. A total amount of 4700 accessions is currently held (3783 accessions of Gramineae and 917 accessions of Leguminosae, Table 1).

Seed is maintained in cold storage chambers (–15°C) with low seed moisture content (<7%) (Table 2). The germination rate is tested periodically. Accessions with a low germination rate (<70%) or seed amount (<5 g) are multiplied. Each increase is carried out in a glasshouse or an isolation field so that the maximum genetic variability of the original sample is preserved.

Whereas in the past the main task was the maintenance of the collection samples, evaluation and documentation for users have recently become more and more important.

A set of accessions is cultivated as single plants or in rows for characterization and evaluation. The focus is on the characterization of new samples and the evaluation of Gramineae collected material, mainly *Lolium perenne*, for useful traits for breeding. In cooperation with institutes of Universities or the Federal Centre for Breeding Research on Cultivated Plants (BAZ), the resistance against important diseases (*Puccinia coronata, Rhynchosporium* and ryegrass mosaic virus) or quality traits are also tested and the results are published.

Passport data of fodder crops are available as an on-line database named PGRDEU by ZADI (Central Agency for Agricultural Documentation and Information) (<http://www.genres.de/pgrdeu/>).

The European Central *Poa* Database has been established in cooperation with the Information Centre for Genetic Resources (IGR) at the ZADI. The database is located at <http://www.dainet.de/genres/eccdb/poa/> and contains passport data of 3003 accessions of 29 species of *Poa*. It is compiled from data obtained from 14 institutes in 11 European countries (see details in section on databases, this volume, p. 37).

Status of the national forage collections in Greece

Thomas Vaitsis

Fodder Crops and Pastures Institute (FCPI), National Agricultural Research Foundation (NAGREF), Larissa, Greece

The Fodder Crops and Pastures Institute (FCPI) in Larissa and the Greek Gene Bank (GGB) in Thessaloniki are the two national institutes holding forage collections in Greece. FCPI has the responsibility for fodder crops and pastures improvement all over Greece. It is directly coordinated by the National Agricultural Research Foundation (NAGREF), a primary state-funded legal entity of the Ministry of Agriculture. The Central Greece Agricultural Research Center (CGARC) is under temporary suspension. GGB has the responsibility for plant genetic resources protection and conservation all over Greece. It is a department of the Agricultural Research Center of Macedonia and Thraki (ARCMT), coordinated by NAGREF.

Breeding forage species is the main task of the FCPI. Collecting and maintenance of forage germplasm is a subsequent task, for supporting plant breeding projects. A considerable forage germplasm collection, including about 3000 accessions, has been created by FCPI during 1982-86 (Table 1). Part of these accessions is kept in Larissa under natural room conditions and part is kept in Thessaloniki under medium-term conditions. Since 1987 some occasional collecting activities have been carried out. *Medicago arborea* germplasm has been collected during 1992-94 in the framework of the EU programme CAMAR. A small collecting mission was undertaken in Cyprus in July 1997 (T. Vaitsis and D. Droushiotis). Ten *Dactylis glomerata,* six *Lolium perenne* and one *Poterium* spp. wild populations were collected in this mission. Seed samples of these accessions are kept in Larissa (FCPI) and Nicosia (ARI). *Medicago varia* was localized in three sites in Cyprus, but it was impossible to harvest seed.

GGB has a storage capacity of 80 m³ to hold 10 000 samples in medium-term (0ºC to +5ºC) and long-term (–18ºC to –21ºC) conditions. Cereals and vegetables accessions are included in its collection, most of these kept in both medium- and long-term conditions. For the moment 1300 forage accessions collected by GGB or donated by FCPI are kept at GGB in Thessaloniki, in medium-term conditions.

The quality status of the national forage collections is about the same as described in the report of the sixth meeting in Beitostølen, 6–8 March 1997. All accessions are documented for passport data using the characters of the standard collection form of IPGRI. Computerization of passport data was concluded by the end of 1998 for all 3000 accessions including 27 genera and 80 species. A small part of accessions has been regenerated, and preliminarily evaluated. Most of the species kept in Greek forage collections are cross-pollinated. Their regeneration is a very difficult task, especially considering the limited available funds and facilities.

GGB started the regeneration of some *Lolium perenne, Lolium* spp. and *Dactylis glomerata* populations. FCPI established new experiments for the characterization and preliminary evaluation of *Lolium perenne* and *Dactylis glomerata.* More than 1000 forage grass and legume accessions were duplicated within the country at GGB in Thessaloniki but it is not a real safety-duplication as seed samples are kept in room conditions in Larissa and in medium-term conditions in Thessaloniki. Some accessions of *Lolium perenne, Lolium* spp., *Festuca arundinacea, Festuca* spp., *Dactylis glomerata, etc.* have been sent to IGER (Wales, UK), PRI (Victoria, Australia) and to other institutes. It is not sure whether these accessions have been included in forage collections of these institutes.

As described in the report of the sixth meeting, only populations from Greece, Bulgaria, Italy, France and Spain have been included in the first *Lolium* Core Collection trial established in March 1996. This experiment was finished in autumn 1998. Another

complementary *Lolium perenne* Core Collection trial, including 130 populations from 15 countries, was established in Larissa in December 1997. Data have been collected during 1998–99 but not analyzed yet.

Table 1. Forage collections in Greece

Species	Advanced cultivars	Landraces	Wild or semi-natural	Breeder's lines	Total
Agropyron caninum	–	–	1	–	1
Agropyron elongatum	–	2	2	–	4
Agropyron repens	–	–	2	–	2
Agropyrum spp.	–	–	16	–	16
Aristella bromoides	–	–	4	–	4
Brachypodium spp.	–	–	8	–	8
Briza media	–	–	1	–	1
Dactylis glomerata	25	–	167	70	262
Ervum ervilia	–	12	–	–	12
Festuca arundinacea	30	–	34	210	274
Festuca ovina	1	–	2	2	5
Festuca spp.	–	–	7	–	7
Hedysarum coronarium	1	–	–	2	3
Hordeum bulbosum	–	–	25	–	25
Hordeum spontaneum	–	–	50	–	50
Hordeum vulgare	31	26	1	–	58
Lathyrus cicera	4	9	–	7	20
Lathyrus ochrus	2	15	–	–	17
Lathyrus sativus	5	15	–	–	20
Lathyrus spp.	–	5	3	–	8
Lolium perenne	24	–	57	80	161
Lolium spp.	4	–	16	–	20
Lolium temulentum	–	–	1	–	1
Lotus corniculatus	1	2	19	–	22
Lupinus albus	–	3	–	–	3
Lupinus angustifolius	–	–	70	–	70
Lupinus luteus	–	–	1	–	1
Lupinus spp.	–	–	2	–	2
Medicago arborea	2	–	36	55	93
Medicago coronata	–	–	1	–	1
Medicago spp. perennials	–	2	5	–	7
Medicago lupulina	–	–	6	–	6
Medicago minima	–	–	1	–	1
Medicago orbicularis	–	–	48	15	63
Medicago sativa	125	30	7	267	429
Medicago spp.*annuals*	–	–	70	–	70
Melilotus alba	–	–	4	–	4
Melilotus spp.	–	–	5	–	5
Onobrychis spp.	–	–	3	–	3
Onobrychis viciifolia	1	–	–	11	12
Oryzopsis miliacea	–	–	13	–	13
Oryzopsis spp.	–	–	2	–	2
Phacelia tanacetifolia	1	–	–	–	1
Phalaris tuberosa	–	–	8	3	11
Phleum pratense	–	–	2	–	2
Phleum spp.	–	–	10	–	10
Pisum sativum	7	21	3	84	115
Poterium sanguisorba	1	–	12	–	13
Poterium spp.	–	–	2	–	2
Sorghum bicolor	–	–	2	–	2
Sorghum sudanense	10	–	–	–	10
Trifolium alexandrinum	11	4	55	20	90
Trifolium angustifolium	–	–	1	–	1
Trifolium arvense	–	–	9	–	9
Trifolium aureum	–	–	2	–	2
Trifolium campestre	–	–	13	–	13
Trifolium cherleri	–	–	13	–	13
Trifolium dubium	–	–	1	–	1

Species	Advanced cultivars	Landraces	Wild or semi-natural	Breeder's lines	Total
Trifolium echinatum	–	–	1	–	1
Trifolium fragiferum	1	1	3	–	5
Trifolium hirtum	5	2	23	–	30
Trifolium hybridum	5	2	1	–	8
Trifolium incarnatum	3	1	5	–	9
Trifolium obscurum	–	–	5	–	5
Trifolium pratense	35	7	57	20	119
Trifolium repens	15	3	74	15	107
Trifolium resupinatum	8	3	9	15	35
Trifolium scabrum	–	–	9	–	9
Trifolium spp.	–	–	64	–	64
Trifolium spumosum	–	–	3	–	3
Trifolium stellatum	–	–	4	–	4
Trifolium striatum	–	–	2	–	2
Trifolium subterraneum	7	3	3	–	13
Trifolium tomentosum	–	–	2	–	2
Trifolium vesiculosum	2	1	5	–	8
Trigonella foenum–graecum	1	1	–	–	2
Trigonella spp.	–	–	2	–	2
Vicia faba	5	142	–	40	187
Vicia sativa	6	40	2	270	318
Vicia spp.	–	–	1	–	1
Total	**379**	**352**	**1098**	**1186**	**3015**

Status of the national forage collections in Hungary

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Institute for Agrobotany, Tápiószele, Hungary

The following Hungarian institutions deal with forage genetic resources and/or related activities:

A. Institute for Agrobotany, Tápiószele
General activities: act as a coordination centre for all crop genetic resources activities in Hungary.
Main responsibilities:

- Maintenance of the national collections of field and vegetable crops.
- Monitoring and supervising the technical conditions in specific collections maintained by the other institutions.
- Coordination of activities associated with international collaboration.
- Development of the National Base Collection for seed-propagated crops.
- Establishment of a National Database for all Hungarian *ex situ* collections.

B. Research Center of the University of Agricultural Sciences Debrecen, Nyíregyháza
General activities: maintenance of germplasm collections to facilitate breeding programmes.

C. Research Center of the University of Agricultural Sciences Debrecen, Karcag
General activities: maintenance of germplasm collections to facilitate breeding programmes.

D. Pannon University of Agricultural Science, Mosonmagyaróvár
General activities: maintenance of germplasm collections to facilitate breeding programmes.

E. R. Fleischmann Agricultural Research Institute, University of Agricultural Sciences Gödöllői, Kompolt
General activities: maintenance of working collections, lines and genetic stocks to facilitate ongoing breeding programmes.

F. Agricultural Research and Development Institute P.U.C., Szarvas
General activities: maintenance of working collections, ecotypes to facilitate breeding programmes.

The collections held by each institute are listed in Table 1.

Table 1. Forage genetic resources in Hungary (see previous page for names and locations of institutes A to F)

	Institutes						
Species	**A**	**B**	**C**	**D**	**E**	**F**	**Total**
Agropyron cristatum	78		16				94
Agrostis spp.	32		2				34
Alopecurus pratensis	40		4				44
Anthyllis vulneraria	8						8
Arrhenatherum elatius	52						52
Brachypodium spp.	14						14
Briza spp.	13						13
Bromus erectus	34		2				36
Bromus inermis	120						120
Bromus spp.	48						48
Dactylis glomerata	252						252
Elymus spp.	44						44
Festuca arundinacea	144		2				146
Festuca pratensis	135		4				139
Festuca pseudovina	39		4				43
Festuca rubra	112		4				116
Festuca rupicola	43						43
Festuca spp.	100		35				135
Lathyrus sativus	226		24				250
Lathyrus spp.	87						87
Lolium multiflorum	60						60
Lolium perenne	276						276
Lotus corniculatus	162						162
Lotus spp.	10						10
Medicago sativa	751	60		27	659	64	1561
Medicago x varia	24						24
Medicago spp.	22						22
Onobrychis viciifolia	69						69
Onobrychis spp.	27						27
Phalaris spp.	23						23
Phleum pratense	62						62
Poa nemoralis	21						21
Poa pratensis	82		6				88
Poa spp.	17						17
Puccinellia spp.	27		5				32
Trifolium pratense	541			24			565
Trifolium repens	186					114	300
Trifolium spp.	56					35	91
Trigonella spp.	26						26
Vicia pannonica	21						21
Vicia sativa	213						213
Vicia villosa	144						144
Vicia spp.	88	43					131
Other grasses	91		1	12			106
Other legumes	25						25
Total	**4645**	**103**	**109**	**63**	**659**	**213**	**5792**

Status of the forage collection at the Israel Gene Bank

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The IGB started the evaluation and regeneration of forage plants at the Volcani Center during the 1998–99 crop season. More than 200 minor *Trifolium* accessions and other crops have been regenerated and characterized for various morpho-agronomic characters. This work is being continued during the 1999–2000 winter season.

A number of rescue plant collection programmes have been carried out in Israel due to genetic erosion. Data on forage plants collected in Israel under the rescue collection programme in collaboration with the Hebrew University of Jerusalem and the Tel Aviv University from 1997 to November 1999 are provided in Table 1. Some of the forage plants conserved at the IGB are also listed in Table 2.

Table 1. Forage germplasm collected under the rescue programmes in Israel from 1997 to November 1999

Species	No. ecotypes	Species	No. ecotypes
Beta vulgaris	4	*Trifolium palaestinum*	15
Hordeum bulbosum	28	*Trifolium purpureum*	5
Lolium rigidum	20	*Urospermum picroides*	8
Lupinus angustifolius	4	*Phalaris tuberosa*	1
Lupinus luteus	2	*Trifolium clypeatum*	1
Medicago polymorpha	14	*Trigonella berythea*	1
Tetragonolobus palaestinus	4	*Vicia sativa*	1
Trifolium dichroanthum	2	*Vigna luteola*	1

Table 2. Forage crops conserved at the Israel Gene Bank

Species	Ecotypes	Species	Ecotypes
Hordeum bulbosum	2	*Trifolium alexandrinum*	41
Lolium rigidum	3	*T. constantinopolitanum*	1
Lolium perenne	2	*T. dichroanthum*	1
Lupinus angustifolius	46	*T. salmoneum*	1
Lupinus luteus	60	*T. subterraneum*	184
Medicago polymorpha	55	*T. vavilovii*	13
Medicago sativa	37	*T. clypeatum*	3
Urospermum picroides	2	*T. berytheum*	10
Vicia sativa	239	*T. alexandrinum* x *T. berytheum*	2
Vicia ervilia	56	*T. resupinatum*	32

Italian forage collections

Valeria Negri

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Information from: Dr Simonetta Bullitta (Bullitta@Hpj.Area.Ss.Cnr.It)

New acquisitions since 1997

Species	No. of accessions	Storage conditions	Status	No. of accessions from Italy
Anthyllis tetraphylla	1	long-term	natural population	all*
Astragalus boeticus	1	long-term	natural population	all
Astragalus hamosus	3	long-term	natural population	all
Biserrula pelecinus	2	long-term	natural population	all
Lathyrus cicera	2	long-term	natural population	all
Lotus cytisoides	8	long-term	natural population	all
L. edulis	10	long-term	natural population	all
L. ornithopodioides	7	long-term	natural population	all
Melilotus indica	1	long-term	natural population	all
M. messanensis	2	long-term	natural population	all
M. sulcata	1	long-term	natural population	all
Medicago aculeata	2	long-term	natural population	all
M. arabica	6	long-term	natural population	all
M. littoralis	1	long-term	natural population	all
M. orbicularis	2	long-term	natural population	all
M. polymorpha	10	long-term	natural population	all
M. truncatula	10	long-term	natural population	all
Ornithopus compressus	5	long-term	natural population	all
Scorpiurus muricatus	6	long-term	natural population	all
Trifolium angustifolium	9	long-term	natural population	all
T. arvense	1	long-term	natural population	all
T. campestre	8	long-term	natural population	all
T. cherleri	5	long-term	natural population	all
T. glomeratum	4	long-term	natural population	all
T. ligusticum	1	long-term	natural population	all
T. scabrum	7	long-term	natural population	all
T. spumosum	2	long-term	natural population	all
T. stellatum	9	long-term	natural population	all
T. subterraneum	9	long-term	natural population	all
T. tomentosum	5	long-term	natural population	all
Vicia sativa	5	long-term	natural population	all

* all collected at Asinara Island (Sardinia).

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Information from: Dr Efisio Piano (Iscfbred@Pop.Telware.It)

Details of the forage genebank's total holdings

Species	No. of accessions	Storage conditions	Status	No. of accessions from Italy	Morpho-agronomic characterization
Medicago sativa sensu lato	94	medium-term	10 cultivars 84 landraces	94	100%
Dactylis glomerata	58	medium-term	16 cultivars 18 natural pop. 24 breeder's lines	34	53%
Trifolium repens	64	medium-term	17 landraces 47 nat. pop.	64	100%
Festuca arundinacea	117	medium-term	20 cultivars 91 natural pop 6 breeder's lines	102	18%
Lolium multiflorum	30	medium-term	20 cultivars 10 natural pop.	15	33%
Trifolium subterraneum sensu lato	1517	medium-term	23 cultivars 1494 breeder's lines (pure lines from nat. pop.)	1494	100%

Note: Depending upon the funding of a national project on genetic resources supported by the Italian Ministry of Agriculture (Genetic Resources Office), this Institute will provide the regeneration and documentation of the collection and assume the responsibility for its long-term maintenance

Istituto del Germoplasma

Consiglio Nazionale delle Richerche, via G. Amendola 165/A, 70126 Bari
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Forage collection in the genebank of the Istituto del Germoplasma

Genera	Total no. of accessions	No. of accessions from Italy
Gramineae		
Aegilops	1616	180
Aegilotricum	2	2
Agropyron	80	74
Agrostis	1	1
Alopecurus	4	3
Ammophila	4	3
Ampelodesma	2	2
Avenula	1	1
Brachypodium	21	15
Bromus	13	3
Cynodon	1	1
Cynosurus	4	4
Dactylis	258	231
Dasypyrum	155	142
Eleusine	1	.
Elymus	3	.
Eragrostis	12	1
Festuca	134	108
Hainaldia	1	1
Holcus	1	1
Koeleria	2	2
Lagurus	1	1
Lolium	369	210
Melica	1	1
Milium	1	1
Oryza	732	1
Oryzopsis	1	1
Panicum	100	4
Pennisetum	53	.
Phalaris	162	97
Phleum	25	15
Poa	3	2
Polypogon	1	1
Secale	399	89
Setaria	5	2
Sorghum	348	9
Stipa	3	2
Triticale	264	.
Vulpia	2	2
Zea	1317	188
Leguminosae		
Anthyllis	1	
Astragalus	1	1
Dorycnium	15	15
Hedysarum	149	133
Hippocrepis	1	1
Lathyrus	332	92
Lotus	38	36
Lupinus	188	85
Medicago	1161	646
Melilotus	14	6
Onobrychis	46	46
Psophocarpus	1	.
Scorpiurus	36	29
Trifolium	490	447
Trigonella	88	12
Vicia	5148	1303
Vigna	944	214
Miscellaneous		
Amaranthus	46	.
Atriplex	8	2

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URL: <http://www.agr.unipg.it/dbvba/index.htm>

Staff: Prof. M. Falcinelli, Director
Prof. V. Negri, Curator

Details of the forage genebank's total holdings

Species	No. of access.	Type of sample
Forage legumes		
Anthyllis vulneraria	11	natural populations
Astragalus spp.	22	natural populations
Coronilla minima	2	natural populations
Coronilla scorpioides	17	natural populations
Coronilla varia	16	natural populations / cultivar
Dorycnium pentaphyllum	11	natural populations
Dorycnium rectum	1	natural population
Galega officinalis	2	natural population
Hedysarurn coronarium	20	natural populations/landraces
Hippocrepis comosa	8	natural populations
Lotus alpinus	2	natural populations
Lotus angustissimus	2	natural populations
Lotus corniculatus	163	natural populations / breeder's lines / cultivars
Lotus japonicus	6	unrecorded status
Lotus ornithopodioides	2	natural populations
Lotus prestii	1	breeder's line
Lotus tenuis	41	natural populations / breeder 's lines
Lotus uliginosus	3	breeder 's lines / unrecorded status
Medicago arabica	44	natural populations
Medicago blancheana	4	natural populations
Medicago constricta	4	natural populations
Medicago coronata	3	natural populations
Medicago disciformis	2	natural populations
Medicago doliata	2	natural populations
Medicago granadensis	4	natural populations
Medicago intertexta	8	natural populations
Medicago laciniata	2	natural populations
Medicago littoralis	5	natural populations
Medicago minima	18	natural populations
Medicago murex	7	natural populations
Medicago muricoleptis	7	natural populations
Medicago noeana	10	natural populations
Medicago orbicularis	37	natural populations
Medicago polymorpha	147	natural populations
Medicago praecox	7	natural populations
Medicago prostrata	3	natural populations
Medicago radiata	1	natural populations
Medicago rigidula	188	natural populations
Medicago rotata	15	natural populations
Medicago rugosa	6	natural populations
Medicago sativa (*)	600	landraces / breeder's lines / cultivars
Medicago sauvagei	3	natural populations
Medicago scutellata	12	natural populations
Medicago soleiroii	1	natural populations
Medicago tenoreana	2	natural populations
Medicago tornata	6	natural populations
Medicago truncatula	21	natural populations

Species	No. of access.	Type of sample
Medicago turbinata	8	natural populations
Onobrychis caput galli	3	natural populations
Onobrychis viciifolia	161	natural populations / breeder's lines / cultivars / landraces
Ononis ornithopodioides	1	natural population
Ononis pusilla	2	natural population
Ornithopus complessus	1	natural population
Trifolium alexandrinum	8	landraces
Trifolium angustifolium	15	natural populations
Trifolium arvense	13	natural populations
Trifolium campestre	35	natural populations
Trifolium cherleri	6	natural populations
Trifolium echinatum	5	natural populations
Trifolium fragiferum	13	natural populations
Trifolium glomeratum	8	natural populations
Trifolium hybridum	8	natural populations
Trifolium incarnatum	18	natural populations
Trifolium lappaceum	3	natural population
Trifolium montanum	11	natural populations
Trifolium nigrescens	6	natural populations
Trifolium ochroleucon	5	natural populations
Trifolium pratense	29	natural populations
Trifolium repens	179	natural populations / breeder's lines / cultivars
Trifolium resupinatum	35	natural populations
Trifolium scabrum	10	natural populations
Trifolium squarrosum	6	natural populations / landraces
Trifolium subterraneum	63	natural populations
Trifolium vesiculosum	8	natural populations
Grasses		
Brachypodium pinnatum	4	natural populations
Cynodon dactylon	4	natural populations
Dactylis glomerata	155	natural populations
Festuca arundinacea	142	natural populations
Festuca pratensis	2	unrecorded status
Festuca rubra	5	natural populations
Lolium perenne	457	natural populations / breeder's lines / cultivars
Phleum alpinum	21	natural populations
Phleum pratense	2	unrecorded status
Poa alpina	1	natural populations
Poa pratensis	22	natural populations / breeder's lines / cultivars

* of which 24 accessions are new acquisitions (landraces, all from Italy, all with morpho-agronomic characterization).

Maintenance conditions

Long-term storage (vacuum-sealed aluminium packets, seed humidity 5-8%, storage temperature –18°C).

Availability of germplasm

Freely available in small quantities if number of seeds permits. We have facilities to multiply the seed of our accessions on request.

Documentation

Computerized. All accessions have an accession number, all accessions collected by the Department have the passport data.

Note: working collection run without specific funding. The number of accessions is subject to change.

Genetic resources of forage grasses and legumes in Latvia

***Biruta Jansone*[1] *and Isaak Rashal*[2]**

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Introduction

After independence in 1991 Latvia underwent big changes in the political, agricultural and scientific domains. During the Soviet period, as in most Soviet republics, there were no special plant genetic resources (PGR) activities in Latvia. The collection of N.I. Vavilov All-Union Institute (VIR) was used for the purpose of conservation and utilization of Latvian PGR. There were only working collections for breeding purposes, comprising accessions originating from different countries.

Consequently institutions do not have appropriate facilities for long-term storage. Therefore most of the cultivated PGR, especially the unique material of Latvian origin, was threatened. In 1993 the Latvian Society of Geneticists and Breeders started organizing the Working Board for Cultivated Plant Genetic Resources and Working Groups for different plant groups, including representatives from plant breeding, research and educational institutions (Rashal 1995). Since 1993 these bodies received little support from the Latvian Academy of Science and Ministry of Agriculture. There is no global national PGR programme in Latvia; this work is included in the common national plant breeding programme.

There is a good cooperation in PGR between Latvian institutions and the Nordic Gene Bank, within the framework of the Nordic-Baltic cooperative programme and financed since 1994 by the Nordic Council of Ministers, played an invaluable role in outlining these tasks (Rashal and Weibull 1997).

Results

In a first step, the main objectives for PGR development were considered to be as follows:

- To establish an inventory of the origins and status of PGR existing in the different Latvian collections
- To create a computerized database on PGR held in Latvian collections
- To develop criteria for inclusion of accessions in Latvian PGR collections
- To evaluate the most important features for accessions included in Latvian PGR collection
- To organize a long-term safety storage system for Latvian PGR collections
- To organize expeditions for collecting wild relatives of cultivated plants.

In 1994 a computerized PGR information centre was established in the Institute of Biology of the Latvian Academy of Science. Latvia now has its own Gene Bank, which has been equipped by the Nordic-Baltic project with dehumidifiers and other tools to dry and pack seeds for long-term storage. Only passport data are included in the database (name of accession, country of origin, breeding institute, name of breeders, year of registration, pedigrees, etc.). Evaluation and characterization data will be added in the next steps.

Table 1 provides data on the forage base collection held at the Latvian Gene Bank.

Seed from the 1997 yield was the first to be placed in storage. There is now a total of 32 accessions of forage species in the Latvian Gene Bank (Table 2).

Table 1. Base collection of forage crops in the Latvian Gene Bank

Variety	Species	Breeding station	Authors	Year of registration
Priek. Tetrapl.	Aliske clover	Priekuļu SIS	A. Apinis	1977
Priekuļu 26	Aliske clover	Priekuļu SIS	A. Apinis	1977
SK–74	Aliske clover	LVZZPI "Agra"	F. Jansons, A. Ciska, R. Akmentiņa	
Menta	Aliske clover	LVZZPI "Agra"	F. Jansons, A. Ciska, B. Jansone, M. Spârniņa	1999
Priekuļu	Bentgrass	Priekuļu SIS	I. Holms	
Priekuļu 129	Bluegrass, Kentucky	Priekuļu SIS	P. Pommers, A. Apinis, V. Reķe	1956
Gatve	Bluegrass, Kentucky	Priekuļu SIS	I. Holms	1995
Vietējā	Fescue, giant			
Ape	Hybrid Ryegrass	LVZZPI "Agra"	P. Bērziņš	1999
Uva	Italian ryegrass	Priekuļu SIS	I. Holms, Z. Mergina	1994
Priekuļu	Late meadow grass	Priekuļu SIS	A. Apinis, P. Pommers	1959
Mežotnes	Lucerne	Mežotnes SIS	P. Jubass	1957
Skrīveru	Lucerne	LVZZPI "Agra"	F. Jansons, A. Jansons, E. Mačuļska	1986
Rita	Meadow fescue	Priekuļu SIS	I. Holms	1995
Priekuļu 519	Meadow fescue	Priekuļu SIS	P. Pommers	1956
Patra	Meadow fescue	LVZZPI "Agra"	P. Bērziņš	1999
Priekuļu 40	Meadow foxtail	Priekuļu SIS	V. Zeibots, A. Apinis	1976
Priekuļu 40	Meadow foxtail	Priekuļu SIS	V. Zeibots, A. Apinis	1976
Priekuļu 59	Perennial ryegrass	Priekuļu SIS	V. Zeibots, P. Pommers, A. Apinis	1959
Spīdola	Perennial ryegrass	LVZZPI "Agra"	P. Bērziņš, S. Ķipare, V. Stesele, I. Holms	1989
Stendes agrais	Red clover	Stendes SIS	J. Lielmanis, I. Celma	1968
Stendes vēlais 2	Red clover	Stendes SIS	J. Lielmanis, N. Konrāds	1951
Skrîveru agrais	Red clover	LVZZPI "Agra"	J. Lielmanis, F. Jansons, A. Ciska, E. Mačuļska	1976
Priekuļu 66	Red clover	Priekuļu SIS	A. Apinis	1968
Dīvaja	Red clover	LVZZPI "Agra"	J. Lielmanis, F. Jansons, A. Ciska	1996
Lielplatones	Red clover			
Agra	Red clover	LVZZPI "Agra"	B. Jansone, A. Ciska	
Na 92	Tall fescue	LVZZPI "Agra"		
Priekuļu 20	Tall or false oat grass	Priekuļu SIS	V. Zeibots, P. Pommers	1959
Priekuïu 2	Timothy	Priekuļu SIS	V. Zeibots	1989
T–79	Timothy	LVZZPI "Agra"	P.Bērziņš	
Priekuļu	Timothy	Priekuļu SIS	V. Zeibots, P. Pommers	1967
Priekuļu 61	White clover	Priekuļu SIS	A. Apinis	1977

Table 2. List of forage species in the Latvian Gene Bank

Species	Number of accessions
Agrostis gigantea (syn. *A. alba)*	1
Alopecurus pratensis	1
Arrhenatherum elatius	1
Dactylis glomerata	1
Festuca pratensis	3
Festuca rubra	1
Lolium multiflorum var. *westervoldicum*	1
Lolium perenne	2
Lolium perenne x Festuca pratensis	1
Medicago x *varia*	1
Phleum pratense	3
Poa palustris	1
Poa pratensis	2
Trifolium hybridum	4
Trifolium pratense	8
Trifolium repens var. *giganteum*	1
Total	**32**

It is important to develop criteria for the inclusion of accessions in the genebank. We believe that all accessions of Latvian origin can be divided in three groups, where the highest priority will be given to modern varieties of Latvian origin and to landraces and accessions collected in natural conditions. The second level of priority concerns the best breeding lines with good properties, but not bred as varieties, and other valuable material which can be used in the future as donors of useful traits. Genetic stocks, mutants and others belong to the third level of priority. The most valuable material of Latvian origin (first level of priority) will also be stored in the Nordic Gene Bank as a safety-duplication collection.

Latvian PGR activities are coordinated with those of other Baltic countries within the framework of the Nordic-Baltic cooperation. Workshops have been organized for the Baltic countries by the Nordic Gene Bank, in which Nordic experiences in PGR documentation have been discussed. Baltic Working Groups aiming at developing common descriptor lists for various crops (cereals, forage, fruits, vegetables) were established. Together with Lithuanian colleagues, individual descriptor lists for white clover, red clover, lucerne and forage grasses have been prepared.

The collecting of samples of naturally growing species and perennial grasses in particular is also insufficient. Special collecting missions were not organized during recent years because of lack of funding.

Conclusions

- The database is a good background for information exchange with other PGR centres.
- The inventory of existing Latvian PGR is almost completed. The next step will be the creation of a system for safety- and long-term conservation of PGR of Latvian origin.

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Status of the forage collection in Lithuania

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Institution dealing with forage genetic resources
Lithuanian Agricultural Institute, Plant Breeding Station, Dotnuva.

Staff/Responsibility
- Dr A. Būdvytytė, PGR Coordinator
- Dr Z. Kešulienė, conservation
- Dr N. Lemežienė, forage grass breeder, Curator
- Forage grasses and legumes breeders (collecting, multiplication, documentation, evaluation, regeneration).

Storage conditions
Long-term storage.

Duplication sites
28 accessions have been safety-duplicated at NGB, Sweden.

Availability of genetic resources
Availability is about 99%.

Evaluation status
Only species involved in the breeding programmes are evaluated: *Dactylis glomerata* L., *Festuca pratensis* Huds., *Lolium perenne* L., *Phleum pratense* L., *Poa pratensis* L., *Medicago sativa* L., *Trifolium repens* L., *Trifolium pratense* L.

Documentation status
Passport data (according to the Forage Passport Descriptors, 1997) and 14–18 evaluation / characterization data (according to the national descriptor list).

Database management system: Microsoft Access.

Regeneration and multiplication
Forage grasses are regenerated or multiplied in field plots, isolated by winter rye. Forage legumes are isolated by special net-type isolators fitted with one small beehive containing Carniolan bees.

Thirteen accessions of *Phalaris arundinacea* L. need to be regenerated.

Updating
Updating started in 1999. Now 405 accessions belonging to 15 species have been updated (Table 1).

Table 1. Forage grasses and legumes collection in Lithuania

Species	Type of accession			
	Advanced cultivars	**Breeder's lines**	**Wild or semi–natural**	**Total**
Grasses				
Agrostis alba L.	2			2
Bromus inermis Leysser*	3	23		26
Dactylis glomerata L.*	15	16	34	65
Festuca arundinacea Schreb.*	2	9		11
Festuca rubra L.*	1	7		8
Festuca pratensis Huds.*	2	49	20	71
Festulolium	1			1
Lolium perenne L.*	3	19	11	33
Phalaris arundinacea			13	13
Phleum pratense L.*	3	23	14	40
Poa angustifolia L.*			1	1
Poa compressa L.*			1	1
Poa palustris L.			1	1
Poa pratensis L.*	3	35	44	82
Legumes				
Medicago sativa L.	3			3
Trifolium hibridum L.*	1	2		3
Trifolium pratense L.*	6	11	5	22
Trifolium repens L.*	3	11	26	40
Total	**48**	**205**	**10**	**423**

* updated accessions

Description of the CGN forage collection

Loek J. M. van Soest and Noor Bas

Centre for Genetic Resources, The Netherlands (CGN), Centre for Plant Breeding and Reproduction Research (CPRO), Wageningen, The Netherlands [7]

The collection

This concerns accessions of the species *Lolium perenne, Festuca pratensis, Poa pratensis* and *Trifolium repens*. Since the last meeting of the ECP/GR Working Group on Forages in 1997 the collection of CGN has been increased with 176 accessions. Particularly old Dutch varieties of grasses, no longer listed on the Dutch variety list, and ecotypes of white clover collected in several old pastures in the Netherlands were included in the collection.

The forages collection consists at present of 641 accessions of 11 different species (Table 1). The grass species were received from the former Foundation of Agricultural Plant Breeding (SvP), private breeding firms from The Netherlands (van Soest and Boukema 1995) and recently extended with old Dutch varieties received from the Centre for Plant Breeding and Reproduction Research (CPRO) at Wageningen.

Most of the material of *Trifolium pratense* was collected by CGN in The Netherlands from 1985 to 1986 (van Soest and Dijkstra 1986, 1998). The accessions of *T. repens* were recently collected in all provinces of the Netherlands. In 1997, a joint plant exploration mission was organized to Uzbekistan in cooperation with the national genebank of Uzbekistan and VIR, St. Petersburg, Russia. This mission collected grasses and clovers which will be included in the collection (van Soest 1998) in the near future. A second expedition was organized in August 1999 to Central Asia, both Uzbekistan and Kyrgizstan. This mission collected several forages (see van Soest *et al.*, p. 165), but only the collected red and white clovers will be included in the CGN collection.

Grasses

The collection consists predominantly of economically important forage grasses cultivated in N.W. Europe. The genus *Lolium*, including accessions of perennial and Italian ryegrass, forms with 249 accessions the most important group (Table 1). The *L. perenne* collection has recently been extended with old cultivars, developed in The Netherlands since 1935 and will be further extended with ecotypes collected in old Dutch pastures. The *Phleum* collection includes two species and consists of 94 accessions. The small collection of *Dactylis glomerata* L. (30) will be further enlarged with old cultivars from The Netherlands and some accessions collected in 1997 in Uzbekistan (van Soest *et al.* 1998). Fifty-two accessions of old Dutch cultivars of *Poa pratensis* were regenerated in 1997 and 1998 and included in the collection; more accessions of *P. pratensis* will be regenerated in the near future and also taken into the collection. In 1999 the first accessions of *Festuca* were multiplied in isolation fields.

In the future old Dutch cultivars of *Festuca* and *Agrostis* species will also be regenerated and included in the collection. Furthermore the collection will be enlarged with ecotypes of different grasses, particularly *L. perenne*. This material was previously collected (1967 to 1982) by private breeders in old meadows in The Netherlands. It is expected that around 2005 the forage grasses collection of CGN will be enlarged with additional material, particularly from Dutch origin and will be extended to approximately 750 accessions.

[7] CGN is now part of Plant Research International, Wageningen, The Netherlands.

Table 1. Forage collection of CGN

Species	No. of samples	Origin of the material
Grasses		
Dactylis glomerata	30	Ecotypes from NLD and HUN
Festuca rubra	13	Old varieties from NLD
Festuca pratensis	1	Old varieties from NLD
Lolium multiflorum	59	Old varieties from NLD
Lolium hybridum	1	Variety from AUS
Lolium perenne	189	Ecotypes NLD, old varieties NLD and Europe
Phleum pratense	87	Mainly old varieties from NLD and some from other European countries
Phleum bertolonii	7	Old varieties from NLD
Poa pratensis	52	Old varieties from NLD
Total grasses	**439**	
Legumes		
Trifolium pratense	147	Ecotypes from NLD and C. Asia, varieties
Trifolium repens	55	Ecotypes from NLD and C. Asia, varieties
Total legumes	**202**	
Total forages	**641**	

Forage legumes

Since the last meeting of the Working Group on Forages in 1997 the *Trifolium* collection was increased with 61 accessions to a total of 202 accessions. The *Trifolium* collection includes presently 147 accessions of red clover (*T. pratense*) and 55 accessions of white clover (*T. repens*). The red clovers were mainly obtained during the rescue operation conducted in 1985 and 1986 (van Soest and Dijkstra 1986, 1998). Besides the collected ecotypes (124 accessions), another 23 accessions of landraces, cultivars and tetraploid breeding lines are taken up in the red clover collection. Under the group of old landraces there are four old Dutch landraces named 'Groninger-', 'Roosendaalse-', 'Gendringse red clover' and 'Rode Maasklaver'.

In 1997 and 1998 collecting trips were organized to all provinces in the Netherlands and some 50 accessions of white clover were collected in old Dutch grasslands. The white clover collection includes 9 ecotypes collected in The Netherlands, 21 old cultivars from the period 1924 to 1990, mainly from The Netherlands, some from other European countries and the polyploid 'Vermont'.

The forage legume collection will be enlarged in the future with another 25 accessions of *T. repens* collected in the Netherlands in 1997 and 1998 and 22 accessions of *T. pratense* (12*)* and *T. repens* (10) collected in 1999 in Central Asia.

Regeneration

Previously all forage crops were regenerated in specially isolated plots in rye fields. Since 1999 *Triticale* has been used as isolating crop. Only material of *Poa pratensis* is not regenerated in isolation plots. The distance between the plots is approximately 50 m. Material that needs vernalization is kept in unheated greenhouses during the winter. After seeds are sown in the summer, some 50 plants are planted in April of the following year in the isolation plots. To prevent lodging, the grasses are staked. Harvest of the seeds is carried out in July / August.

Documentation

The collections are documented for passport data in GENIS, the CGN information system based on the database management system ORACLE (van Hintum 1987). The passport data of some of the grass ecotypes from different European countries are, however, incomplete. So far no characterization / evaluation data of the forage collections are included in GENIS.

Since April 1998 passport data of most of the CGN collections can be searched on-line or downloaded by crop on CGN'S Web site (<http://www.plant.wageningen-ur.nl/about/Biodiversity/Cgn/collections/>). Information on the following forages can be found on the Web site: clover, cocksfoot, lolium and timothy. The others will follow in the near future.

Future activities

Planned activities for the next five years can be summarized as follows:

- To broaden the forage collection with original Dutch material and to include forages collected in 1997 and 1999 in Central Asia
- To regenerate approximately 400 accessions of both grasses and clovers
- To update and include new passport data in GENIS and the databases on the CGN Web site
- To secure evaluation data from users and to include available information in GENIS.

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Forage collection at the Nordic Gene Bank

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Nordic Gene Bank (NGB), Alnarp, Sweden

Introduction

Between 1979 and 1983 NGB collected forage crops in all the Nordic countries including Greenland. Since then, forage species have been collected more sporadically. NGB also has Nordic material collected in the 1970s before NGB was established (Fig. 1). Today, seeds from 2478 accessions are available at NGB (Table 1). Information on forage accessions is provided in the Accession Database at <http://www.ngb.se/Databases/Accson.html>.

Table 1. Forage accessions at the Nordic Gene Bank

Genus	Varieties	Local mat.	Wild mat.	Breeding material	Unknown	Total
Agrostis	13	1	136	2	0	**152**
Alopecurus	0	0	28	1	0	**29**
Bromus	7	0	24	0	0	**31**
Calamagrostis	0	0	1	0	0	**1**
Cynosurus	1	0	1	0	0	**2**
Dactylis	35	1	203	3	0	**242**
Danthonia	0	0	1	0	0	**1**
Deschampsia	0	1	9	0	0	**10**
Festuca	90	3	448	5	1	**547**
Holcus	0	0	1	0	0	**1**
Lolium	91	1	78	2	0	**172**
Lotus	1	0	0	0	1	**2**
Medicago	27	1	0	0	1	**29**
Phalaris	1	1	45	1	0	**48**
Phleum	48	33	283	5	0	**369**
Poa	57	1	292	0	1	**401**
Trifolium	113	126	201	0	0	**440**
Vicia	0	0	1	0	0	**1**
Total						**2478**

Storage and safety-duplication

Prior to storage the seeds are dried to a moisture content of between 3 and 4%, packed in airtight containers (aluminium foil bags and bottles). The temperature in active and base collection is –20°C. The safety base storage facility is located in a coal mine on Svalbard, Norway. The storage temperature in permafrost varies between –3°C and –4°C. Today there are 1230 forage accessions stored as safety-duplicates. In Table 2 the number of accessions preserved yearly in safety base is presented.

Regeneration

Every year 125–150 forage accessions are regenerated in different parts of the Nordic countries. The aim is to do this as close to the place of origin as possible. The work is done by the members of the Nordic Working Group on Forages at their home institutes. During 1999 the forage accessions were regenerated for the first time according to the method presented at the ECP/GR Working Group on Forages meeting in 1997 (Sackville Hamilton *et al.* 1998). The results will be evaluated at the end of 1999.

Utilization

The collection has been utilized in both research and plant breeding activities. Especially the pre-breeding activities on *Trifolium* (Helgadóttir *et al.* 1999) and characterization of the *Phleum* collection conducted by the Nordic Working Group of Forages should be mentioned.

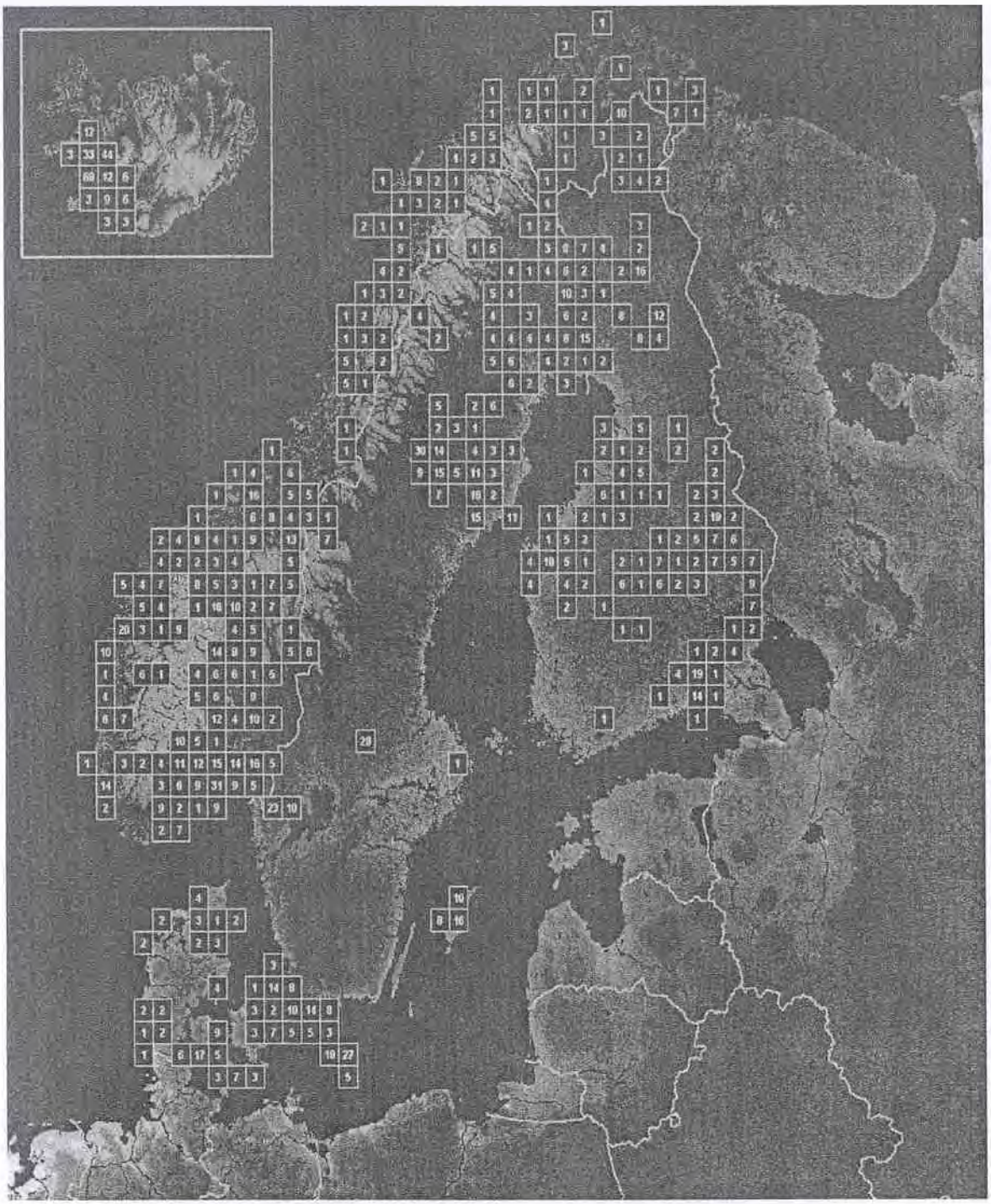

Fig. 1. Forage material collected in the Nordic countries. The number of accessions collected in a location is shown in each square.

Table 2. Forage accessions stored at the NGB Svalbard Safety Base

	Year					Total
Species	**1986**	**1987**	**1988**	**1992**	**1998**	
Agrostis capillaris	3	0	5	0	41	**49**
Agrostis gigantea	1	0	1	0	0	**2**
Agrostis stolonifera	2	0	3	0	1	**6**
Alopecurus pratensis	0	0	1	0	27	**28**
Bromus arvensis	2	0	0	0	0	**2**
Bromus inermis	1	1	0	1	2	**5**
Bromus rigidus	0	0	0	1	0	**1**
Bromus secalinus	1	0	0	0	0	**1**
Calamagrostis purpurea	0	0	1	0	0	**1**
Cynosurus cristatus	0	0	1	0	0	**1**
Dactylis glomerata	5	3	30	15	20	**73**
Deschampsia cespitosa	0	0	0	0	1	**1**
Deschampsia flexuosa	0	0	0	1	1	**2**
Festuca arundinacea	1	0	0	0	8	**9**
Festuca ovina	0	0	1	0	8	**9**
Festuca pratensis	4	9	19	19	11	**62**
Festuca rubra	7	8	19	98	71	**203**
Festuca trachyphylla	0	1	2	1	0	**4**
Lolium multiflorum	2	6	11	1	5	**25**
Lolium perenne	8	9	24	41	45	**127**
Lolium x *hybridum*	0	0	0	0	1	**1**
Lotus corniculatus	0	0	1	0	0	**1**
Medicago lupulina	0	3	0	1	2	**6**
Medicago sativa	7	2	5	2	4	**20**
Melilotus alba	0	0	0	0	1	**1**
Melilotus officinalis	0	0	0	0	2	**2**
Phalaris arundinacea	0	1	10	10	10	**31**
Phleum alpinum	0	1	0	0	2	**3**
Phleum pratense subsp. *bertolonii*	2	0	3	0	0	**5**
Phleum pratense subsp. *pratense*	5	6	30	19	74	**134**
Poa alpina	0	1	0	0	1	**2**
Poa palustris	1	0	0	0	1	**2**
Poa pratensis	14	2	20	123	51	**210**
Poa trivialis	0	2	1	0	0	**3**
Trifolium hybridum	4	3	4	2	11	**24**
Trifolium pratense subsp. *pratense*	52	23	13	9	38	**135**
Trifolium repens var. *repens*	8	3	11	2	9	**33**
Vicia sativa subsp. *sativa*	4	1	0	0	0	**5**
x Festulolium loliaceum	0	0	0	0	1	**1**
Total	**134**	**85**	**216**	**346**	**449**	**1230**

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Status and utilization of the national forage collection in Poland

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In Poland, collecting, evaluation and preservation of forage genetic resources have received attention since 1972. Many years of expeditions, field evaluation and genebank activities resulted in more than 19 000 forage accessions collected.

Owing to our present research activities, new genera and species as well as new groups of species have been included. For example in grasses we started to collect tufted hairgrass (*Deschampsia caespitosa*), junegrass (*Koeleria* sp.), brome grass species (*Bromus* sp.) and crested dog's tail (*Cynosurus cristatus*). Numbers of new species (usually one species per one accession) from 'botanical' (species from native and foreign floras) and 'ecological' (species for reclamation, energy crops, etc.) groups were also included in our collection.

The recent status of the Polish forage collection is reported below. It is clear from Tables 1 and 2 that nearly 90% of our collection are wild and semi-wild ecotypes. Only 3.1% of collected grass accessions are of unknown status, i.e. insufficiently documented. Forages represent nearly 30% of the total number of accessions in the Plant Genetic Resources Preservation Programme.

Table 1. Status of the Polish legume collection

Genus / species	Wild or semi-natural ecotypes	Status unknown	Advanced cultivars and breeder's lines	Total per species
Anthyllis vulneraria L.			3	3
Coronilla varia L.			1	1
Lotus	1		218	219
Medicago	184		5	189
Melilotus	1		3	4
Onobrychis	1		13	14
Ornithopus sativus Brot.	22		86	108
Trifolium	289		170	459
Total	**498**		**499**	**997**

Table 2. Status of the Polish grass collection

Genus, species, subtaxa	Wild or semi-natural ecotypes	Status unknown	Advanced cultivars and breeder's lines	Total per species
Agrostis alba L.	2		4	6
Agrostis canina L.			1	1
Agrostis capillaris L.	8		31	39
Agrostis gigantea L.	1		3	4
Agrostis stolonifera L.	17		8	25
Alopecurus pratensis L.			5	5
Arrhenatherum elatius L.			8	8
Bromus benekeni (Lange) Trimen	1			1
Bromus inermis Leyss.	92		10	102
Bromus secalinus L.	1			1
Bromus sitchensis L.			1	1
Bromus stamineus L.			1	1
Bromus willdenowii Kunth			3	3
Cynosurus cristatus L.	27			27
Dactylis glomerata L.	5861	134	171	6166
Deschampsia caespitosa (L.) Beauv.	58			58
Festuca arundinacea Schreb.	736	130	66	932
Festuca heterophylla Lam.			2	2
Festuca ovina L.	4		24	28
Festuca pratensis Huds.	3430	32	123	3585
Festuca rubra s.l.	97		120	217
Koeleria sp.	25			25
Lolium multiflorum var. *westervoldicum* Wittm.			5	5
Lolium multiflorum Lam.			112	112
Lolium perenne L.	2178	55	378	2611
Lolium x *boucheanum* Kunth.			26	26
Lolium x *hybridum* Hausskn.			8	8
Phalaris aquatica L.			9	9
Phalaris arundinacea L.			2	2
Phalaris canariensis L.			2	2
Phleum pratense L.	2374		140	2514
Poa compressa L.	12		2	14
Poa nemoralis L.	16		4	20
Poa palustris L.	4		6	10
Poa pratensis L.	1289	210	135	1634
Different species – 'botanical' collection			129	129
Different species – 'ecological' collection			6	6
Total per type of accession	**16233**	**561**	**1545**	**18339**
Percentage of total number of accessions	**91.2**	**3.2**	**8.7**	**100.0**

Since the last report (1996), 5874 forage accessions (5627 grasses) have been distributed to many users in Poland and abroad (Table 3). This represents 30.4% of the total collection. In most cases users are supplied with small seed samples and in a few cases they receive living plants from field collection (e.g. to grass breeders).

Table 3. Utilization of the Polish forage collection (1997–99)

	No. of accessions			
Genus / species	**1997**	**1998**	**1999**	**Total**
Legumes				
Anthyllis		1		1
Lotus	2	3	2	7
Medicago	8	1	4	13
Melilotus	1	1	2	4
Onobrychis		3	2	5
Trifolium	183	3	16	202
Others		5	20	25
Total legumes	**194**	**17**	**46**	**257**
Grasses				
Agrostis sp.	10	5	2	17
Alopecurus pratensis	2		1	3
Arrhenatherum elatius	3		2	5
Bromus inermis	3	1	1	5
Dactylis glomerata	2	5	4	11
Deschampsia caespitosa		1	1	2
Festuca sp.	154	488 **	52	694
Lolium perenne	95	18	320	433
Phalaris sp.	2	2	2	6
Phleum pratense	12	5	4	21
Poa pratensis	2488 *	1568 *	10	4066
Others	47	212	105	364
Total grasses	**2818**	**2305**	**504**	**5627**

* resistance tests, provided in IHAR, Radzików
** Plant Breeding Station, Szelejewo, Poland

All the above accessions are stored in long-term storage (except wild ecotypes of perennial ryegrass stored in medium-term storage in Bydgoszcz according to the Core Collection Programme needs). Owing to current financial conditions it is not possible to undertake any regeneration.

Collection of native and foreign grass species in the Botanical Garden of the Plant Breeding and Acclimatization Institute in Bydgoszcz

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Introduction

For nearly 30 years numerous activities on conservation of genetic resources of pasture grasses have been carried out in the Botanical Garden of Plant Breeding and Acclimatization Institute in Bydgoszcz (Majtkowski and Majtkowska 1994). As a result of expeditions organized yearly to different regions of Poland nearly 26 000 ecotypes have been collected, evaluated and transmitted as seed samples to the National Centre for Plant Genetic Resources of IHAR, Radzików.

Beside the living collection of pasture grass ecotypes, in 1980 the collection of native and foreign grass species from temperate climatic regions was developed. This is the biggest grass collection in Poland and it was grown on the basis of seed exchange between botanical gardens and expeditions.

Materials and methods

Plants for the living collection were grown from seeds received from different botanical gardens or collected during expeditions. Seeds were sown on top of filter paper, young seedlings were transplanted to small pots filled with standard soil-peat-sand mixture and further grown in unheated glasshouse for 3–5 months. Young plants were then transferred to the field on small (1.5 m^2) plots. The total number of plants grown in the field is related to the number of living seeds or living plants received. Thus in some cases, especially for rare or protected species, only a few plants represent one particular taxon.

The collection of decorative grasses was evaluated for their general aesthetic value on the basis of: morphology, plant habit, shape and colour of inflorescence, phenology, disease and frost resistance.

The suitability of grass species for various 'ecological' purposes (i.e. reclamation, soil erosion protection, energy crop, etc.) was evaluated in highly devastaded areas, for example around the Nitrogen Plant at Puławy (poor and dry soil, high nitrogen concentration). Since some species can combine decorative and 'ecological' purposes, they were tested as decorative elements for landscape construction on recreation areas developed on a coal-mine dump in Silesian region (southern Poland).

Results and recommendations

More than 400 taxa from 116 genera were collected in the living collection of native and foreign grass species. More than 60% are foreign and 75% are perennials. There are also 34 rare and protected species from Poland and Western Pomerania as well as Wielkopolska regions (Zarzycki and Kaźmierczakowa 1993; Żukowski and Jackowiak 1995) (Table 1).

Observation on overwintering and evaluation of the morphology, phenology as well as decorative and 'ecological' quality was done for selected species well adapted for cultivation in Polish climatic conditions. It is of great value for the popularization of new plant species for different types of use (Tables 2 and 3):

- decorative (parks, gardens, dried bunches, etc.)
- renovation of industry-devastated area, 'green zone' near highways, erosion control on wasteland
- renewable energy source
- raw material for building and packaging purposes.

The living collection of grass species is also used for education of students from Agricultural Universities (Bydgoszcz, Poznań, Olsztyn).

Table 1. Rare and protected grass species from the Polish flora

No.	Genus	Species	Status†	Collecting year
1	*Aira*	*praecox* L.	V*	1983
2	*Avenula*	*planiculmis* (Schrader) Sauer	R*	1998
3	*Avenula*	*pratensis* (L.) Dumort.	r**	1987
4	*Bellardiochloa*	*violacea* (Bellardi) Chiov.	V	1993
5	*Bromus*	*arvensis* L.	R	1984
6	*Bromus*	*benekenii* (Lange) Trimen	i**	1980
7	*Bromus*	*ramosus* Huds.	e**	1986
8	*Bromus*	*secalinus* L.	v**	1984
9	*Calamagrostis*	*stricta* Trin.	V	1995
10	*Catabrosa*	*aquatica* (L.) Beauv.	V	1984
11	*Elymus*	*farctus* (Viv.) Runem. ex Melder.	E*	1986
12	*Elymus*	*europaeus* L.	E	1982
13	*Festuca*	*carpatica* F.G. Dietr.	EN*	1995
14	*Festuca*	*polesica* Zapal.	v, i	1984
15	*Festuca*	*psammophila* (Hack. ex Celak.) Fritsch	k**	1998
16	*Festuca*	*pseudovina* Hack.ex Wiesb.	R	1983
17	*Festuca*	*tatrae* (Czako) Deg.	EN	1980
18	*Festuca*	*tenuifolia* Sibth	k	1980
19	*Festuca*	*vaginata* Waldst.& Kit.ex Willd.	k	1980
20	*Hierochloë*	*odorata* (L.) P. Beauv.	R, RC*	1980
21	*Hierochloë*	*repens* (Host) Simonkai	R	1997
22	*Lolium*	*remotum* Schrank	E	1986
23	*Lolium*	*temulentum* L.	r	1986
24	*Melica*	*ciliata* L.	I	1982
25	*Poa*	*glauca* Vahl.	I	1980
26	*Sclerochloa*	*dura* (l.) P. Beauv.	R	1987
27	*Sesleria*	*varia* (Jacq.) Wettst.	R	1984
28	*Sesleria*	*uliginosa* Opiz	V	1982
29	*Stipa*	*capillata* L.	RC	1986
30	*Stipa*	*joannis* Celak.	RC, V	1984
31	*Stipa*	*pulcherrima* C. Koch	RC, V	1994
32	*Trisetum*	*flavescens* (L.) Beauv.	V	1982
33	*Vulpia*	*bromoides* (L.) S.F.Gray	I	1980
34	*Vulpia*	*myuros* (L.) C.C. Gmel.	R	1980

† Categories of threat: E, e – endangered (in direct danger of extinction); EN – endemic plant; R, r – rare; V, v – vulnerable; RC – species protected in Poland; I, i – species of indeterminate threat; K, k – species of insufficiently known threat.

*: in Poland; **: in Western Pomerania, Wielkopolska or Kujawy regions.

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Table 2. Ornamental species in the grass collection of the Botanical Garden in Bydgoszcz

Genus	Species	Subspecies	Origin/donor
Achnatherum	*bromoides* Beauv.		BG*. Leipzig/DEU
Achnatherum	*calamagrostis* (L.) Beauv.		BG. Kiel/DEU
Achnatherum	*splendens* (Trin.) Nevski		BG. Leipzig/DEU
Agrostis	*rupestris* All.		SVK/95**, Skalnate Pleso (Tatry Mtn.), 1800 m
Andropogon	*gerardi* Vitm.		BG. Chicago/USA
Arrhenatherum	*elatius* (L.) Beauv.	subsp. *bulbosum* Schubl.& Martens f. *variegata*	BG. Lublin/POL
Arundo	*donax* L.		Unknown
Boissiera	*squarrosa* (Soland.) Nevski		BG. Taszkent/UZB
Bothriochloa	*caucasica* (Trin.) C.E.Hubb.		BG. Vacratot/HUN
Bouteloua	*curtipendula* Torr.		BG. Dresden/DEU
Bouteloua	*gracilis* Steud.		BG. Poznań/POL
Briza	*australis* Prokud.		BG. IHAR Bydgoszcz/POL
Briza	*elatior* Sibth.& Sm.		BG. IHAR Bydgoszcz/POL
Briza	*maxima* L.		BG. IHAR Bydgoszcz/POL
Bromus	*japonicus* Thunb. ex Murr		BG. Aarhus/DNK
Bromus	*madritensis* L.		BG. Coimbra/PRT
Bromus	*rigidus* Roth		BG. IHAR Bydgoszcz/POL
Chrysopogon	*gryllus* (L.) Trin.		BG. Frankfurt am Main/DEU
Cortaderia	*selloana* Aschers.& Graebn.		Johnsons Seeds/GBR
Deschampsia	*caespitosa* (L.) P.B.	"Goldtau"	BG. Bydgoszcz/POL
Deschampsia	*caespitosa* (L.) P.B.	'Tautrager'	BG. Essen/DEU
Desmazeria	*rigida* (L.) Tutin		BG. Zurich/CHE
Elymus	*canadensis* L.		BG. Jena/DEU
Eragrostis	*neo-mexicana* Vasey		BG. Guyancourt/FRA
Erianthus	*ravennae* (L.) Beauv.		BG. Berlin-Dahlem/DEU
Festuca	*cinerea* Vill.	cv. Azurit	Agric. Acad. Poznań/POL
Festuca	*cinerea* Vill.	cv. Blauglut	Agric. Acad. Poznań/POL
Festuca	*cinerea* Vill.	cv. Blauspatz	Agric. Acad. Poznań/POL
Festuca	*cinerea* Vill.	cv. Silbereiche	Agric. Acad. Poznań/POL
Festuca	*cinerea* Vill.	cv. Silbersee	Agric. Acad. Poznań/POL
Festuca	*ovina* L.	cv. Solling	Agric. Acad. Poznań/POL
Festuca	*scoparia* Kern. ex Nym.		BG. Bonn/DEU
Glyceria	*maxima* (Hartm.)Holmb.	var.*variegata*	Agric. Acad. Poznań/POL
Helictotrichon	*parlatorei* (J. Woods) Pilger		BG. Wrocław/POL
Hordeum	*jubatum* L.		BG.IHAR Bydgoszcz/POL
Hystrix	*patula* Moench		BG. Munster/DEU from Ontario, CAN
Imperata	*cylindrica* (L.) Beauv.		BG. Padova/ITA
Koeleria	*glauca* DC.		BG. IHAR Bydgoszcz/POL
Koeleria	*lobata* Roem. & Schultes		BG. Cluj-Napoca/ROM
Koeleria	*macrantha* (Ledeb.) Schult.		BG. Champex/CHE from Valais, 600 m
Koeleria	*pyramidata* (Lam.) P. Beauv.		BG. Aachen/DEU
Lagurus	*ovatus* L.		BG.IHAR Bydgoszcz/POL
Lamarckia	*aurea* (L.) Moench		BG.IHAR Bydgoszcz/POL
Melica	*altissima* L.		BG.IHAR Bydgoszcz/POL
Melica	*altissima* L.	var. *atropurpurea*	BG. Essen/DEU
Melica	*ciliata* L.		BG. Landskrona/SWE
Melica	*jacquemonti* Decne		BG. Szeged/HUN
Melica	*transsilvanica* Schur		POL174/95, Trzy Korony (Pieniny Mtn.), 987 m
Miscanthus	*sacchariflorus* Hack.		BG.IHAR Bydgoszcz/POL
Miscanthus	*sinensis* Anderss.		BG.IHAR Bydgoszcz/POL
Miscanthus	*sinensis* Anderss.	var.*zebrinus* Matsum.	BG. Wrocław/POL
Molinia	*caerulea* (L.) Moench	var.*variegata* A.A. Beetle	Agric. Acad. Poznań/POL
Neyraudia	*reynaudiana* Keng ex Hitchc.		BG. Liege/BEL from Nat. Park Kao Yai, Thailandia
Panicum	*capillare* L.		BG. Frankfurt am Main/DEU
Panicum	*clandestinum* L.		BG. Leipzig/DEU
Panicum	*virgatum* L.		BG. Washington/USA
Pennisetum	*alopecuroides* (L.) Spreng.		BG. Munchen-Nymphenburg/DEU
Pennisetum	*flaccidum* Griseb.		BG. Kopenhagen/DNK
Pennisetum	*setaceum* (Forsk.) Chiov.		BG. Gran Canaria/ESP
Pennisetum	*villosum* R.Br.		BG.IHAR Bydgoszcz/POL
Phalaris	*arundinacea* L.	var. *luteopicta*	Agric. Acad. Poznań/POL
Phalaris	*arundinacea* L.	var. *picta* L.	BG.IHAR Bydgoszcz/POL
Phalaris	*canariensis* L.		BG.IHAR Bydgoszcz/POL
Pleioblastus	*pygmaeus* (Miq.) Nakai		BG.IHAR Bydgoszcz/POL
Poa	*badensis* Haenke ex Willd.		BG. Halle/DEU

Genus	Species	Subspecies	Origin/donor
Poa	*glauca* Vahl.		BG. Berlin-Dahlem/DEU
Polypogon	*monspeliensis* (L.) Desf.		BG. Leipzig/DEU
Rhynchelytrum	*repens* (Willd.) C.E.Hubb.		BG. Dresden/DEU
Schizachyrium	*scoparium* Nash		Genbank Malchow/DEU
Sesleria	*argentea* Savi		BG. Rennes/FRA
Sesleria	*heufleriana* Schur	subsp. *hungarica* Ujhelyi	BG. Vacratot/HUN
Sesleria	*tatrae* (Degen) Deyl		BG. Leipzig/DEU
Sesleria	*uliginosa* Opiz		BG.IHAR Bydgoszcz/POL
Setaria	*italica* (L.) P. Beauv.	conv. *maxima* Mansf.	BG.IHAR Bydgoszcz/POL
Setaria	*italica* (L.) P. Beauv.	conv. *moharia* Mansf.	BG.IHAR Bydgoszcz/POL
Setaria	*palmifolia* (Koenig) Stapf.		BG. Dresden/DEU
Sorghastrum	*nutans* (L.) Nash		BG. Liege/BEL
Spartina	*pectinata* Bosc ex Link		BG. Wrocław/POL
Spartina	*pectinata* Bosc ex Link	*aureomarginata*	Agric. Acad. Poznań/POL
Spodiopogon	*sibiricus* Trin.		BG. Munster/DEU
Stenotaphrum	*secundatum* Kuntze	*variegatum*	BG. Turku/FIN
Stipa	*capillata* L.		BG. Bern/CHE
Stipa	*capensis* Thunb.		BG. Coimbra/PRT
Stipa	*joannis* Celak.		Exp.1984, Trzeciewnica near Bydgoszcz
Stipa	*lessingiana* Trin.& Rupr.		BG. Wurzburg/DEU
Stipa	*pulcherrima* C. Koch		BG. Rouen/FRA
Stipa	*robusta* (Vasey) Scribn.		BG. Tubingen/DEU
Uniola	*latifolia* Michx.		BG. Bordeaux/FRA

* BG – Botanical Garden
** Stanowisko Naturalne

Table 3. "Ecological" and alternative species in the grass collection of the Botanical Garden in Bydgoszcz

Genus	Species	Subsp./variety	Origin/donor
Agropyron	*cristatum* Beauv.	Fairway	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*cristatum* Beauv.	Kirk	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*cristatum* Beauv.	Parkway	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*desertorum* (Fisch. & Link) Schult.		GBRC Gatersleben/DEU
Agropyron	*desertorum* (Fisch. & Link) Schult.	Nordan	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*elongatum* Host ex Beauv.		BG. Cluj-Napoca/ROM
Agropyron	*glaucum* Roem. et Schult.		BG. Antwerpen/BEL
Agropyron	*intermedium* (Host) Beauv.		BG. Dijon/FRA
Agropyron	*intermedium* (Host) Beauv.	Clarke	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*intermedium* (Host) Beauv.	Greenleaf	West. Reg. Plant Introd. Station, Pullman/USA
Agropyron	*tanaiticum* Nevski		VIR Sankt Petersburg/RUS
Ammophila	*arenaria* (L.) Link		BG. Landskrona/SVE
Andropogon	*gerardi* Vitm.		BG*. Chicago/USA
Andropogon	*gerardi* Vitm.		BG. Jena/DEU
Andropogon	*gerardi* Vitm.	Bison	Plant Material Center, Bismarck/USA
Andropogon	*gerardi* Vitm.	Bonilla	Plant Material Center, Bismarck/USA
Andropogon	*gerardi* Vitm.	Champ	National Seed Stor. Lab., Fort Collins/USA
Andropogon	*gerardi* Vitm.	Kaw	National Seed Stor. Lab., Fort Collins/USA
Andropogon	*gerardi* Vitm.	Pawnee	National Seed Stor. Lab., Fort Collins/USA
Calamovilfa	*longifolia* Hack.		BG. Munchen-Nymphenburg/DEU
Calamovilfa	*longifolia* Hack.	ND–95	Plant Material Center, Bismarck/USA
Elymus	*canadensis* L.	Mandan	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*dahuricus* Turcz.ex Griseb.	Arthur	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*dahuricus* Turcz.ex Griseb.	James	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*farctus* Runemark & Melderis		BG. Rennes/FRA
Elymus	*glaucus* Regel		BG. Bydgoszcz/POL
Elymus	*hispidus* (Opiz) Melderis		BG. Champex/
Elymus	*lanceolatus* Gould	Bannock	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*lanceolatus* Gould	Critana	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*lanceolatus* Gould	Elbee	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*lanceolatus* Gould	Sodar	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*pungens* (Pers.) A. Melderis		BG. Antwerpen/BEL
Elymus	*pungens* ssp. *campestris* A.Love		BG. Guyancourt/FRA
Elymus	*pyracanthus* (Drob.) Nevski		BG. Budapest/HUN
Elymus	*trachycaulus* Gould ex Shinners		BG. Kopenhagen/DNK
Elymus	*trachycaulus* Gould ex Shinners	Primar	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*trachycaulus* Gould ex Shinners	Pryor	West. Reg. Plant Introd. Station, Pullman/USA
Elymus	*trachycaulus* Gould ex Shinners	San Luis	West. Reg. Plant Introd. Station, Pullman/USA
Elytrigia	*pruinifera* Nevski		BG. Guyancourt/FRA
Leymus	*angustus* (Trin.) Pilger	Prairieland	West. Reg. Plant Introd. Station, Pullman/USA
Leymus	*cinereus* (Scribn. & Merr.) A. Love	Magnar	West. Reg. Plant Introd. Station, Pullman/USA
Leymus	*cinereus* (Scribn. & Merr.) A. Love	Trailhead	West. Reg. Plant Introd. Station, Pullman/USA
Leymus	*mollis* (Trin.) Pilger		BG. Moskwa/RUS
Leymus	*multicaulis* (Kar. & Kir.) Tzvel.		VIR Sankt Petersburg/RUS
Leymus	*racemosus* (Lam.) Tzvel.		BG. Moskwa/RUS
Miscanthus	x *giganteus* J.M. Greef & M. Deuter		VITROPLANT, Klein Wanzleben/DEU
Panicum	*virgatum* L.		BG. Washington/USA
Panicum	*virgatum* L.	Alamo	Nat. Germplasm Resour. Lab., Beltsville/USA
Panicum	*virgatum* L.	Blackwell	Nat. Germplasm Resour. Lab., Beltsville/USA
Panicum	*virgatum* L.	Cave-in-Rock	Nat. Germplasm Resour. Lab., Beltsville/USA
Panicum	*virgatum* L.	Dacotah	Plant Material Center, Bismarck/USA
Panicum	*virgatum* L.	Forestburg	Plant Material Center, Bismarck/USA
Panicum	*virgatum* L.	Kanlow	Nat. Germplasm Resour. Lab., Beltsville/USA
Panicum	*virgatum* L.	Pathfinder	National Seed Stor. Lab., Fort Collins/USA
Panicum	*virgatum* L.	Summer	National Seed Stor. Lab., Fort Collins/USA
Panicum	*virgatum* L.	Trailblazer	Nat. Germplasm Resour. Lab., Beltsville/USA
Pascopyrum	*smithii* (Rydb.) A. Love	Rodan	Plant Material Center, Bismarck/USA
Pascopyrum	*smithii* (Rydb.) A. Love	Rosana	West. Reg. Plant Introd. Station, Pullman/USA
Sorghastrum	*nutans* (L.) Nash	Holt	National Seed Stor. Lab., Fort Collins/USA
Sorghastrum	*nutans* (L.) Nash	Lometa	National Seed Stor. Lab., Fort Collins/USA
Sorghastrum	*nutans* (L.) Nash	Osage	National Seed Stor. Lab., Fort Collins/USA
Sorghastrum	*nutans* (L.) Nash	Oto	National Seed Stor. Lab., Fort Collins/USA
Sorghastrum	*nutans* (L.) Nash	Tomahawk	Plant Material Center, Bismarck/USA
Spartina	*pectinata* Bosc. ex Link		BG. Jena/DEU

Forage collections in Portugal

Eliseu Bettencourt
Genebank – Genetics, Estação Agronómica Nacional, Oeiras, Portugal

Status of forage collections held in Portuguese institutes

Genus	Species	No. accessions	Type of sample*	Origin of sample
PRT001 – Banco Português de Germoplasma Vegetal (BPGV), Braga				
Bromus	spp.	13	LR	PRT(13)
Dactylis	*glomerata*	22	WS	
Dactylis	spp.	122	LR	PRT(122)
Festuca	spp.	63	LR	PRT(63)
Holcus	*lanatus*	8	WS	
Lathyrus	spp.	38	LR	PRT(38)
Lathyrus	*sylvestris*	2	LR	PRT(2)
Lathyrus	*tingitanus*	1	LR	
Lolium	*multiflorum*	118	LR	PRT(44)
Lolium	*perenne*	1	WS	
Lotus	*corniculatus*	4	LR	PRT(4)
Medicago	spp.	128	LR	PRT(126)
Ornithopus	*compressus*	9	WS	
Ornithopus	*sativus*	2	WS	
Ornithopus	spp.	15	LR	PRT(13)
Panicum	*miliaceum*	10	LR	PRT(10)
Plantago	*lanceolata*	1	WS	
Plantago	*lanceolata*	1	LR	PRT
Rumex	*obtusifolius*	20		PRT(20)
Rumex	*scutatus*	50		PRT(50)
Scorpiurus	*vermiculatus*	4	LR	PRT(4)
Trifolium	*campestre*	1	WS	
Trifolium	*glomeratum*	4	WS	
Trifolium	*incarnatum*	3	LR	
Trifolium	*repens*	2	WS	
Trifolium	spp.	308	LR	PRT(306)
PRT014 – Secção de Forragens – Departamento de Botânica, Genética e Melhoramento, Estação Agronómica Nacional, Oeiras				
Lathyrus	*articulatus*	8	GS	
Lathyrus	*arvensis*	2	GS	
Lathyrus	*cicera*	4	WS	
Lathyrus	*clymenum*	1	WS	
Lathyrus	*ochrus*	8		
Lathyrus	*sativus*	4	GS;WS	
Lathyrus	*tingitanus*	1	WS	
Trifolium	*alexandrinum*	38	GS;IF	
Trifolium	*resupinatum*	10	GS;WS	
PRT025 – Departamento de Genética e Biotecnologia, Universidade de Trás-os-Montes e Alto Douro, Vila Real				
Dactylis	*glomerata*	45	WS	
Festuca	*arundinacea*	8	WS	
Festulolium		15	WS	
Lolium	*multiflorum*	7	WS	
Lolium	*perenne*	12	WS	

Genus	Species	No. accessions	Type of sample*	Origin of sample
PRT065 – Departamento de Protecção de Plantas, Universidade de Trás-os-Montes e Alto Douro, Vila Real				
Althaea	*officinalis*			PRT
Paronychia	*argentea*			PRT
PRT066 – Departamento de Biologia, Universidade dos Açores, Ponta Delgada, S. Miguel, Açores				
Lotus	*azoricus*		WS	
Rumex	*azoricus*		WS	
PRT071 – Jardim Botânico da Madeira, Funchal, Madeira				
Acacia	*bayleiana*		CU	
Acacia	*longifolia*		CU	
Acacia	*mearnsii*		CU	
Anthyllis	*lemanniana*	1	GS	Madeira
Brachychiton	*acerifolium*		CU	
Echium	*candicans*	1	GS	Madeira
Echium	*nervosum*	1	GS	Madeira
Erythrina	*crista-galli*		CU	
Genista	*tenera*	3	GS	Madeira
Leucaena	*leucocephala*		CU	
Lotus	*glaucus narias*	1	GS	Madeira; Canarias
Lotus	*macranthus*	1	GS	Madeira
Melaleuca	*armilaris*		CU	
Pittosporum	*undulatum*		CU	
Plantago	*arborescens* subsp. *maderensis narias*	7	GS	Madeira;Canarias
Rumex	*maderensis ores*	1	GS	Madeira; Açores
Senna	*corymbosa*		CU	
Teline	*maderensis*	7	GS	Madeira
Tipuana	*tipu*		CU	
Ulex	*europaeus*		CU	
PRT084 – Sector de Pastagens e Forragens, Departamento de Pastagens, Forragens e Proteaginosas (ENMP), Elvas				
Bromus	spp.	7		
Dactylis	spp.	101		
Festuca	spp.	28		
Holcus	spp.	12		
Lathyrus	spp.	74		
Medicago	spp.	375		
Ornithopus	spp.	28		
Scorpiurus	spp.	3		
Trifolium	spp.	183		
Trifolium	*subterraneum*	731		
PRT092 – Departamento Engenharia Biológica e Ambiental, Universidade de Trás-os-Montes e Alto Douro, Vila Real				
Celtis	*australis*	1	WS	PRT
PRT094 – Banco de Genes de Infestantes, Endémicas e em Perigo, Departamento de Protecção de Plantas e Fitoecologia, ISA, Lisboa				
Bromus	*diandrus*	1		
Plantago	*lanceolata*	1		
Ulex	*densus*			

* Type of sample: CU = cultivated; GS = genetic stock; IF = introgressed forms; LR = landraces; WS = wild/weedy species.

Genetic resources of grasses and legumes in Romania

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In this first synthesis report presented to the Working Group, we consider it necessary to make a general estimation of grasslands biodiversity for the two main components.

The geographical location (46° parallel and 25° meridian in the centre of the country) and the geomorphologic diversity with a balanced distribution between plains (33%), hills (36%) and mountain areas (31%) spreading from the Black Sea, the Danube floodplain and delta up to altitudes exceeding 2500 m asl in the Carpathians (nearly 60% of this chain), provide a wide range of conditions which give Romania (237.5 km²) one of the richest biological diversity in Europe (Fig. 1).

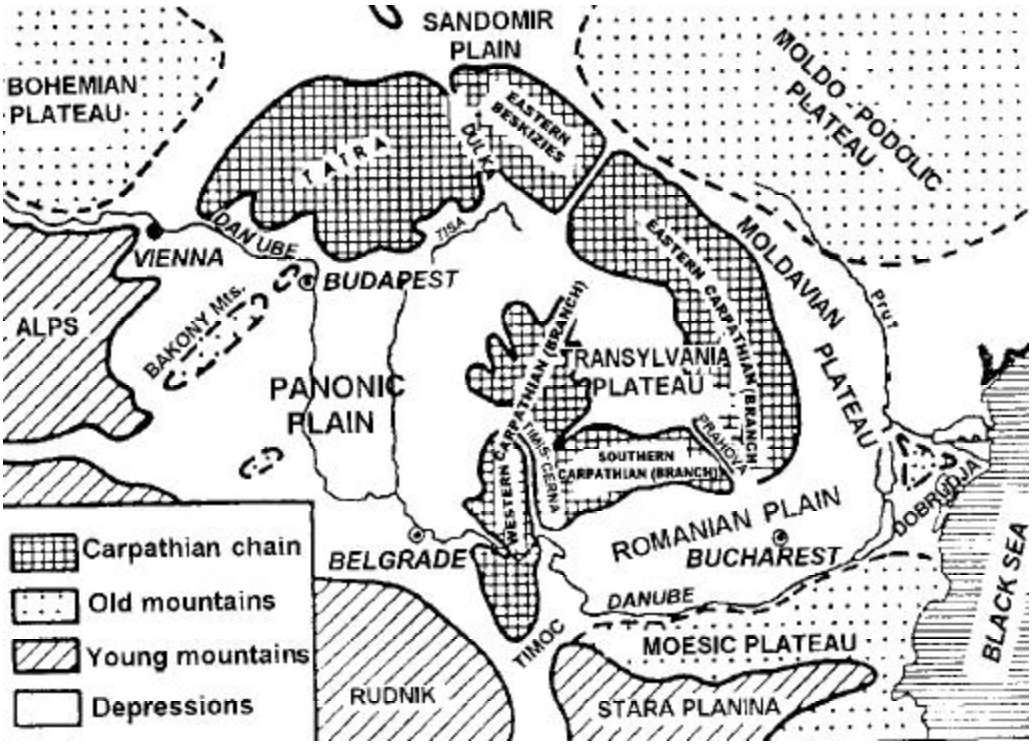

Fig. 1. The Carpathian chain.

Climate and soil conditions determine a primary zone and intrazonal units of vegetation, from the coast up to 2544 m at the Romanian peak Moldoveanu in the Fagaras Mountains.

After the intervention of man and his animals, the forest vegetation was replaced by grass vegetation resulting in natural pastures of secondary origin which together with the natural grasslands of primary origin (alpine, steppe, silvo-steppe, floodplains, salty soils, sandy soils, etc.) currently cover over 4.9 million ha, i.e. 20% of the country's area.

There are 1.3 million ha grasslands in the plain, 2.2 million ha in hills and tableland (200–800 m asl), 1.4 million ha in the mountains, including 250 000 ha subalpine and alpine pastures.

Table 1 lists the principal genera and number of taxa of the families Gramineae (Poaceae) and Leguminosae (Fabaceae) in grasslands, according to the *Romanian Flora* vol. V (1957) and vol. XII (1972).

Table 1. Number of species, subspecies, varieties, forms and hybrids in the families Gramineae and Leguminoseae in natural grasslands

No.	Genus	Species	Subspecies	Varieties	Forms	Hybrids	Total
Gramineae							
1	*Aegilops*	2	3				5
2	*Aeluropus*	1					1
3	*Agropyron*	11	1	27	23	1	63
4	*Agrostis*	8	4	18	19		49
5	*Aira*	2		1			3
6	*Alopecurus*	6		3	6		15
7	*Ammophila*	1					1
8	*Anthoxanthum*	1		4	3		8
9	*Apera*	2		2	2		6
10	*Arrhenatherum*	1		4	7		12
11	*Beckmannia*	1			3		4
12	*Botriochloa*	2					2
13	*Brachypodium*	3		7	3		13
14	*Briza*	1			6		7
15	*Bromus*	18		44	36	2	100
16	*Calamagrostis*	7		9	2	1	19
17	*Catabrosa*	1			4		5
18	*Chrysopogon*	1		1			2
19	*Cleistogenes*	2					2
20	*Crypsis*	1		1	1		3
21	*Cynodon*	1		2	2		5
22	*Cynosurus*	2			1		3
23	*Dactylis*	2		6	2		10
24	*Danthonia*	1		4			5
25	*Deschampsia*	2		8	5		15
26	*Digitaria*	3		1	2		6
27	*Elymus*	1	2				3
28	*Eragrostis*	3		1			4
29	*Erianthus*	2					2
30	*Festuca*	32	22	52	87	3	196
31	*Glyceria*	4		8			12
32	*Haynaldia*	1		1			2
33	*Heleochloa*	2					2
34	*Helictotrichon*	8		4	5		17
35	*Hierochloe*	2					2
36	*Holcus*	2		2			4
37	*Hordelymus*	2					2
38	*Hordeum*	4	4		1		9
39	*Koeleria*	6	2	16	3	1	28
40	*Lolium*	4		11	7	1	23
41	*Melica*	5	2	3	24		34
42	*Milium*	2		2	1		5
43	*Molinia*	1	3	4			8
44	*Nardus*	1					1
45	*Oreochloa*	1			1		2
46	*Oryzopsis*	2					2
47	*Phalaris*	2	1				3
48	*Phleum*	7	4	7	3		21
49	*Pholiurus*	1					1
50	*Phragmites*	1		3	1		5
51	*Poa*	24	8	52	49		133
52	*Psilurus*	1			1		2
53	*Puccinellia*	4		5	3		12
54	*Sclerochloa*	1					1
55	*Secale*	2					2
56	*Sesleria*	5	4	2	7		18
57	*Sieglingia*	1			2		3
58	*Stipa*	10	2	3	3		18
59	*Trisetum*	4		8	4		16
60	*Ventenata*	1			1		2
61	*Vulpia*	3			1		4
Total Gramineae		**235**	**62**	**326**	**331**	**9**	**963**

No.	Genus	Species	Subspecies	Varieties	Forms	Hybrids	Total
Leguminosae							
1	*Anthyllis*	1	3	1	9		14
2	*Astragalus*	34		14	29		77
3	*Coronilla*	6			7		13
4	*Dorycnium*	2			5		7
5	*Galega*	1			1		2
6	*Genista*	10	2	10	11		33
7	*Glycyrrhiza*	3					3
8	*Hedysarum*	2					2
9	*Lathyrus*	25		29	19		73
10	*Lotus*	4		8	3		15
11	*Medicago*	11		12	21		44
12	*Melilotus*	6		4	7	2	19
13	*Onobrychis*	5		1	4		10
14	*Ononis*	5		5	2		12
15	*Ornithopus*	2					2
16	*Oxytropis*	5	2	2			9
17	*Psoralea*	1		2			3
18	*Tetragonolobus*	2					2
19	*Trifolium*	38	2	32	71	5	148
20	*Trigonella*	5					5
21	*Vicia*	30	1	32	25		88
Total Leguminosae		**198**	**10**	**152**	**214**	**7**	**581**

Among grasses the most representative are species of the genera *Festuca* (32), *Poa* (24), *Bromus* (18), *Agropyron* (11), *Stipa* (10), *Agrostis* (8), *Helictotrichon* (8), *Calamagrostis* (7), *Phleum* (7) and *Alopecurus* (6), and among legumes the genera *Trifolium* (38), *Astragalus* (34), *Vicia* (30), *Lathyrus* (25), *Medicago* (11), *Genista* (10), *Melilotus* (6), *Coronilla* (6), *Onobrychis* (5) and *Oxytropis* (5). Those 61 grasses genera with 963 taxa, and 21 legumes genera with 581 taxa, to which must be added a huge number of ecotypes, provide an image of the genetic resources which await investigation.

The following researchers worked in this field: at the Grassland Research Institute–Brasov, A.J. Kovacs (1975–90), M. Balan (1986–95), Gh. Dologa (1991–97) and T. Marusca (1998 to present); at the Suceava Genebank, M. Cristea (1985) and at present M. Avramiuc; we thank them for their contribution presented below (Table 2).

The active collections (4–6^{0}C) of both institutes comprise 1652 new and old samples which need to be regenerated. Besides these seed collections, clones are also kept in the following institutes in the Academies of Agricultural Sciences and Forestry:

- Grassland Research Institute, Brasov, Breeding department for *Dactylis glomerata, Festuca arundinacea, F. pratensis, F. rubra, Lolium perenne, Poa pratensis, Trifolium repens* and *Lotus corniculatus*
- Grassland Research Station, Timisoara for *Lotus corniculatus, Trifolium repens* and *Lolium perenne*
- Grassland Research Station, Vaslui for *Bromus inermis, Onobrychis viciifolia* and *Agropyron pectiniforme*
- Grassland Research Station, Jucu-Cluj for *Festuca arundinacea* and *Dactylis glomerata.*
- Research Institute for Cereals and Industrial Crops, Fundulea for *Medicago sativa* and *Lolium multiflorum*
- Agricultural Research Station, Suceava for *Phleum pratense*
- Agricultural Research Station, Caracal for *Pisum arvense.*

Other collections are kept at the Agricultural University in Cluj-Napoca for *Trifolium pratense, T. repens* and *Onobrychis viciifolia* and at the University in Iasi for *Bromus inermis.* Many of these species of grasses and legumes are conserved *in situ* in 263 official natural reserves. These activities are also carried out in the Botanical Gardens of Cluj-Napoca, Iasi, Bucuresti, Craiova, Timisoara and Jibou.

We hope that this report will contribute to the conservation of Romanian forage genetic resources and their integration in the European area and economy.

Table 2. Active collections of forage grasses and legumes

Current number	Genus	Species	No. of accessions		Total
			Genebank*	GRI Brasov	
1	*Agrostis*	*alba*	1	4	5
2	*Agrostis*	*gigantea*	2	7	9
3	*Agrostis*	*stolonifera*	1	1	2
4	*Agrostis*	*tenuis*	11	62	73
5	*Alopecurus*	*pratensis*	3	0	3
6	*Anthyllis*	*vulneraria*	3	0	3
7	*Arrhenatherum*	*elatius*	6	9	15
8	*Astragalus*	*cicer*	1	0	1
9	*Astragalus*	*glycyphyllos*	1	0	1
10	*Brachypodium*	*pinnatum*	1	0	1
11	*Bromus*	*erectus*	6	10	16
12	*Bromus*	*inermis*	1	0	1
13	*Coronilla*	*varia*	1	0	1
14	*Cynosurus*	*cristatus*	1	0	1
15	*Dactylis*	*glomerata*	35	58	93
16	*Deschampsia*	*caespitosa*	2	0	2
17	*Festuca*	*arundinacea*	17	52	69
18	*Festuca*	*gigantea*	2	2	4
19	*Festuca*	*heterophylla*	2	8	10
20	*Festuca*	*pratensis*	25	56	81
21	*Festuca*	*rubra*	31	72	103
22	*Festuca*	*vaginata*	1	0	1
23	*Festuca*	*valesiaca*	3	0	3
24	*Holcus*	*lanatus*	2	0	2
25	*Lathyrus*	*latifolius*	1	0	1
26	*Lathyrus*	*pratensis*	2	0	2
27	*Lathyrus*	*sativus*	1	0	1
28	*Lathyrus*	sp.	1	0	1
29	*Lathyrus*	*sylvestris*	1	0	1
30	*Lolium*	*perenne*	74	254	328
31	*Lotus*	*corniculatus*	6	14	20
32	*Medicago*	*falcata*	2	0	2
33	*Medicago*	*lupulina*	8	0	8
34	*Medicago*	*sativa*	9	0	9
35	*Melilotus*	*albus*	3	5	8
36	*Melilotus*	*officinalis*	4	0	4
37	*Onobrychis*	*transcaucasica*	1	0	1
38	*Onobrychis*	*viciifolia*	1	1	2
39	*Phalaris*	*arundinacea*	0	12	12
40	*Phleum*	*montanum*	1	0	1
41	*Phleum*	*pratense*	31	11	42
42	*Phleum*	sp.	1	0	1
43	*Pisum*	*sativum*	99	0	99
44	*Poa*	*nemoralis*	1	2	3
45	*Poa*	*pratensis*	2	40	42
46	*Trifolium*	*alpestre*	1	0	1
47	*Trifolium*	*arvense*	3	0	3
48	*Trifolium*	*campestre*	2	0	2
49	*Trifolium*	*fragiferum*	4	0	4
50	*Trifolium*	*hybridum*	8	0	8
51	*Trifolium*	*medium*	1	0	1
52	*Trifolium*	*montanum*	7	0	7
53	*Trifolium*	*ochroleucum*	5	0	5
54	*Trifolium*	*pannonicum*	10	0	10
55	*Trifolium*	*pratense*	20	25	45
56	*Trifolium*	*repens*	16	10	26
57	*Trisetum*	sp.	1	0	1
58	*Vicia*	*faba*	440	0	440
59	*Vicia*	*cracca*	5	0	5
60	*Vicia*	*hirsuta*	2	0	2
61	*Vicia*	*sativa*	1	0	1
62	*Vicia*	*tetrasperma*	1	0	1
63	*Vicia*	*villosa*	2	0	2
TOTAL			**937**	**715**	**1652**

* Genebank Suceava, 1 Decembrie 1918 Str., No. 17, 5800 Suceava, Romania.

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Perennial fodder crops in the collection of Vavilov Institute: taxonomic diversity and breeding value

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The collection of the Forage Crops Department of the Vavilov Institute consists of 21 943 accessions in the base collection and 6366 in the working collection. These accessions belong to 486 species. Breeding varieties exist for approximately 50 species of the collection.

Several large taxonomic groups are represented in the collection: legumes (Fabaceae), grasses (Poaceae), and a number of families with a limited use in plant industry – Polygonaceae, Asteraceae, Chenopodiaceae, etc.

Legumes – Fabaceae Lindley

Seventeen genera of the Fabaceae family are represented in the collection. The main part of the collection is formed by accessions of *Medicago* L. (18 perennial and 32 annual species, 3402 accessions) and *Trifolium* L. (40 species, 5263 accessions). The legume collection contains 10.5% landraces and obsolete varieties, 36.5% native and foreign breeding varieties, and 53% wild-growing accessions from almost all geographical and ecological regions of the former USSR. Only three legume species play an important role in plant industry (*Medicago sativa* L., *M. varia* Mart., *Trifolium pratense* L.). Another nine species are well known by breeders, but they have limited use (*Onobrychis arenaria* (Kit.) DC., *O. transcaucasica* Grossh., *Lotus corniculatus* L., *Trifolium repens* L., *T. hybridum* L., *Medicago falcata* L., *Melilotus albus* Medik., *M. officinalis* (L.) Pall.). Varieties exist for 11 other species of the genera *Onobrychis*, *Medicago*, *Trifolium*, *Galega*, etc. The vast and diverse genera *Astragalus* L. and *Oxytropis* DC., which are represented in the collection by 37 species, are not used in plant breeding and industry. The collection plays an important role in breeding of perennial fodder legumes in the former USSR and Russia. Forty-three percent of all varieties which were created in former USSR and 76% of the varieties created after 1984 were derived from the accessions of the VIR collection (alfalfa: 83% and 96% of varieties respectively).

Grasses – Poaceae Barnh.

Eighteen genera are represented in the collection. The largest are the collections of *Phleum* (2 species, 1370 accessions), *Dactylis* (6 species and subspecies, 1056 accessions) and *Festuca* (27 species, 1879 accessions). The collection is represented by native landraces and breeding varieties (8%), foreign breeding varieties (17%) and wild-growing material mostly from the former USSR (75%). Most wild accessions were collected in the northwestern region of Russia and in Kazakstan and Central Asia. Only six species of grasses are widely used in agricultural practice, so the collection is a great reserve of diversity for plant breeding. The role of the collection in current breeding programmes is comparatively high. Twenty-eight percent of all breeding varieties and 60% of the varieties derived after 1984 were obtained from the accessions of the collection.

Non-traditional silage crops

The specimens of families Amaranthaceae (*Amaranthus)*, Apiaceae (*Heracleum*, *Archangelica*), Asteraceae (*Inula*, *Rhaponticum*, *Sylphium*, *Phacelia*), Boraginaceae (*Symphytum*), Polygonaceae (*Polygonum*, *Rumex*) form the group of non-traditional silage crops (265 accessions). This group is represented in the collection by wild-growing accessions from all geographical regions of the former USSR.

Non-traditional arid fodder crops

The group of non-traditional arid fodder crops (32 accessions in the laboratory storage and approximately 800 preserved in the field at the Astrakhan Research Station and Research Station for the Plant Genetic Resources of Kazakstan) is represented by the wild-growing accessions of the specimens of the families Chenopodiaceae (*Kochia*, *Ceratoides*, *Halymodendron*, *Salsola*) and Polygonaceae (*Calligonum*) from steppe and desert regions of the former USSR. In spite of the rather limited period of breeding of these cultures, a number of varieties were created, which are used in Uzbekistan and Kazakstan. The important role of the fodder crops department collection in their breeding must be mentioned. All current varieties of arid cultures were created from the accessions of the collection.

The mobilization of new genetic material is ongoing. During the last 5 years researchers of the department have carried out expeditions in the countries of the former USSR (Russia – Central region, Northern Caucasus, Altai Mountains; Kazakstan – western and southern regions; Uzbekistan – mountain and desert regions; Ukraine).

Organization

Eight curators conduct the work with the collection: PhD Natalie Yu. Malysheva – cultivated and wild species of alfalfa; PhD Vladimir F. Chapurin – red, hybrid and white clover and wild species of clover; PhD Olga V. Duk – sweet clover and sainfoin; Natalie V. Rakovskaya – non-traditional cultures; Ph.D. Irina A. Tikhomirova – tall grasses; PhD Lyudmila M. Chetvertnykh – low and amenity grasses; PhD Leonid L. Malyshev – arid grasses and arid cultures.

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Status of national forage collections in the Slovak Republic

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The Research Institute of Plant Production is the coordinator of the National Cultural Plants Genepool Protection Programme in the Slovak Republic. Since April 1999 a coordination project was approved, involving five organizations; other institutes are financed by the state through grants of the Ministry of Agriculture of the Slovak Republic. The participating institutes are coordinated by the Board of Plant Genetic Resources which holds meetings usually twice a year. RIPP, through the Gene Bank, is in charge of the conservation and documentation of plant genetic resources for all Slovakia.

Forage genetic resources (GR) are being dealt with in three stations in Slovakia: RIPP Piešťany (forage legumes), Breeding station Levočské Lúky (grasses) and Breeding station Horná Streda (forage legumes).

Within forage GR, RIPP deals with the collecting, study, evaluation, characterization and conservation of species of the Fabaceae family. Alfalfa, red clover and birdsfoot trefoil are bred in three breeding stations belonging to the Research Institute. The main activity of Horná Streda and Levočské Lúky breeding stations is the breeding of legumes and/or grasses.

Research Institute of Plant Production, Piešťany

Jarmila Drobná, Curator, *Medicago* sp., *Trifolium* sp., other forage legumes
Michaela Benková, Curator, *Lupinus* sp., *Lathyrus* sp.

Table 1. Forage collection in RIPP

Genus	Number of accessions
Anthyllis L.	16
Astragalus L.	17
Coronilla L.	8
Lathyrus L.	43
Lotus L.	69
Lupinus L.	31
Medicago L.	315
Melilotus Mill.	30
Onobrychis Mill.	30
Trifolium L.	436
Trigonella L.	1
Total	**996**

Table 2. Details on forage legumes collections (status by 31 October 1999)

Genus and species	Advanced cultivars	Landraces	Wild	Breeder's lines	Others	Total
Anthyllis vulneraria L.	1	–	14	–	1	16
Astragalus australis (L.) Lamk.	–	–	1	–	–	1
Astragalus cicer L.	3	–	–	9	–	12
Astragalus glycyphyllos L.	–	–	4	–	–	4
Coronilla varia L.	1	–	7	–	–	8
Lathyrus sativus L.	2	40	–	–	1	43
Lotus corniculatus L.	20	–	40	1	1	62
Lotus ornithopoides L.	1	–	–	1	–	2
Lotus pedunculatus Cav.	1	–	–	–	–	1
Lotus uliginosus Schkuhr	–	–	2	–	–	2
Lotus sp.	–	–	–	–	2	2
Lupinus albus L.	13	–	–	–	–	13
Lupinus angustifolius L.	7	–	–	–	–	7
Lupinus luteus L.	11	–	–	–	–	11
Medicago arabica (L.) Huds.	–	–	1	–	–	1
Medicago falcata L.	2	–	14	8	5	29
Medicago lupulina L.	1	–	25	–	–	26
Medicago minima L.	–	–	3	–	–	3
Medicago orbicularis (L.) Bartal.	–	–	2	–	–	2
Medicago polychroa Grossh.	1	–	–	–	–	1
Medicago romanica Prodan	–	–	5	–	–	5
Medicago sativa L.	179	2	11	35	3	230
Medicago x *varia* Martyn	16	–	1	–	1	18
Melilotus alba Med.	4	–	10	–	–	14
Melilotus dentata (W. et K.) Pers.	–	–	–	–	1	1
Melilotus neapolitanus Ten.	–	–	1	–	–	1
Melilotus officinalis (L.) Pallas	2	–	3	3		8
Melilotus tauricus (M.B.) Ser.	–	–	2	–	–	2
Melilotus sp.	–	–	2	–	2	4
Onobrychis viciaefolia Scop.	19	–	11	–	–	30
Trifolium alexandrinum L.	6	–	–	–	–	6
Trifolium alpestre L.	–	–	1	–	–	1
Trifolium angustifolium L.	–	–	1	–	–	1
Trifolium arvense L.	–	–	7	–	–	7
Trifolium aureum Pollich	–	–	10	–	–	10
Trifolium campestre Schreb.	–	–	2	–	–	2
Trifolium caucasicum Tausch	–	–	2	–	–	2
Trifolium dubium Sibth.	–	–	1	–	–	1
Trifolium fragiferum L.	–	–	2	–	–	2
Trifolium hybridum L.	4	–	8	3	–	15
Trifolium hirtum All.	–	–	1	–	–	1
Trifolium incarnatum L.	1	–	–	–	–	1
Trifolium medium L.	–	–	15	–	–	15
Trifolium montanum L.	–	–	4	–	–	4
Trifolium ochroleucon Huds.	–	–	1	–	–	1
Trifolium pannonicum Jacq.	–	–	1	–	–	1
Trifolium pratense L.	168	–	47	20	9	244
Trifolium repens L.	71	–	41	1	–	113
Trifolium resupinatum L.	6	–	–	–	–	6
Trifolium rubens L.	–	–	1	–	–	1
Trifolium semipilosum Fres.	1	–	–	–	–	1
Trifolium subterraneum L.	–	–	1	–	–	1
Trigonella cretica (L.) Boiss	–	–	1	–	–	1
Total	**541**	**42**	**306**	**81**	**26**	**996**

The survey does not include accessions obtained in collecting expeditions in 1999.

Maintenance of collections and regeneration

In 1998, those accessions with required germinating capacity and sufficient amount were stored in the new Gene Bank in the active (0°C) and base (–18°C) collections. Other accessions are stored in the working collection (+5°C) (regeneration is needed).

In 1997-99, the 104 accessions of forage legumes were multiplied, 50 in technical isolation. Our effort in this field is much limited by finances.

Table 3. Number of forage GR stored in the Gene Bank and regeneration need

Species	No. of accessions			Accessions in need of regeneration† (%)
	Total	Medium–term storage	Long-term storage	
Medicago sp.	315	146	126	54
Trifolium sp.	436	280	171	35
Others	245	101	27	60
Total	**996**	**527**	**324**	**49**

† storage in the working collection.

Availability and utilization of genetic resources

About 70% of accessions are available in limited quantities on an exchange basis.

Since 1997 some 250 accessions of different forage legumes have been distributed to breeders, researchers and to other users in Slovakia and abroad.

Evaluation status

The majority of the forage legumes GR obtained is included in the experiments as soon as possible, to evaluate morphological, biological and economic characters. This concerns several tens of characters; available descriptors, national and international, are used, or as the case may be, requirements of breeders are taken into account for this evaluation.

Records are so far mostly manual, presented in the form of reports on experiments; they are available to interested users, e.g. breeders.

In 1997–99, 249 forage GR were evaluated.

New classifiers for particular forage species are currently being prepared, using IPGRI descriptors and old national classifiers.

In 1998 a computerized database of descriptive data was created. It now includes 204 accessions of forage legumes with all available evaluation data.

Documentation status

In 1997, the structure of the databases was transformed according to the Forage Passport Descriptor List and data on *Poa, Lolium, T. repens, Dactylis, Festuca, Arrhenatherum, Trisetum, Medicago, T. pratense* and other perennial forage legumes were sent to the European Forage Databases.

Databases were extended by adding new accessions obtained during the last two years. Data on *Pisum*, *Lupinus*, *Lathyrus*, *Faba, Vicia* and other grass and clover species are ready to be sent too.

Safety-duplication

There is no safety-duplication. In the future, the accessions will be duplicated in the Gene Bank in VURV Praha-Ruzyně, Czech Republic. Preparation and especially regeneration will take a long time. The first accessions could be safety-duplicated in 2001 approximately.

Plant Breeding Station Levoské Lúky

Mária Lorková, Curator

Table 4. Details on grasses collections

Genus and species	Advanced cultivars	Wild	Breeder's lines	Total
Agrostis L.	–	6	–	6
Agrostis stolonifera L.	9	8	–	17
Agrostis tenuis Sibth.	8	45	–	53
Alopecurus L.	6	10		16
Arrhenatherum elatius P. Beauv.	9	19	–	28
Briza L.	–	4	–	4
Bromus L.	–	1	–	1
Cynosurus L.	2	9		11
Dactylis L.	45	162		207
Deschampsia caespitosa (L.) P.Beauv.	2	24	3	29
Festuca arundinacea Schreb.	32	4	4	40
Festuca L.	–	8	–	8
Festuca ovina L.	12	41	–	53
Festuca pratensis Huds.	59	477	–	542
Festuca rubra L.	48	25	1	74
x *Festulolium* Aschers. et.Graebn.	4	–	–	4
Hierochloe R.Brown	–	1	–	1
Koeleria Pers.	–	1	–	1
Lolium x *hybridum* Hausskn.	12	–	–	12
Lolium multiflorum Lamk.	32	–	–	32
Lolium perenne L.	98	131	10	239
Nardus stricta L.	–	2	–	2
Phleum L.	3	4	–	7
Phleum pratense L.	29	58	4	91
Poa L.	7	25	–	32
Poa pratensis L.	97	104	7	208
Phragmites Adans.	–	2	–	2
Trisetum Pers.	2	22	–	24
Total	**517**	**1191**	**35**	**1743**

Maintenance of collections and regeneration

So far the accessions are stored in working collection conditions. In 1999 39 accessions were stored in the active collection and 12 in the base collection in the Gene Bank in Piešťany. In 1997, 25 GR of grasses were multiplied.

Evaluation status

In 1997, 210 GR of grasses were evaluated.

Documentation status

Some passport data are available for 1668 accessions, in a new structure.

Duplication sites

Not duplicated.

Availability of genetic resources

Available in limited quantity (about 25%).

Plant Breeding Station Horná Streda

Marta Lazar…íková, Miroslav Vavák, Curator, *Vicia* sp.
Miroslav Vavák, Curator, *Faba* sp.
Zdenék Slamena, Jozef Štefanka, Curator, *Pisum* sp.

Table 5. Status of forage legumes collections

Species	Advanced cultivars	Landraces	Wild	Breeder's lines	Others	Total
Faba vulgaris L.	100	10	9	1	7	127
Pisum sativum conv. *speciosum*	155	12	–	54	–	221
Vicia sativa L.	119	4	–	7	4	134
Vicia villosa Roth.	1	–	–	–	–	1
Total	**375**	**26**	**9**	**62**	**11**	**483**

Maintenance of collection and regeneration

Table 6. Number of forage legumes GR stored in Gene Bank and in need of regeneration

Species	No. of accessions		% of accessions in need of regeneration
	Medium-term storage	Long-term storage	
Faba sp.	22	4	57
Pisum sp.	20	20	40
Vicia sp.	13	10	64
Total	**55**	**34**	

Other accessions are stored in the working collection.

In 1997–99, 53 accessions of *Vicia* sp., 51 of *Faba vulgaris* and 40 of *Pisum sativum* convar. *speciosum* were multiplied. Some of these accessions will be stored in the Gene Bank.

Evaluation status

In 1997–99, 94 accessions of *Vicia* sp., 75 of *Faba vulgaris* and 26 of *Pisum sativum* convar. *speciosum* were evaluated. The manual descriptive data are available for 306 accessions.

Documentation status

At present, the passport data of the following GR are available: 14 of *Vicia* sp., 22 of *Faba vulgaris* and 20 of *Pisum sativum* convar. *speciosum*; the manual passport data of 411 accessions are available.

Duplication sites

Not duplicated.

Availability of genetic resources

Available in limited quantity (about 30%).

Status of the forage collection in Slovenia

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Introduction

Landscape diversity in the territory of Slovenia is a result of natural characteristics and a long history of human colonization and various land uses. The main attribute of the diversity is a small mosaic structure and changing appearance on short distances. Farming adapted to the natural conditions by application of different methods thus became the main factor in the development of the Slovenian countryside. It also contributed considerably to the changing face of the landscape. The main bioregions reflect the diversity of Slovenian landscapes, yet the transition between the Alps and the other regions is particularly outlined as "the pre-alpine landscapes". Within these regions micro-factors build up the mosaic of small characteristics and diverse landscape structures. As a result, many different ecotypes of grasses and clovers can be found in the extensive grassland area of Slovenia.

Early projects to collect Slovenian autochthonous populations, ecotypes and landraces of agricultural species with the goal of breeding new and improved cultivars were initiated about 35 years ago. In the framework of the former Yugoslavia during the late 1980s a programme started with the task to collect plant genetic resources for the Yugoslav Gene Bank. After the independence of Slovenia, the Slovenian Ministry of Science and Technology financed the initiation of a genebank of vegetables, potato, fodder plants, grasses, clovers, small fruits and grapevine. In 1996 the Ministry of Agriculture, Forestry and Food started financing the Slovene genebank programme with the aim of maintenance, evaluation, regeneration and preservation of Slovenian autochthonous species, ecotypes, populations and landraces of agricultural plants.

Forages collection

The Slovene genebank system consists of two working collections for forage grasses and clover species housed at the **Biotechnical Faculty of the University of Ljubljana** and at the **Agricultural Institute of Slovenia.** The whole collection consists of 638 accessions of 20 different forage species (Table 1), where the Biotechnical Faculty of the University of Ljubljana holds 91 legume accessions and 39 grass accessions and the Agricultural Institute of Slovenia 224 legume accessions and 284 accessions of grasses.

Table 1. Forage species accessions held at the Slovenian genebank

Genus	Wild	Advanced cultivars and breeder's lines
Trifolium	227	3
Medicago	26	5
Vicia	18	–
Lotus	13	–
Other legumes	23	–
Total clovers	**307**	**8**
Lolium	48	2
Festuca	49	9
Phleum	48	1
Poa	13	5
Dactylis	68	1
Agrostis	8	1
Alopecurus	17	–
Other grasses	53	–
Total grasses	**304**	**19**
Total	**611**	**27**

The collection includes material of economically important forage species. Most of the accessions were collected through short collecting missions throughout Slovenia. In 1999 a cooperative project was initiated with the Czech Gene Bank for several week-long collecting expeditions in Slovenia and Czech Republic. The first joint collecting trip included two northwestern regions of Slovenia: Gorenjska and Primorska.

Characterization/evaluation

Last year we started to evaluate 39 white clover and 13 timothy accessions. White clover hills were evaluated for profuseness of bloom, field pest and disease susceptibility, and plant habit. There are fairly large differences in internode length and bloom profuseness between accessions. One accession showed absence of pests and diseases.

Evaluation of timothy accessions was set up in four repetitions, which will help us to assess some basic characters, as well as herbage yield.

Documentation

In 1999 we started developing an information and database management system for the Slovenian genebank. All the forage species accessions are well documented for IPGRI minimum passport descriptors, although some minor gaps exist. So far no characterization / evaluation data are included.

Storage

Seeds dried to the moisture content of approx. 5–7% are stored in glass jars in a vault with medium-term storage conditions of 4^{0}C. We plan to start storing seed samples on a long-term basis as soon as the collection grows enough for this activity to become economically feasible.

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Collections of forage grasses in northern Spain

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There are two organizations maintaining collections of forage grasses in the north of Spain: the Misión Biológica de Galicia (MBG) at Pontevedra and the Centro de Investigaciones Agrarias de Mabegondo (CIAM) at A Coruña.

A National Coordination Project including these collections is presently being carried out in Spain. The main objectives are (1) to inventory all national accessions and to introduce the passport data in a database, in dBaseIV or Access, (2) to regenerate those accessions with low seed viability, (3) to characterize forage grass accessions based on morphological and important agronomic traits, and (4) to establish dissimilarity groups with the aim to establish a core collection in each of the specific collections of CIAM and MBG.

Germplasm bank of the Misión Biológica de Galicia (MBG) at Pontevedra

MBG is a research institute devoted to plant breeding and plant genetic resources. MBG is carrying out a programme of collecting and conservation of landraces and natural populations of several important crops (maize, legumes, grasses and brassica crops) from the northern areas of Spain. The *Dactylis glomerata* (cocksfoot) collection includes more than 500 Galician natural cocksfoot accessions, 32 of them are diploids (subsp. *izcoi*), 13 tetraploids (subsp. *marina*), 81 coastal tetraploids (subsp. *glomerata*) and 375 inland tetraploids (subsp. *glomerata*). All the seeds are maintained in cold storage at 0–4ºC and 45–55% relative humidity.

A database file of all these accessions was sent to the European *Dactylis* database. The study of the geographic distribution and genetic resources of cocksfoot in Galicia was carried out by Lindner and García (1997). Between 1995 and 1999, 75 accessions were multiplied. These multiplied accessions are being characterized according to the IBPGR protocol with the aim to establish a core collection in 2000.

Germplasm bank of the Centro de Investigaciones Agrarias de Mabegondo (CIAM) at A Coruña

CIAM is a research centre on pastures and animal production. CIAM is carrying out a programme of collecting and conservation of landraces and natural populations of maize and forage grasses from the northern areas of Spain.

CIAM collected *Lolium* (ryegrasses) and *Festuca* (tall fescue) species from the north of Spain in the 1980s and 1990s. At each collecting site, seeds from at least 50 plants were taken from an ecologically homogenous area of 100–1000 m^2. Seeds of all plants were bulked, without balancing the contribution of each plant. Seed was stored in manila packets at 0–4ºC and 45–50% relative humidity. Geographical data (latitude and longitude) were recorded for each sample and are available on request. A database file of all these accessions was sent to the European *Lolium* and *Festuca* databases. Germplasm collected usually requires an initial seed increase before storage and distribution. Between 1995 and 1999, 49 accessions were multiplied.

Multiplication is conducted at CIAM (43º15' N, 8º18'W) near the coast (100 m elevation) on a silt loam soil. Multiplication is carried out in sheltered fields to allow around 100 plants per accession to intercross panmictically. For isolation, plots of each accession are surrounded by long-culm winter wheat or rye in densely packed patches, 1.40 m high, 20 m thick. Muslin bags are used to avoid natural seed dispersal of the plants in the fields. Out of the seed obtained, around 3000 seeds are sent to the National Gene Bank of Spain (CRF) at Alcalá de Henares (Madrid) and at least 3000 seeds are stored at CIAM. As reported in other publications, native populations of perennial and Italian ryegrasses collected in northern

Spain show a high variability for morphologic, agronomic and isozyme characters (Oliveira *et al.* 1997a, 1997b; Oliveira and Charmet 1998). An example is seen among our collections, on the better winter production of some local populations of ryegrasses compared to commercial cultivars.

The CIAM collection has 140 Spanish accessions of ryegrasses and tall fescue species. The distribution is the following: 75 of perennial ryegrass, 41 of Italian ryegrass and 24 of tall fescue. These accessions are being characterized according to the IBPGR protocol with the aim to establish a core collection in 2000.

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Status of the national forage collection in Switzerland

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Change of Representative to the ECP/GR Working Group on Forages

Owing to the current restructuration of the Swiss Federal Research Stations, becoming effective 1 January 2000, the breeding work on forages is being concentrated at the Station of Reckenholz (Swiss Federal Research Station for Agroecology and Agriculture, Zürich). This means that forage breeding is terminated at Changins (Swiss Federal Research Station for Agronomy, Nyon), and the programmes on *Festuca, Dactylis* and *Poa,* initiated by Sam Badoux and later pursued by Arnold Schori, are being transferred to Zurich. Based on this change, it appeared reasonable to replace Arnold Schori, who becomes responsible for the winter wheat programme at Changins, by myself (Beat Boller) of Zürich-Reckenholz, as the National Representative to the ECP/GR Working Group on Forages. The genebank collection itself stays at Changins under the responsibility of Gert Kleijer. I thank Sam Badoux and Arnold Schori for promoting the contact with the Group and hope to be able to contribute significantly to its work in the future.

Current status of national collection

There has been no change in the contents of the national collection since the survey of 1997.

Future activities

Lolium multiflorum

A small number of wild accessions which were collected in 1996 have been multiplied to carry out agronomic evaluation, which is now under way. These accessions will be entered into the genebank at Changins.

Trifolium pratense

An effort is undertaken to regenerate about 110 accessions of red clover of the 'Mattenklee' type collected in 1971–72, which are in urgent need of regeneration because of their poor germination rate. The accessions are held by Reckenholz and partly by Braunschweig. Furthermore, it is planned to describe these accessions systematically. Some financial support for this initiative is given by the federal authorities as part of the national "Plan of Action" to implement the decisions of the Rio Convention. It is planned to sow one-third of the accessions each year in 1999, 2000 and 2001.

UK National Collections

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Vicieae collection

Professor F.A. Bisby, curator of the collection of Vicieae, previously held at the University of Southampton, has moved to the University to Reading. The Vicieae collection has been moved to the University of Reading, and is now stored in freezers newly purchased to hold the collection.

Millenium Seed Bank, Wakehurst Place

The following communication has been received from S. Linington, curator of the genebank.

The RBG Kew Seed Bank continues to maintain the collections listed in the last ECP/GR forages catalogues but has added relatively little new relevant material since then. This is because the bank has concentrated its efforts on conservation of wild plant germplasm from the tropical and sub-tropical drylands. This effort is currently being expanded by the Millennium Seed Bank Project which, through a major international collaborative programme, aims to collect and conserve seed samples from 10% of the world's seed-bearing species. Included within this Project but of European relevance is the conservation of samples from nearly all of the UK's seed-bearing species. This part of the Project is substantially complete. The Project, which receives funding from the UK's Millennium Commission, will soon be based within the Wellcome Trust Millennium Building located at Wakehurst Place, Sussex, UK. This facility offers processing, research, training and public interpretation capabilities along with a very large underground seed storage vault. The Project's organizers (e-mail: msbsci@rbgkew.org.uk) would be interested in hearing from those involved with European wild plant conservation who might wish to use the facility as a duplicate or base store.

Institute of Grassland and Environmental Research (IGER)

The IGER Genetic Resources Unit (GRU) is the major UK active forages genebank. Current holdings amount to approximately 9000 accessions of approximately 350 species. Genebank activities since 1997 are summarized in Table 1.

Table 1. Summary of the number of accessions distributed, regenerated and newly acquired at the Genetic Resources Unit of IGER since 1997

Year	1997	1998	1999
Accessions distributed	426	631	373
Accessions regenerated	104	120	165
New accessions	807	37	108

Regeneration

The regeneration programme has been intensified. Priorities have been established that include regenerating old accessions of low viability, to the maximum possible extent within the institute's annual capacity and the need to multiply seed of accessions needed for research purposes. The maximum annual regeneration capacity has now been reached, both in terms of facilities for regeneration (isolation chambers) and labour. A breakdown of accessions regenerated by species is given in Table 2.

Table 2. Number of accessions regenerated at IGER-GRU since 1997, tabulated by species

Species	1997	1998	1999
Lolium perenne	80	27	65
L. multiflorum	–	–	–
Annual *Lolium*	3	45	29
Festuca arundinacea	3	1	30
F. pratensis	6	5	29
F. gigantea	7	–	–
Dactylis glomerata	2	9	4
Fine-leaved fescues	2	1	1
Agrostis spp.	1	–	–
Poa spp.	–	28	5
Other species	–	4	2

Core collections

The GRU is making increased use of core collections to improve the efficiency of utilization. In addition to the classical UK core collection already established for the European *Lolium* core collection, the GRU has identified a set of "targeted core collections" to support breeding and research on specific objectives. Objectives are established through discussion with breeders and other scientists at IGER, and currently focus on identification of new molecular markers for temperature response, trampling tolerance, and heading date. These new targeted core collections have been identified by analyzing passport and available evaluation data, specifically to maximize the expected genetic variance for the relevant characteristic.

Forage genetic resources in Ukraine

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The territory of Ukraine is situated in rather favourable bioclimatic conditions. Soils are very diverse. Most (60.6%) agricultural soils are chernozems. Forest soils rank second with 21%.

The total area of Ukraine is 60.4 million hectares including 41.9 million hectares agricultural land (69.4%). The area of cultivated fields is 33.3 million hectares (55.1%).

The following soil-climatic zones are found in Ukraine: forest, forest-steppe, steppe, mountain part of the Crimean Peninsula, Carpathian zone.

Activities related to the study and conservation of forage crops in Ukraine are coordinated by the National Centre for Genetic Resources, Kharkiv. The programmes are performed by research organizations situated in various soil-climatic zones of Ukraine, namely the Feed Research Institute, the Institute of Land Cultivation, the Institute of Irrigated Land Cultivation, the Institute of Land Cultivation and Animal Biology and Ustimovka Plant Experimental Station (Table 1).

Table 1. Institutes involved in the programme "Genetic resources of forage crops in Ukraine"

Research institutes	Soil-climatic zones
Yurjev Plant Production Institute (National Centre for Plant Genetic Resources of Ukraine)	Forest-Steppe
Feed Research Institute	Forest-Steppe
Institute of Land Cultivation	Forest and Forest-Steppe
Institute of Irrigated Land Cultivation	Steppe
Institute of Land Cultivation and Animal Biology	Forest-Steppe and Carpathian Zone
Ustimovka Plant Experimental Station	Forest-Steppe

The collection of the National Centre for Genetic Resources holds 2515 accessions of more than 50 species (Table 2).

The most numerous crops in these collections are *Trifolium* spp. (460 accessions), *Medicago* spp. (359), *Bromus inermis* Leyss. (256), *Lolium* spp. (236), *Festuca arundinacea* Schreb. (197), *Festuca pratensis* Huds. (163) and *Dactylis glomerata* L. (159). In 1998, 201 entries were added to this collection, most of them native to the Ukraine.

A significant part of the forage crops genepool in Ukraine is represented by registered cultivars. By 2000, 374 cultivars of 74 species will be registered (Table 3).

Most of them are cultivars of native breeding. The following species have a particularly high number of registered cultivars: *Vicia sativa* L. (31), *Beta vulgaris* L. subsp. *vulgaris* var. *alba* DC. (30), *Medicago sativa* L. and *M. falcata* L. (26), *Trifolium pratense* L. (22), *Lupinus* L. (18), *Pisum sativum* L. and *Pisum arvense* L. (15), *Sorghum vulgare* Pers. (15).

Table 2. Composition of forage crops collections in Ukraine at 10.11.1998

Species	No. of access.	Commercial cultivars of: Ukraine	Other countries	Local cvs. and forms	Breed-ing lines	Synthetic populations	Wild relatives of cvs.	Status unknown
Medicago L.	359	5	64	210	–	48	32	–
Trifolium L.	460	25	98	244	–	34	45	14
Onobrychis L.	46	7	3	15	–	–	21	–
Melilotus Desr.	22	2	–	–	–	–	20	–
Galega L.	8	1	–	–	–	–	7	–
Lotus corniculatus L.	149	2	19	12	–	70	46	–
Astragalus L.	12	–	–	–	–	–	12	–
Ornithopus sativus Brot.	41	2	6	6	–	–	–	27
Bromus inermis Leyss.	256	16	76	21	19	73	35	16
Lolium L.	236	3	28	12	51	9	12	121
Festuca pratensis Huds.	163	3	103	14	–	21	20	2
Festuca arundinacea Schreb.	197	8	19	10	109	1	20	30
Agropyron Gaertn.	56	1	3	2	6	–	38	6
Dactylis glomerata L.	159	11	80	5	18	–	34	11
Phleum pratense L.	27	2	6	8	–	7	4	
Amaranthus L.	32	8	6	–	–	18	–	–
Other species	292	43	46	29	–	54	114	6
Total	**2515**	**139**	**557**	**588**	**203**	**335**	**460**	**233**

Table 3. Species composition of registered cultivars of forage crops in Ukraine by 2000

Species	Number of cultivars	Foreign cultivars
Vicia faba L.	9	–
Vicia sativa L.	31	–
Pisum sativum L., *Pisum arvense* L.	15	3
Lupinus L.	18	3
Melilotus albus Desr.	4	–
Onobrychis L.	7	–
Trifolium pratense L.	22	4
Trifolium hybridum L.	5	2
Trifolium repens L.	7	3
Medicago sativa L., *Medicago varia* L.	26	3
Lotus corniculatus L.	7	4
Dactylis glomerata L.	8	4
Festuca pratensis Huds.	10	3
Festuca arundinacea Schreb.	3	1
Festuca rubra L.	3	1
Bromis inermis Leyss	7	1
Phleum pratense L.	7	2
Lolium multiflorum Lam.	11	1
Lolium perenne L.	8	3
Secale cereale L.	8	2
Sorghum vulgare Pers.	15	7
Sorghum sudanense (Piper.) Stapf.	9	1
Beta vulgaris L. subsp. *vulgaris* var. *alba* DC	30	19
Other species	104	24
Total	**374**	**90**

In recent years, the assortment of registered cultivars has been increased with "non–traditional forage crops". In 1995–2000 only, 33 additional cultivars of 18 species have been registered (Table 4).

Table 4. Species composition of registered cultivars of non-traditional forage crops in Ukraine in 1995–2000

Species	Number of cultivars
Trifolium apertum Bobr.	1
Trifolium alexandrinum L.	1
Galega orientalis L.	2
Medicago lupulina L.	1
Festuca ovina L.	1
Lathyrus silvestris x *Lathyrus latifolia* L. (*granoliflorus* Sibth. et Suith.)	1
Kochia scoparia L. (Schrad.)	1
Amaranthus L.	10
Malva meluca Graebn.	1
Malva crispa L.	2
Malva pulchella Berh.	2
Bunias orientalis L.	2
Silfium perfoliatum L.	2
Brassica rapa x *Brassica campestris* var. *olifera biennis*	1
Helianthus tuberosus x *H. annus* L.	1
Sorghum almum Parodi.	2
Lavatera thuringiaca L.	1
Secale cereale L. (spring type)	2
Total	**34**

It should be noted that cultivar 'Diana' is the first example worldwide of the use of the species *Trifolium apertum* Bobr. in agriculture.

The breeding of cultivars of pasture species of perennial legumes such as *Trifolium ambiquum* M.B. and *Trifolium fragiferum* L. is continued. These species are outstanding for their drought tolerance and salt tolerance, respectively.

Unfortunately, the national collections of forage crops in Ukraine contain few native wild populations of many species of leguminous and cereal perennial grasses. This is due to the difficult economic situation in Ukraine and corresponding limited funding for these activities. In 1991–99, only four expeditions were conducted aimed at the prospection of forage populations.

Proposals

- To increase work on the common European databases for major forage species
- To improve the exchange of collection material of forage crops
- To find means and organize expeditions for the collecting of most valuable species of forage crops in Ukraine and other European countries.

Current status of forage collections in F.R. Yugoslavia

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The F.R. Yugoslavia belongs to the Mediterranean basin, one of the divergence centres for a large number of plant species grown today. Its abundant plant cover includes around 4300 plant species from 157 families and 888 genera. A large number of species are endemics of which 215 are protected (Kišgeci and Cvetković 1998). According to the same authors, last year the status of national collection was as follows: 5156 samples are stored in the Plant Gene Bank (of which 586 are documented at passport data level, 2187 at characterization level, 2455 at primary evaluation level). It is probable that the number of samples has slightly increased this year.

Seven institutes are involved in plant breeding and collecting, while three of them also deal with forage crops: Agricultural Research Institute "Serbia", Centre for Forage Crops, Kruševac; Centre for Agricultural and Technological Research, Zaječar; Agricultural Research Institute, Novi Sad.

Over the past two years, especially this year when our country has faced difficult warfare conditions, the work of these institutes as well as part of the projects on collecting new plant species for the Gene Bank was impaired by adverse circumstances.

Collecting

Legumes

In our country lucerne (*M. sativa* L.) is one of the most important and widely grown crops of the genus *Medicago.* Sickle burclover (*M. falcata* L.) is of less importance for growing but more important for lucerne breeding because it is a source of resistance to poor growing conditions (poor soils, low temperatures, drought, bacterial diseases). The selected lucerne varieties are of extraordinary quality, with high protein, vitamin and mineral (calcium) contents. The selection activities resulted in a large number of new varieties and genotypes characterized by high yields of dry matter, high protein contents, tolerance to drought, low temperatures and diseases, frequent cutting, grazing, resistance to lodging and poorer soil types, difference in harvest time and life length. Therefore, all activities involving collection and preservation of genetic resources are of critical importance for lucerne breeding and production.

At the Agricultural Research Institute, Novi Sad, plant material intended for the collection was obtained from a number of sources. In 1998 four genotypes were received from Bulgaria and six from Spain. In 1999 the collection included four varieties from Iran and eight from Yugoslavia.

Samples collected for characterization were sown wide-spaced, 70 × 50 cm, in rows 10 m long, in three replicates, i.e. 20 plants per row, 60 per genotype. Basic morphological and biological characteristics were recorded for these crops.

Further characterization was carried out using the material from densely sown plots, 5 m^2 in size, in five replicates. Green and dry matter yields, resistance to drought, low temperatures as well as quality in a smaller number of plants were recorded.

Evaluation and characterization were conducted using the IBPGR Descriptor List for the genus *Medicago* and UPOV/TG/1/2/. The data were not analyzed statistically.

Last year, at the Agricultural Research Institute "Serbia", Centre for Agricultural and Technological Research, Zaječar, 14 genotypes of *Medicago sativa*, 9 genotypes of *Lotus corniculatus* and 6 genotypes of *Onobrychis sativa* were collected from the wild. As in the above-mentioned institute, partial characterization and evaluation of characters of primary importance for the selection programme of each species were carried out.

Grasses

This year, at the Centre for Forage Crops, Kruševac, 29 samples of *Arrhenatherum elatius* seeds were collected from 29 locations from a broad area of our region (southeast Serbia). The samples originate from domesticated populations, used for a number of years for seed production. Next year these samples will be sown in isolation and adequate observations will be made on them (descriptors for grasses). They will be included in the breeding programme of a new variety and will be delivered to the collection of the Plant Gene Bank.

About 70–130 g of seeds with basic passport data were collected.

Regeneration

Regeneration of the existing collection of autochthonous grasses populations, stored in the National Gene Bank since 1992 (Tomić 1997), was carried out in 1998 and 1999. Five grass species, 16 samples of *Agrostis gigantea*, 34 of *A. stolonifera*, 35 of *A. capillaris*, 5 of *Dactylis glomerata* and 10 of *Lolium perenne*, i.e. 99 samples in total, were sown in the field in rye isolation, 20 plants each on 2 m^2. The time of heading and date of harvest as well as seed yields in both years were recorded. Average data for each sample are reported in Table 1.

Table 1. Agronomic data recorded for grass species regenerated in 1998–99

	1998			1999		
Species	**Heading**	**Harvest**	**Seed yield (g)**	**Heading**	**Harvest**	**Seed yield (g)**
A. gigantea	01.6–14.6	23.7–27.7	35.2–176.3	01.6–10.6	25.7–03.8	130.0–356.3
A. stolonifera	01.6–14.6	23.7–27.7	49.1–292.4	01.6–11.6	25.7–03.8	92.2–354.9
A. capillaris	28.5–14.6	23.7–27.7	60.1–315.6	26.5–10.6	25.7–03.8	94.5–250.9
D. glomerata	25.4–08.5	23.6–29.6	202.1–627.7	23.4–10.5	21.6–25.6	119.9–393.8
L. perenne	03.5–14.5	03.7	76.3–219.3	04.5–13.5	28.6–03.7	133.6–288.7

After harvest, the samples were processed, dried to below 5% moisture, seed viability and total germination were measured by standard laboratory methods. It was found that both parameters range within the limits of germination, depending on the grass species.

Seed samples, 10 g each, were put in laminated aluminium foil bags and stored at –20°C for long-term storage at the Maize Research Institute, Belgrade-Zemun. After the onset of the war, a collection of registered varieties and of breeding material in advanced stage of selection at the Centre for Forage Crops was sent to the said Institute to be kept there. A total of 48 samples was delivered, i.e. 25 varieties of grasses and 23 varieties of legumes (Table 2).

Table 2. Samples transferred to the Maize Research Institute, Belgrade-Zemun

Species	**Number of samples**
Phleum pratense	4
Dactylis glomerata	7
Lolium multiflorum	4
Festuca pratensis	3
Festuca arundinacea	5
Festuca rubra	2
Medicago sativa	9
Trifolium pratense	13
Lotus corniculatus	1
Total	48

Almost all samples from the collection are being exploited in the said Institutes for the breeding of new forage species varieties.

Nowadays all our projects are at the terminal stage. In the near future the Federal and Republic Ministries of Science and Technology will open competition for projects in agricultural research. We do hope that there will also be projects on further collecting of new plant material from wild flora to be conserved in the Gene Bank and used for breeding purposes.

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Collecting activities

Cooperation on collecting activities after the Rio Convention: difficulties

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Owing to the new conditions of access to plant genetic resources (on the one hand the sovereign right of countries to exploit their own genetic resources – property rights – and on the other hand the principle of free access for all *bona fide* users), access has overall become more difficult (Begemann 1996).

This situation has led to insecurity in international collaboration, since it became uncertain how the principles of the Rio Convention could be implemented without hindering the use of plant genetic resources. This also affected the planning of collecting missions.

During the last three years, the IPK Genebank has organized and carried out collecting missions in Croatia, Bulgaria and Spain (Table 1). The main goal was to close gaps in the collection of grasses and other species, to acquire valuable accessions, and to exchange experience with partners working with PGR in order to learn from each other and to promote collaboration.

The following information was acquired during the recent collecting missions (listed in Table 2).

First, with respect to the **organization of a collecting mission**:

1. **A partner institution must be found in the country where collecting will take place.**
   In all three countries, interested partners could be found. Their level of interest was, however, very different. The Gene Banks of Croatia and Bulgaria essentially did not support the mission. Fortunately, there were other competent institutions or private persons who were helpful and who understood the goal of the collecting mission.
2. **If there is an interest in joint collecting of the same material, species, etc., the mission must be accomplished on the basis of mutual trust.**
   This is the most important point of each collecting mission. It is better to have established personal contacts before planning a trip (e.g. somebody met in a meeting, etc.). Otherwise one has to establish personal contacts by mail, e-mail or phone, and to explain the plans in detail. In Croatia and Bulgaria, arrangements were made verbally through an intermediary contact. In Spain we established direct contact with the Gene Bank which helped to organize the trip in the country after signing a Material Acquisition Agreement. This Agreement (see Annex) determines exactly all conditions of the collecting mission and creates a basis of confidence, since all details are accepted by both partners.
3. **It is important to find a specialist for translating and for finding the right places/sites for collecting.**
   It is not so easy to find the right partners willing to join the trip. Ideally they should have experience with PGR and a good knowledge about plants and their geographical distribution. They should also ideally be friendly persons, able to make good contacts with the local people, in order to receive seed and/or useful information/data. In all three countries we had good guides and met kind, intelligent people. But in some regions we met annoyed people, who could not understand what we were doing and why. Fortunately this was very rare.

Second, with respect to the **implementation of the collecting**:

4. **Both partners participated in collecting, tasks were divided, and material as well as information were shared in the end.**

In Croatia and Spain, all partners participated in the trip. Either the organizers participated themselves, or they designated another responsible person, who took part on behalf of the genebank. In Bulgaria it was slightly more complicated, because the preparation of trip was not done so well by the genebank. But all participating persons and institutions shared the tasks and at the end the collected material (seed, and in Spain also data) was divided.

5. **Ideally, after the collecting mission, joint work is developed with the new accessions (multiplication, characterization and evaluation).**
There are no arrangements and concrete examples so far of continued collaboration between the countries. There is good cooperation only between Deutsche Saatveredelung Lippstadt-Bremen GmbH (DSV) and the Malchow branch station of the IPK Gene Bank in Germany. In this case, after the collecting mission the material was divided for multiplication. Later, all multiplied material was included in a first evaluation trial in order to look at some important traits to assess the value of PGR. Seed will then be available for distribution together with the related information. Similar arrangements between different countries would be desirable.

Table 1. Overview of collecting missions, 1993-99

		Number of accessions of grasses				
		Collected			Introduced in collection	
Year	Region/Country	Total	Species†		Total	Species†
1995	Altmark/Germany	309	48	L. p.	258	48 L. p.
			35	D. g.		33 D. g.
			26	F. p.		26 F. p.
			44	P. p.		44 P. p.
			25	Ph. p.		25 Ph. p.
			131	other		82other
1996	Northeast Croatia	55	25	L. p.	18	3 L.p.
			4	D. g.		5 D. g.
			0	F. p.		0 F. p.
			2	P. p.		2 P. p.
			0	Ph. p.		0 Ph. p.
			24	other		8 other
1997	Central Croatia	156	34	L. p.	108	24 L. p.
			16	D. g.		9 D. g.
			13	F. p.		12 F. p.
			24	P. p.		20 P. p.
			14	Ph. p.		3 Ph. p.
			55	other		40 other
1998	Rhodopy, Coast of Black Sea, North Bulgaria	497	73	L. p.		field cultivation 1999
			29	D. g.		
			20	F. p.		
			13	P. p.		
			27	Ph. p.		
			335	other		
1999	Galicia, Spain	345	83	L. p.		field cultivation 2000
			37	D. g.		
			0	F. p.		
			0	P. p.		
			0	Ph. p.		
			225	other		

† Species: L. p. = *Lolium perenne;* D. g. = *Dactylis glomerata;* F. p. = *Festuca pratensis;* P. p. = *Poa pratensis;* Ph. p. = *Phleum pratense.*

Table 2. Overview of collecting missions in the last three years

Step	Croatia 1996-97	Bulgaria 1998	Spain 1999
1. Definition of partner institution of German Gene Bank (IPK)	Gene Bank Zagreb, Croatian Environmental Education Center, NGO "Arche Noah", Austrian Association for maintenance of diversity of crop plants, DSV, Breeding company, Germany	Botanical Garden, Sofia; Gene Bank (IIPGR), Sadovo; R. Slawowa, private person of Bulgaria; DSV, Breeding company, Germany	Plant Genetic Ressources Centre of the INIA, Alcala de Henares; Centre of agricultural research (CIAM), Mabegondo; DSV, Breeding company, Germany
2. Establishment of a basis of mutual confidence	Arrangements by mail, telephone; no direct contact with the genebank before the trip, only through contact person in Croatia	Arrangements by mail, e-mail, telephone; no direct contact with the genebank before the trip, only through contact person in Bulgaria; direct arrangements before the beginning of the trip in Botanical Garden, Sofia	Arrangements by mail, e-mail, telephone; direct contact with the genebank before the trip (Material Acquisition Agreement), and direct arrangements with CIAM Mabegondo before the beginning of the trip
3. Identifying a specialist for translation and collecting	Very good Croatian guide	No official guide from the Gene Bank; good Bulgarian contact person for translation, necessary information from Botanical Garden	A good guide for translation; necessary information obtained from INIA and CIAM
4. Implementation	All partners participated and shared tasks; material was divided	Not all partners participated and shared tasks; material was divided	All partners participated and shared tasks; material and passport data (information) was shared between all partners
5. Planning for common work with collected material	No arrangements (only with DSV division of labour, common evaluation)	No arrangements (only with DSV division of labour, common evaluation)	May be arrangements in the future (only with DSV division of labour, common evaluation)

Conclusion

Based on the experiences of the last collecting missions, the following recommendations can be highlighted:

- Ensure timely preparation and establishment of contacts
- Define precise arrangements (Material Transfer Agreement)
- Agree on sharing of responsibility (who is responsible for what?)
- Agree on division of labour
- Propose joint evaluation of collected material in order to increase the value of PGR.

References

Begemann, F. (editor). 1996. Access to Plant Genetic Resources for Food and Agriculture - The Process of Discussion. P. 131 *in* Schriften zu Genetischen Ressourcen, Bd. 3. ZADI, Bonn.

Annex. Example of a Material Acquisition Agreement (MAA)

Agreement for the Acquisition of Material

between
Plant Genetic Resources Centre of the INIA
Alcalá de Henares
Madrid
Spain
– hereinafter referred to as INIA –

and

IPK
Institut für Pflanzengenetik und Kulturpflanzenforschung
(Institute of Plant Genetics and Crop Plant Research)
Corrensstrasse 3,
06466 Gatersleben,
Germany
represented by its Acting Director, Prof. Dr U. Wobus,
and its Administrative Director B. Eise
– hereinafter referred to as IPK –

Preamble
The FAO Commission on Genetic Resources for Food and Agriculture is presently engaged in drawing up guidelines for the future exchange of germplasm to be used by the food and agricultural industries. Current negotiations centre on the adaptation of the International Undertaking on Plant Genetic Resources to the Biological Diversity Convention. Depending upon the results of these negotiations, the terms of this AAM are subject to future modification such that they comply with the norms to be established by the FAO's Revised International Undertaking with regard to Plant Genetic Resources and with other international norms agreed upon. The Spanish government actively participates in these negotiations with the aim of ensuring that any future regime will facilitate the exchange and use of these world resources of inappreciable value, and the just and equal sharing of benefits derived from the commercial or other uses of the germplasm.

§ 1 Subject Matter Of This Agreement
The collection by the Germplasm Bank of the Institute of Plant Genetics and Crop Plant Research (IPK), External Station Malchow (Federal Republic of Germany) of **local varieties of cereals and legumes, and wild grasses (*Lolium, Poa, Festuca*) in the North and North East of the Iberian Peninsula in July or August 1999.**

Half of the resources collected during the expedition referred to by this agreement will be **deposited at the Plant Genetic Resources Centre of the INIA (Alcalá de Henares, Madrid) for** their preservation and investigation.

§ 2 Property in Results And Restrictions Of Usage Of Collected Material
The acquirer of the material authorised by this document, renounces any property claims to the material collected or any material essentially derived from it, and also renounces the right to apply for the intellectual property rights over the germplasm or related information.

The acquirer will also refrain from distributing the material (or part of it) ceded by this agreement to a third party or institution without previous authorisation by the Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA) (**National Institute of Research and Food and Agricultural Technology**).

This Agreement for the Acquisition of Material may only be **used for research purposes**.

The **commercialisation** of any product derived from the acquired material **would require a further agreement.**

The acquirer of this material promises to yearly **inform the INIA of relevant data yielded by the research** for which the germplasm was collected. If the acquirer so wishes, the results of his / her investigation will not be made public for three years after their receipt.

It is the responsibility of the acquirer to comply with the biosecurity, export and import and any other guidelines regulating the release of genetic material in the country of destination of the material.

§ 3 Participants And Costs

The group of German scientists will consist of three members, one of them a employee of DSV (Deutsche Saatveredelung; German Seed Amelioration)

The German scientists taking part in the expedition will be accompanied by a representative of the INIA who will provide them with information and the necessary contacts for the success of the expedition.

The expedition will commence and finish at Center of affiliation of the Spanish participant.

The expedition will be financed in its entirety by the IPK (including travelling costs and expenses payable to the Spanish representative).

§ 4 Representation

The INIA requests the applicant to formalise the present agreement through the signing of this document by the legal representative of IPK who takes the responsibility of this AAM upon him / herself.

Name of Acquirer: Mrs. E. Willner

Institution IPK – Institut für Pflanzengenetik und Kulturpflanzenforschung
Außenstelle Malchow

Full address: Corrensstr. 3, D-06466 Gatersleben

On behalf of the IPK:

Authorised signature Date

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B. Eise Prof. Dr. U. Wobus

On behalf of the INIA:

Name and Position: Francisco José Simón Vila, President of the INIA

Signature Date

Collecting activities in the Czech Republic and bordering regions

Magdalena Ševčíková[1] and Vojtech Holubec[2]

[1] Oseva PRO Ltd., Grassland Research Station, Zubří, Czech Republic

[2] Research Institute of Crop Production (RICP), Gene Bank, Praha–Ruzyně, Czech Republic

In the past, research projects based on plant genetic resources were long-term oriented, with large-scale testing of new domestic and foreign cultivars providing recommendations for the plant breeding programmes in our country. Insufficient attention was paid to the collecting of wild species and maintenance of landraces. Often, the collected material was not appropriately recorded. As a result, domestic landraces represented only 1.5% and domestic wild relatives only 0.5% of the whole germplasm documented in the germplasm information system EVIGEZ in 1991.

To fill the gaps in germplasm collections two projects were accepted:

- "Gathering, Collection and Conservation of Wild Genetic Resources and Landraces in Czech Republic" supported by the Grant Agency of the Czech Republic for the years 1993-95
- "The Mapping, Collecting and Conservation of Threatened Landraces and Wild Plants Related to Cultivated Crops in the Czech Republic and Bordering European Region", supported by the Ministry of Agriculture for the years 1996–2000.

The projects were prepared at the Gene Bank, RICP Praha, in cooperation with the Agricultural University Brno, the Research Institute for Fodder Plants Troubsko, the Grassland Research Station Zubří, the Research and Breeding Institute for Fruits Holovousy and the Gene Bank, RICP Olomouc.

The aim of the initial project was to collect and conserve the widest genetic diversity of domestic wild populations of fodder plants, wild relatives of cultivated crops and threatened landraces of fruits and other crops. The second project is based on the continuation of this activity plus a larger evaluation of genetic erosion. The old extensive genepool gathered in germplasm collections is compared with available lists of registered, bred cultivars. The missing materials are searched for, mostly in the germplasm collections of the neighbouring countries (Austria, Germany, Poland and Slovakia) and gathered from domestic and foreign sources for "repatriation". Three old Czech grass varieties that were lost were found in the Gene Bank Malchow, Germany. Systematic collecting activity is going on to cover botanically the richest regions and those with a probable distribution of landraces in the Czech Republic. The localities are marked with geographical coordinates using GPS satellite navigation system. As a result, except for collected samples, inventory, distribution maps and computer documentation are provided. Further collection priorities will be formulated for regions and species. The necessity for *ex situ* or *in situ* conservation strategies will be discussed.

During a 7-year expedition activity, various phytogeographic regions of the Czech Republic with a rich flora were visited (Fig. 1). Many of them are protected as National Parks and Protected Landscape Regions. Altogether, over 3400 samples of forages were collected (Table 1). Larger seed samples were placed in the base collection of the Gene Bank, smaller samples have been regenerated within specialized germplasm collections. The number of wild populations of fodder plants increased to 22.5% of the germplasm documented in the information system in 1999.

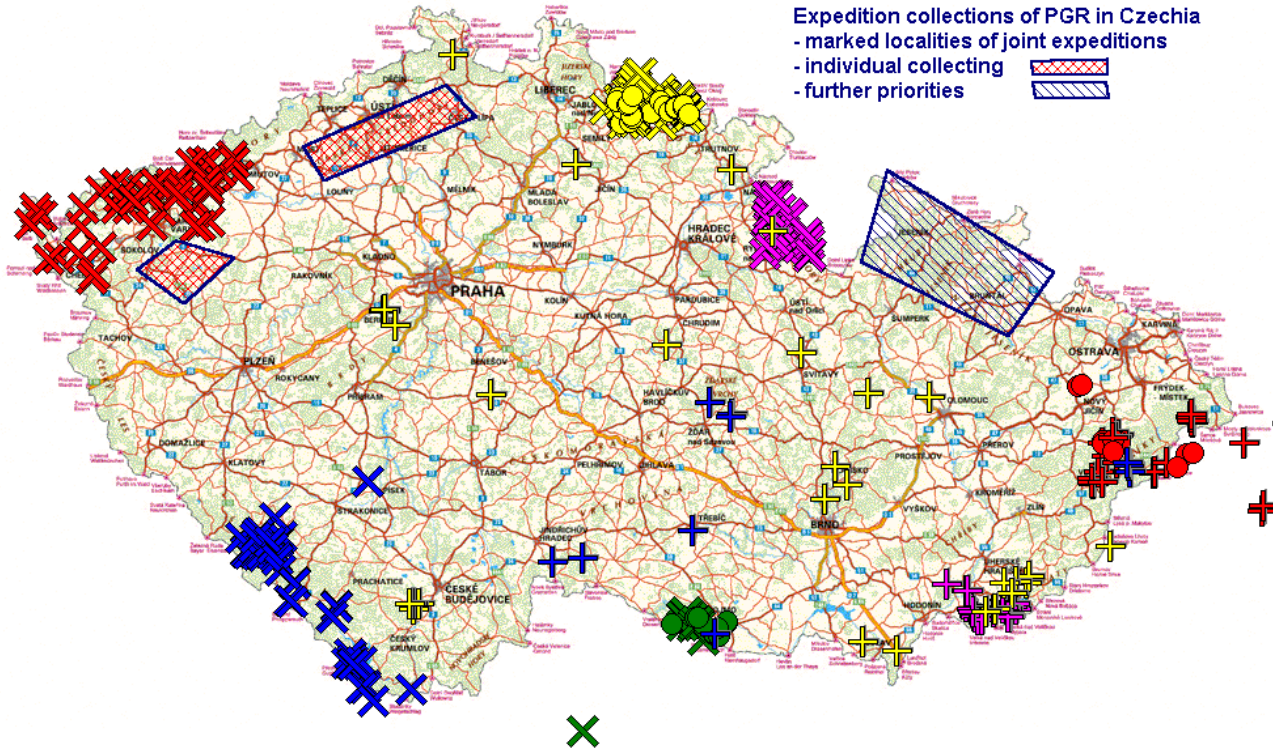

Fig. 1. Expeditions for collecting of plant genetic resources in Czech Republic.

Table 1. Genetic resources of grasses, legumes and meadow herbs collected in the Czech Republic (1993-99)

Phytogeographic region	Collecting area	Year	Grasses	Legumes	Herbs
1. Thermophyticum					
1.1. Thermobohemicum	České středohoří*	1995	149	4	
1.2. Pannonicum	Bílé Karpaty	1993	53	60	85
	Bílé Karpaty*	1994-96	21	17	31
	Brněnsko*	1993-97		198	73
	Znojemsko*	1993-97	5	407	258
	Podyjí	1997	106	64	48
2. Mesophyticum					
2.1. Mesophyticum Massivi bohemici	Českomoravská vysočina*	1993-95	6	13	5
2.2. Mesophyticum carpaticum	different sites	1993-96	21		
3. Oreophyticum					
3.1. Oreophyticum Massivi bohemici	Šumava	1994	238	142	47
	Krkonoše	1995	202	56	47
	Orlické hory	1996	131	69	53
	Slavkovský les*	1997	75		1
	Krušné hory	1998	151	149	80
3.2. Oreophyticum carpaticum	Moravskoslezské Beskydy*	1993-98	111		
	Moravskoslezské Beskydy	1999	107	53	70
Total			**1376**	**1232**	**798**

* individual collecting

Collecting of forages in Central Asia

Loek J.M. van Soest[1], Vladimir Chapurin[2] and Karim Baimatov[3]

[1] *Centre for Genetic Resources, The Netherlands (CGN), Centre for Plant Breeding and Reproduction Research (CPRO), Wageningen, The Netherlands*

[2] *N.I. Vavilov Research Institute of Plant Industry (VIR), St. Petersburg, Russian Federation*

[3] *Uzbekistan Research Institute of Plant Industry, Tashkent, Uzbekistan*

Introduction

Following the first joint expedition to Uzbekistan in 1997 (van Soest 1998; van Soest *et al.* 1998), a second multicrop expedition was conducted in August 1999. This expedition was a joint mission between the Academia of Sciences of Uzbekistan and Kyrgyzstan, the N.I. Vavilov Research Institute of Plant Industry (VIR) and the Centre for Genetic Resources, The Netherlands (CGN - now part of Plant Research International, Wageningen). The mission was funded by CGN, with financial support through the Dutch Seed Trade Association (NVZP). In Uzbekistan the team included four members whereas in Kyrgyzstan the team was extended with two Kirghiz researchers.

The expedition collected from markets and in wild vegetation. Although the mission concentrated predominantly on collecting a number of vegetable crops, several forages could also be sampled.

Collecting activities and material sampled

The team collected both in Uzbekistan, particularly areas of the Fergana Valley, and in mountainous areas of East Kyrgyzstan surrounding this valley. The members of the mission travelled nearly 3000 km in both Uzbekistan and Kyrgyzstan. Table 1 lists the collecting localities and their characteristics. The forage germplasm was obtained from roadsides and along small rivers, natural grasslands, and mountainous areas and valleys in the mountains.

Passport data were collected and the latitude and longitude were determined with a GPS Tracker. Where possible, observations regarding grazing by cattle (cows, goats and sheep) were made. It should be noted that all the collected forages were sampled at altitudes above 900 m. A characteristic of these altitudes is the difference in day and night temperatures.

The mission collected 52 accessions of 10 different forage species (Table 2). Some of the accessions need further taxonomic identification.

Conclusion

The expedition collected accessions of 10 forage species in the Central Asian centre of origin, region 5 according to Zeven and De Wet (1982). This region is not considered as the centre of origin of most of the collected forage species and this type of germplasm has not received much attention during previous expeditions in this region. Therefore, the collected material can be considered as rather unique plant genetic resources.

The collected material will be regenerated by the VIR and CGN and thereafter made available to potential users.

References

van Soest, L.J.M., K.I. Baimatov and V.F. Chapurin. 1998. Multicrop collecting mission to Uzbekistan. Plant Genetic Resources Newsletter 116:32-35.

van Soest, L.J.M. 1998. Report of the expedition to Uzbekistan - Itinerary, collected materials and data. Centre for Plant Breeding and Reproduction Research (CPRO-DLO), Centre for Genetic Resources, The Netherlands (CGN), Wageningen, The Netherlands. 34pp.

Zeven, A.C. and J.M. de Wet. 1982. Dictionary of cultivated plants and their regions of diversity. Pudoc, Wageningen, The Netherlands. 263pp.

Table 1. Collecting localities of expedition to Uzbekistan and Kyrgyzstan in 1999

Locality no.	Date	Altitude (m)	Latitude	Longitude	Description locality
L1	12.08.99	480	41/17'N	69/21'E	Tashkent, Tuzl Market in Yangibad region
L1a	12.08.99	482	41/16'N	69/22'E	Tashkent city, Yangibad Market
L2	12.08.99	475	41/14'N	69/20'E	Tashkent, Kujluk Market in southern part of city
L3	12.08.99	710	40/55'N	69/50'E	1 km outside Akhangaran on road to Angren
L4a	13.08.99	840	41/00'N	70/07'E	Entrance of Angren (East) on road to Kokand
L4	13.08.99	1000	41/01'N	70/09'E	Market of Angren
L5	13.08.99	1040	41/03'N	70/09'E	Road Angren to Kokand, 5 km from Angren (roadside)
L6	13.08.99	1340	41/09'N	70/25'E	Road Angren to Kokand, 30 km, valley on the right (c. 5km)
L7	14.08.99	1270	41/10'N	70/28'E	Road Angren to Kakand, 37 km, valley near Kujundii resort
L8	14.08.99	1310	41/09'N	70/28'E	As L7, c. 1,5 km into valley along dry river
L9	15.08.99	1500	41/00'N	70/38'E	Road Angren to Kokand, c. 80 km before Kokand, near Resaksoy river (roadside)
L10	15.08.99	915	40/54'N	70/46'E	Road Angren to Kokand, c. 73 km before Kokand, Kullistan
L11	15.08.99	1180	41/01'N	70/44'E	Oltinkon village, by-road of Angren-Kokand, c. 8 km
L12	15.08.99	1470	41/05'N	70/41'E	c. 6 km North of Oltinkon (roadside)
L13	15.08.99	c. 1150	41/01'N	70/44'E	Only local melon, somewhere around Oltinkon village
L14	16.08.99	1500	41/05'N	70/41'E	San Salar village, c.8 km North of Oltinkon, 700 m. in valley
L15	16.08.99	1575-1750	41/06'N	70/41'E	As L14, but 2-3 km in same valley
L16	17.08.99	1680-1700	41/05'N	70/38'E	c. 11 km N. of Oltinkon, Djosipeja village, along Bukrisay river, over distance of c. 2 km in valley of the river
L17	18.08.99	660	40/50'N	70/49'E	Road Angren to Namangan, 6 km after Khanabad
L18	18.08.99	500	40/52'N	71/06'E	Market of Pap
L19	18.08.99	700	40/59'N	71/14'E	Market of Chust
L20	18.08.99	550	40/54'N	71/10'E	Road Pap to Chust, c.13 km.
L21	18.08.99	750	41/03'N	71/18'E	Road Chust to Kasansay, c. 12 km
L22	18.08.99	560	40/57'N	71/24'E	Road Chust to Namangan, c. 15 km
L23	18.08.99	500	41/00'N	71/41'E	Market Namangan
L24	18.08.99	480	40/53'N	71/54'E	Road Namangan to Andizhan, c 28 km (roadside)
L25	18.08.99	500	40/48'N	72/13'E	Road Namangan to Andizhan, c. 8 km before Andizhan
L26	20.08.99	670	40/43'N	72/35'E	Road Andizhan to Kurgantepa, c 18 km (roadside)
L27	20.08.99	755	40/43'N	72/45'E	Kurgantepa, near railways
Kyrgyzstan					
L28	20.08.99	790	40/63'N	72/57'E	Just after the border, 5 km before Dzhalal Abad,
L29	20.08.99	975	41/01'N	73/04'E	Road Dzhalal Abad to Kok Yangak, c. 12 km
L30	21.08.99	1140	41/02'N	73/10'E	c. 5 km S.E. of Kok Yangak, farm of Institute of Biosphere
L31	21.08.99	1360	41/03'N	73/12'E	Shahta village, c. 6 km west of Kok Yangak
L32	21.08.99	1700	40/59'N	73/11'E	In mountains c 12 km south of Kok Yangak, near Akterik
L33	22.08.99	1720-1770	40/59'N	73/11'E	Near L32 in surrounding mountains
L34	23.08.99	1420-1500	41/14'N	73/22'E	c.18 km from Arkange skoye, on the river Kara Alma, lower part of Ferganskiy Khrebet
L34a	23.08.99	1500-1560	41/15'N	73/21É	As L34, but c.4km further in the valley of the river Kara Alma
L35	24.08.99	1390	41/13'N	73/21'E	c. 13 km from Arkange skoye, Kara Alma village
L36	24.08.99	1260	41/10'N	73/19'E	c. 10 km from Kara Alma village in direction to Dzhalal Abad
L37	24.08.99	945	41/02'N	73/05'E	Octyabr'skoye village, c. 20 km N of Dzhalal Abad (roadside)
L38	24.08.98	780	40/57'N	72/56'E	Dzhalal Abad (S.E.), compound of Institute of Biosphere

Locality no.	Date	Altitude (m)	Latitude	Longitude	Description locality
L39	24.08.98	1050	40/51'N	73/06'E	Tash Akur village, Uzgen region
L40	24.08.99	1150	40/34'N	72/59'E	Campsite South of road Uzgen to Osh, c. 14 km before Osh
L41	25.08.99	965	40/33'N	72/52'E	Road Uzgen to Osh, Kara-su village, 7 km before Osh
L42	25.08.99	970	40/32'N	72/48'E	Market of Osh
L43	25.08.99	1000	40/40'N	73/09'E	Road Osh to Uzgen, c. 3 km before Leninskoye (roadside)
L44	25.08.99	1060	40/46'N	73/17'E	Market of Uzgen
L45	26.08.99	1220	40/49'N	73/28'E	Road Uzgen to Mirzaaki, c 4 km after Mirzaaki, Salaam Alik
L45a	26.08.99	955	40/49'N	73/13'É	Road Uzgen to lake, c. 8 km, Kenech village
L46	26.08.99	700	40/57'N	73/01'E	Market Dzhalal Abad
L47	26.08.99	835	40/57'N	72/51'E	Kurkera-Mistek, c. 15 km on road Dzhalal Abad to B. Kurgan
L48	26.08.99	700	41/03'N	72/35'E	3 km outside Lenin Dzho on road to Kochkor Alta (roadside)
L49	27.08.99	660	41/03'N	72/24'E	c.2 km before Kochkor-Ata (roadside)
L50	27.08.99	550	41/07'N	72/11'E	Near Samaldy-Say village, Nokin district (roadside)
L51	27.08.99	690	41/28'N	72/18'E	Road Tash-Kumyr to Kara-Kul, c. 20 km, 2 km of Naryn river
L52	27.08.99	890	41/31'N	72/27'E	Road Tash-Kumyr to Kara-Kul, c. 25 km before Kara-Kul
L53	27.08.99	1090	41/35'N	72/41'E	Near Kara-Kul, c. 1,5 km in valley with small farms
L54	28.08.99	1110	41/42'N	72/54'E	Road Kara-kul to Lake Toktokul, c. 28 km (roadside)
L55	28.08.99	960	41/24'N	72/54'E	South site of Lake Toktokul, c. 40 km of Kara-kul (roadside)
Uzbekistan					
L56	29.08.99	600	40/46'N	72/46'E	Market of Andizhan
L57	30.08.99	700	40/42'N	72/37'E	Dzalal- Kuduk, 20 km S.E. of Andizhan, Exp. Station
L58	30.08.99	540	40/37'N	72/13'E	Road Andizhan to Fergana, c. 5 km after Leninsk (roadside)
L59	30.08.99	510	40/31'N	71/58'E	Road Kuva to Margilan, c. 8 km after Kuva (roadside)
L60	30.08.99	520	40/29'N	71/ 43'E	Market of Margilan
L61	30.08.99	500	40/26'N	71/36'E	Road Margilan to Ristan, c. 7 km (roadside)
L62	30.08.99	520	40/22'N	71/17'E	Market of Ristan
L63	30.08.99	510	40/30'N	71/10'E	Road Ristan to Kokand, c.12 km (roadside)
L64	30.08.99	480	40/32'N	70/56'E	Market of Kokand

Table 2. Forages collected in Uzbekistan and Kyrgyzstan in 1999

Species	No. of accessions	Altitude range (m)	Genebank responsible for maintenance
Dactylis glomerata L.	7	1120-2250	VIR
Lathyrus pratensis L.	1	1640	VIR
Medicago spp.(blue type)	7	925-1850	VIR
Melilotus officinalis L. Pallas	10	1120-2250	VIR
Melilotus alba Medicus	1	960	VIR
Trifolium repens L.	10	1240-1820	CGN and VIR
Trifolium pratense L.	12	1120-1790	CGN and VIR
Vicia spp.	2	1640-1900	VIR
Hedisarum coronarium L.	1	1285	VIR
Cicer arietinum L.	1	1680	VIR
Total	**52**		

Collecting activities in Finland and other Nordic countries

Merja Veteläinen
Nordic Gene Bank, Alnarp, Sweden

Introduction

NGB collected forage crops in all the Nordic countries, including Greenland, between 1979 and 1983. Since then, forage species have been collected more sporadically. NGB also has Nordic material collected in the 1970s before NGB was established. Today, the geographical distribution of the collected material is satisfactory, but there are gaps in southern Finland and central Sweden. The aim is to cover these areas by the end of 2000.

Collecting mission in Finland during 1998-99

In 1998, owing to the threat of disappearance of the locally cultivated forage material, the Working Group on Forages at the Nordic Gene Bank initiated a collecting mission together with Boreal Plant Breeding in Finland. Traditionally, Finnish farmers have used home-produced seed, adapted to local conditions, for pastures. However, with the EU membership, subsidies for cultivars not included in the official list of varieties were terminated. Therefore, there was an urgent need to collect local material from southern Finland. By announcements in the rural newspapers and through contacts with the agricultural advisors, a number of farmers still cultivating old varieties and landraces were identified. The contacts with the farmers resulted in approximately 170 locally cultivated forage accessions which will be preserved in the Nordic Gene Bank (Table 1).

Future collecting activities in the Nordic countries

In 2000 a forage collecting mission will be undertaken in Sweden in the hope of saving old, locally adapted genotypes. In addition, *Phalaris* material from Finland will be re-collected. This research and breeding material was lost in the 1980s, but thanks to good documentation of the collecting sites it is hoped to find the populations collected earlier and preserve them in the NGB.

Regeneration of the collected material

The new collected accessions should be increased within a reasonable timeframe. However, NGB has only a limited capacity for this work. Consequently, NGB's Working Group on Forages works to establish a system which aims to find a balance between new collected material and regeneration capacity. It is also important that the genetic variation of the material already preserved be studied in order to make well-targeted collecting missions in the Nordic Countries.

Table 1. Forage accessions collected from Finland 1998-99

Taxon	Wild	Landraces	Cultivars	Total
Alopecurus pratensis	21	5	–	26
Dactylis glomerata	16	3	1	20
Festuca sp.	12	2	1	15
Phalaris sp.	5	4	–	9
Phleum pratense	30	23	3	56
Trifolium repens	3	1	–	4
Trifolium hybridum	3	–	–	3
Trifolium pratense	11	26	1	38
Total	**101**	**64**	**6**	**171**

Collecting activities in Italy and Wales by IGER, UK

N. Ruaraidh Sackville Hamilton

Institute of Grassland and Environmental Research (IGER), Plas Gogerddan, Aberystwyth, Ceredigion, United Kingdom

Italy 1998

As a result of collaborative research between the Clover Breeding Group of IGER and Dr Giuseppe Parente of Servizio Agricoltura-Aziende Sperimentali-Dimostrative in the Provincia di Pordenone, a gap in forage collections was identified in the northeast of Italy. A collecting expedition in Italy was planned to fill the gap and undertaken during 1998. The accessions collected are summarized in Table 1.

Table 1. Summary of samples collected during a collaborative Italy-UK collecting expedition in the northeast of Italy in 1998

Species	Number of accessions
Lolium perenne	43
Agropyron cristatum	3
Dactylis glomerata	1
Festuca pratensis	1
Festuca ovina	1
Trifolium pratense	20
Trifolium repens	40
Total	**109**

Wales 1997-98

Accessions are collected from local sites where particular populations are identified as filling gaps in the collection. Table 2 summarizes the accessions collected during 1997-98. Emphasis on *Poa annua* was in support of newly developing breeding and research objectives for amenity grasses.

Table 2. Summary of samples collected in Wales in 1997-98

Species	Number of accessions
Dactylis glomerata	1
Festuca rubra	1
Lolium perenne	3
Poa annua	14
Total	**19**

Collection, evaluation and conservation of forage legumes germplasm in Abruzzo (Italy)

***R. Torricelli*[1], *V. Negri*[1], *D.D. Silveri*[2] *and F. Veronesi*[1]**

[1] *Plant Breeding Institute, University of Perugia, Perugia, Italy*
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Introduction

Forage legumes can play an important role in the development of sustainable agriculture following the European Union Agricultural Policy which encourages the farmers to respect environmental issues. With this aim the Agency for Agricultural Development of Abruzzo Region financed a research project, aimed at the collecting, evaluation, conservation and utilization of both natural populations and landraces (farmer's varieties) of forage legumes still present in Abruzzo.

Where landraces are concerned, attention was focused on lucerne (*Medicago sativa* subsp. *sativa* L., $2n=4x=32$), by far the most important forage legume in Italy, grown on about one million hectares (Veronesi and Falcinelli 1988). Lucerne is characterized by important agronomic features in restoring soil structure and fertility and it occupies a significant economic position in the animal feed market. As for the natural populations (mainly annual medics and *Trifolium* spp.) growing in pastures, these germplasm sources can be used in breeding programmes aimed at the selection of varieties able to produce high-quality forages in marginal areas and to protect soils at risk of erosion.

The present study reports the productive characterization (dry matter yield) of lucerne landraces collected in Abruzzo and their genetic variability as estimated by the use of DNA markers (AFLP, Amplified Fragment Length Polymorphism); collecting activities concerning annual and perennial natural populations of forage legumes are also summarized.

Materials and methods

Lucerne landraces

Twenty-four landraces of *M. sativa* were collected in Abruzzo from the farmers who had reproduced seeds in their own farms for at least 15 years (Fig. 1, Table 1) at the beginning of 1997. Part of the seeds (100 g) was stored in the genebank of the Plant Breeding Institute as temporary depository, the other seeds were used to characterize the landraces for agronomic traits and to study their genetic variability through the use of AFLP markers. In this study the controls were represented by 4 varieties and 2 diffused landraces (commonly called "ecotypes"), found on the national seed market.

Forage yield evaluation

The forage dry matter yield (DMY) of landraces, varieties and ecotypes was evaluated during 1997 and 1998 in three experimental fields located at Capestrano (AQ) in the inner part of Abruzzo (350 m asl), Vasto (CH) on the coast of Abruzzo (10 m asl) and Perugia in Umbria Region (220 m asl). The experimental design used was a randomized complete block with three replications and plots of 4.5 m^2.

Molecular characterization

In January 1998, 100 seeds of each accession (with the exception of Atessa, 18 and Casoli, 20) were sown in jiffy pots and the plantlets were grown in the greenhouse. Young leaves were collected from 4-week-old plants, and the total genomic DNA was extracted from 21 randomly chosen plants per accession following the procedure described by Barcaccia and Rosellini (1996). Equal amounts of DNA extracted from each of the 21 plants per accession

were mixed to produce a DNA bulk relative to the accession. AFLP fingerprinting was performed using the Vos *et al.* (1995) procedure, with the modifications described by Barcaccia *et al.* (1998). Labelled selected DNA fragments separated on standard 4.5% acrylamide gels were scored as 1 for present and 0 for absent, and then analyzed for each band. The genetic similarity matrix was calculated to define the centroids of the analyzed accessions using NTSYS software (Rohlf 1992).

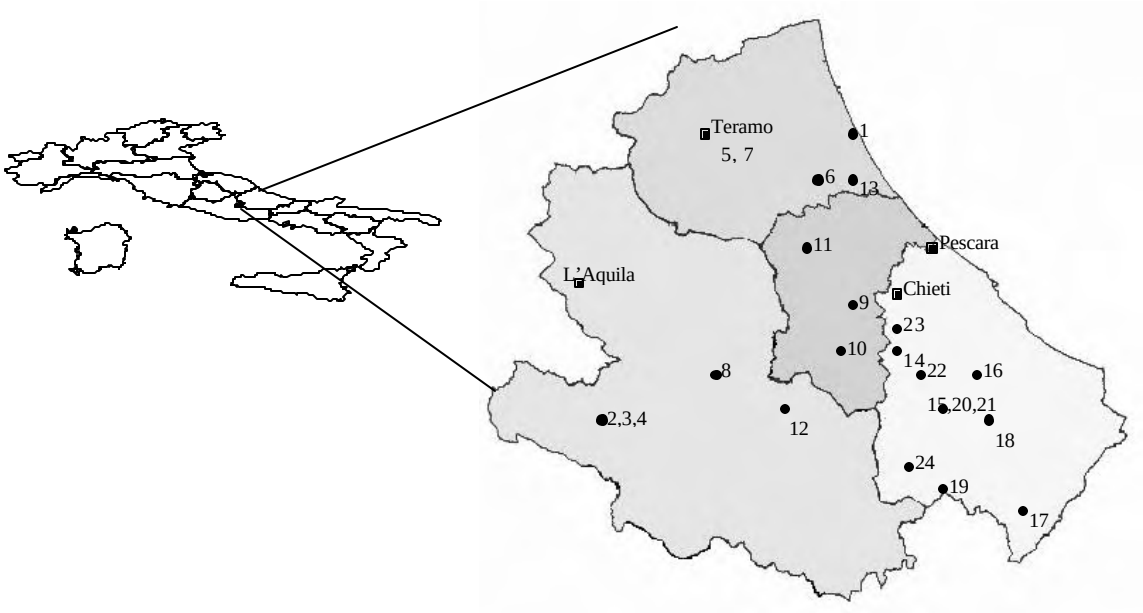

Fig. 1. Geographical distribution of lucerne landraces collected in Abruzzo (Italy).

Table 1. Collection numbers, name of collection sites, their altitudes and codes used in the text

N°	Collection site	Altitude (m asl)	Code	N°	Collection site	Altitude (m asl)	Code
1	Roseto degli Abr. (TE)	100	M1	16	Paludi (CH)	250	M16
2	Magli. dei Marsi (AQ)	728	M2	17	Roccaspinalveti (CH)	700	M17
3	Magli. dei Marsi (AQ)	728	M3	18	Atessa (CH)	475	-
4	Magli. dei Marsi (AQ)	780	M4	19	Casale (CH)	800	M19
5	Forcella (TE)	250	M5	20	Casoli (CH)	378	-
6	Valle Rosea (TE)	200	M6	21	Casoli (CH)	378	M21
7	Mezzanotte (TE)	300	M7	22	S. Domenico (CH)	300	M22
8	Castelv. Subeq. (AQ)	1000	M8	23	S. Marco (CH)	200	M23
9	Rosc. Villa Bad. (PE)	230	M9	24	S. Venanzio (CH)	700	M24
10	Petranico (PE)	500	M10	25	Variety Sabina (a)	-	VS1
11	C. Paglia. Penne (PE)	370	M11	-	Variety Sabina (b)	-	VS2
12	Raiano (AQ)	370	M12	-	Variety Sabina (c)	-	VS3
13	S. Giac. Di Atri (TE)	280	M13	-	Ecotype Central Italy	-	EIC
14	Colle S. Donato (CH)	300	M14	-	Ecotype Romagnola	-	ER
15	Casere Casoli (CH)	278	M15	-	Variety Equipe	-	VE

Natural populations of forage legumes

During 1997-98 the central area of Abruzzo was explored to collect natural populations of forage legumes. We explored natural pastures to look for widespread legumes species; on the whole, 39 accessions were collected (Table 2).

Table 2. Species collected, collection sites and altitude relative to natural population collecting missions 1997-98

N°	Species	Collection sites	Altitude (m asl)
1	*M. polymorpha* L.	Capestrano (AQ)	465
2	*M. polymorpha* L.	Castel di Ieri (AQ)	520
3	*M. rigidula* Desr.	Capestrano (AQ)	465
4	*M. rigidula* Desr.	Civitaretenga (AQ)	820
5	*M. rigidula* Desr.	Cast. Sub. Crapella (AQ)	500
6	*M. rigidula* Desr.	Ofena (AQ)	500
7	*M. rigidula* Desr.	Cast. Sub. Vignara (AQ)	500
8	*M. orbicularis* All.	Capestrano (AQ)	465
9	*M. orbicularis* All.	Ofena (AQ)	500
10	*M. orbicularis* All.	Civitaretenga (AQ)	820
11	*M. orbicularis* All.	Cast. Sub. Crapella (AQ)	500
12	*M. orbicularis* All.	Castel di Ieri (AQ)	520
13	*M. orbicularis* All.	Cast. Sub. Casette C. (AQ)	1000
14	*M. minima* Grufb.	Capestrano (AQ)	465
15	*M. minima* Grufb.	Ofena (AQ)	500
16	*M. minima* Grufb.	Cast. Sub. Crapella (AQ)	500
17	*M. arabica* Huds.	Castel di Ieri (AQ)	520
18	*M. disciformis* DC.	Civitaretenga (AQ)	820
19	*T. campestre* Schreb.	Ofena (AQ)	500
20	*T. campestre* Schreb.	Cast. Sub. Casette C. (AQ)	1000
21	*T. pratense* L.	Cast. Sub. Vignara (AQ)	500
22	*T. stellatum* L.	Ofena (AQ)	500
23	*T. scabrum* L.	Civitaretenga (AQ)	820
24	*T. fragiferum L.*	Castel di Ieri (AQ)	520
25	*T. subterraneum* L.	Castel di Ieri (AQ)	520
26	*T. montanum* L.	S. Stefano di S. (AQ)	1460
27	*C. scorpioides* L.	Cast. Sub. Casette C. (AQ)	1000
28	*C. minima* L.	S. Benedetto Per. (AQ)	1100
29	*C. varia* L.	Cast. Sub. Casette C. (AQ)	1000
30	*A. vulneraria* L.	S. Benedetto Per. (AQ)	1100
31	*A. vulneraria* L.	S. Stefano di S. (AQ)	1460
32	*O. viciifolia* Scop.	S. Stefano di S. (AQ)	1460
33	*O. viciifolia* Scop.	S. Benedetto Per. (AQ)	1100
34	*O. caput-galli* Lam.	Ofena (AQ)	500
35	*O. caput-galli* Lam.	S. Stefano di S. (AQ)	1460
36	*L. corniculatus* L.	S. Stefano di S. (AQ)	1460
37	*L. tenuis* L.	Castel di Ieri (AQ)	520
38	*V. sativa* L.	S. Stefano di S. (AQ)	1460
39	*V. villosa* Roth.	Castelv. Subequo (AQ)	490

Results

Lucerne landraces

Dry matter yield evaluation

The results concerning dry matter yield (DMY) (g / m²) are reported in Table 3 as sum of individual cuts; given the different number of cuts and the different years of data collection (1997 and 1998), data coming from each experimental field have been analyzed separately.

At Vasto (near the coast) populations M5 (mean=431), M18 (mean=430), M22 (mean=423) and M17 (mean=415 g / m²) proved to be very interesting. Control materials showed DMY significantly lower than the above-reported populations in this experimental field. The experiment carried out in Capestrano showed that M11 (mean=482), M13 (mean=470), M15 (mean=465), M18 (mean=448), M9 (mean=443), M8 (mean=441) and M5 (mean=436 g / m²) were significantly more productive than controls; with the only exception of Romagnola ecotype (mean=387 g / m²). In contrast, data obtained in Perugia have not shown significant differences between controls and landraces, though significant differences have been reported among landraces with populations M13 (mean=400), M8 (mean=384), M1 (mean=383) and M9 (mean=377 g / m²) showing good productive levels.

Molecular characterization

The AFLP markers have shown genomic polymorphisms of the analyzed lucerne populations (landraces, ecotypes and varieties). Three primer combinations (Eco-RI+3 / Mse-I+3 with selective bases CAC / AGA, CCA / ACA, and CAC / AGG, respectively) generated a total of 192 amplification products (on the average 64 products per primer combinations); 43.75% of them were polymorphic. The average level of genetic similarity among the local landraces was 0.879, ranging between 0.781 (M5 vs. M10) and 0.927 (M4 vs. M20). In particular, M10 appeared to be isolated from all the other analyzed materials.

Table 3. Dry matter yield (g/m²) of 24 lucerne landraces collected in Abruzzo and 6 control materials (Travaglini *et al*. 1999)

Ecotypes and varieties	Vasto 1997	Capestrano 1998	Perugia 1998
M1 Roseto degli Abruzzi (TE)	384 BCDEFG	417 DEFGH	383 DEF
M2 Magliano dei Marsi 1 (AQ)	365 BCDEFG	403 DEFGH	312 AB
M3 Magliano dei Marsi 2 (AQ)	375 BCDEFG	374 CDEFGH	323 ABC
M4 Magliano dei Marsi 3 (AQ)	304 AB	363 CDEFGH	326 ABCD
M5 Forcella (TE)	431 G	436 EFGH	364 BCDEF
M6 Valle Rosea (TE)	401 DEFG	407 DEFGH	346 ABCDEF
M7 Mezzanotte (TE)	339 ABCDEFG	380 DEFGH	357 ABCDEF
M8 Castelvecchio Subequo (AQ)	340 ABCDEFG	441 FGH	384 EF
M9 Rosciano Villa Badessa (PE)	324 ABCDE	443 FGH	377 CDEF
M10 Pietranico (PE)	349 BCDEFG	344 BCDEFG	352 ABCDEF
M11 C. da Pagliaporci (PE)	362 BCDEFG	482 H	325 ABC
M12 Raiano (AQ)	334 ABCDEF	368 CDEFGH	305 A
M13 S.Giacomo di Atri (TE)	359 BCDEFG	470 GH	400 F
M14 Colle S. Donato (CH)	378 BCDEFG	392 DEFGH	332 ABCDE
M15 Casere Casoli (CH)	372 BCDEFG	465 GH	333 ABCDE
M16 Paludi (CH)	320 ABCD	300 ABCD	329 ABCDE
M17 Roccaspinalveti (CH)	415 EFG	405 DEFGH	354 ABCDEF
M18 Atessa (CH)	430 G	448 FGH	343 ABCDEF
M19 Casale Montenerodomo (CH)	403 DEFG	309 ABCDE	333 ABCDE
M20 Piano Carlino (CH)	397 CDEFG	369 CDEFGH	309 AB
M21 C. le Serre Casoli (CH)	390 BCDEFG	410 DEFGH	340 ABCDE
M22 S. Domenico (CH)	423 FG	414 DEFGH	326 ABCD
M23 S. Marco (AQ)	364 BCDEFG	404 DEFGH	314 AB
M24 S. Venanzio (CH)	378 BCDEFG	425 DEFGH	348 ABCDEF
VS1 Var. Sabina 1 (25)	311 ABCD	321 BCDEF	354 ABCDEF
VS2 Var. Sabina 2 (26)	340 ABCDEFG	222 AB	360 ABCDEF
VS3 Var. Sabina 3 (27)	306 ABC	248 ABC	351 ABCDEF
ECI Ec. Italia Centrale (28)	385 BCDEFG	187 A	349 ABCDEF
ER Ec. Romagnolo (29)	344 ABCDEFG	387 DEFGH	348 ABCDEF
VE Var. Equipe (30)	255 A	323 BCDEF	363 BCDEF
DMS $_{0,05}$	**92**	**127**	**57**

Averages followed by the same letter are not significantly different at $P \leq 0.05$.

The centroids analysis obtained with the similarity matrix (Fig. 2) based on Dice (1945) coefficients has shown that almost 50% of the local landraces (11 out of 24) belong to a homogeneous genetic core showing more than 91% of similarity. Within this group the commercial ecotypes 'Italia centrale' (EIC) and 'Romagnola' (ER) and the variety 'Equipe' (VE) are present. Several of the remaining local landraces shared the genetic polymorphisms associated with Function 2. The markers associated with this function clearly discriminated populations M1, M5, and M7, which were collected in the northern part of the collection area, from populations M10 and M16 (Fig. 2). Markers associated with Function 1 can discriminate accessions M1, M2, and M6 from M11, M13, M15, M16 and M23. It is also interesting to note that three seed samples of the variety 'Sabina' (VS1, VS2, and VS3) produced materials which appeared to be quite different from each other.

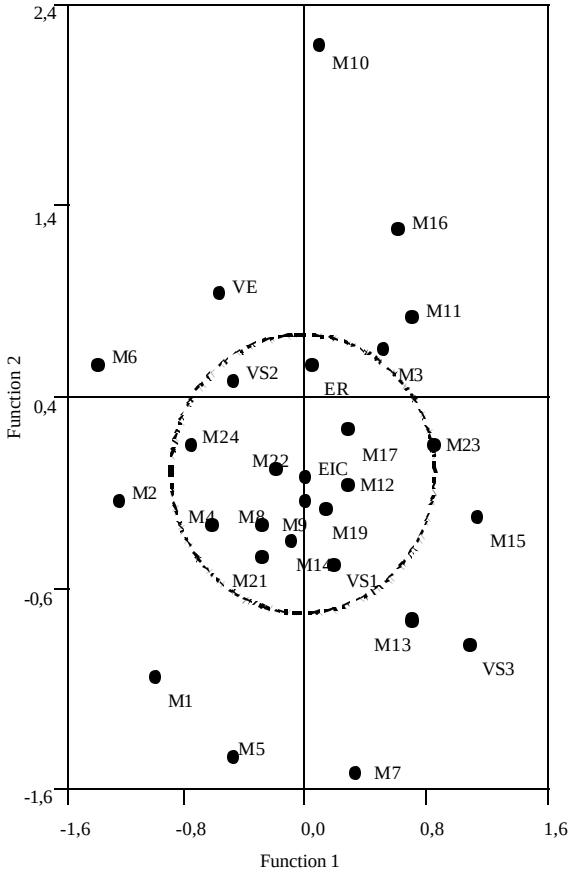

Fig. 2. Centroids relative to the accessions plotted according to UPGMA method based on the two main discriminant functions (Albertini *et al.* 1998).

Natural pasture legumes

Twenty-four annual and perennial species were collected in the collecting mission; accessions from higher altitudes are of particular interest. Presently some accessions of *M. rigidula, M. orbicularis, T. fragiferum* and *T. subterraneum* are being multiplied to enable their morpho-agronomic evaluation.

Conclusions

The above-reported results show that in the Abruzzo Region it is possible to collect interesting germplasm accessions belonging to lucerne landraces and to a wide spectrum of forage legumes.

The results relative to lucerne DMY show that, on average, the collected landraces are more productive than commercial varieties and ecotypes when grown within their adaptation area. These materials are presently used in a breeding programme to synthesize new varieties adapted to central Italy.

Last but not least, the molecular markers utilized (AFLP) appeared to be able to characterize the genetic variability among local germplasm resources and can be used to identify the most representative populations in one particular area.

Acknowledgements

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Forage collecting activities in Lithuania, 1997-99

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During 1997-99 eight expeditions were organized to natural habitats of various geographical locations of 16 Lithuanian administrative regions. Since Lithuania is a country of plains most habitats were situated not higher than 10 m above sea level. The highest hills were 100-150 m asl.

As a result 557 seed accessions of forage grasses were collected in 103 natural habitats (Table 1). Altogether 24 species of grasses and 17 species of legumes were collected. Most of the accessions (more than 70%) belong to the species involved in the breeding programmes.

Table 1. Number of grasses and legumes accessions collected in Lithuania, 1997-99

Species	1997	1998	1999	Total
Grasses				
Agrostis tenuis Sibth.			1	1
Anthoxanthum odoratum L.			1	1
Bromus inermis Leysser	6	4	9	19
Cynosurus cristatus L.		1	1	2
Corynephorus canescens L.			2	2
Dactylis glomerata L.	21	26	33	80
Festuca arundinacea Schreb.		2		2
Festuca pratensis Huds.	11	27	28	66
Festuca rubra L.	12	10	30	52
Festuca gigantea L.			3	3
Festuca psammophila Hackd.			2	2
Festuca ovina L.			13	13
Festuca trachyphylla Hackd.			1	1
Glicerija nemoralis Uecht. et Korn.		1	1	2
Koeleria glauca Schkuhr.			2	2
Koeleria piramidata Schkuhr.			2	2
Lolium perenne L.	7	9	11	27
Phleum pratense L.	18	21	18	57
Phleum phleoides L.		1		1
Poa pratensis L.	14	26	33	73
Poa nemoralis L.			3	3
Poa compressa L.	1	4	2	7
Poa palustris L.			1	1
Phalaris arundinacea L.			4	4
Total grasses				**423**
Legumes				
Anthyllis vulneraria L.		1	1	2
Astragalus glycyphyllus L.		2		2
Galega officinalis L.		1		1
Lotus uliginosus Schkuhr.	1	2		3
Medicago sativa L.			1	1
Medicago falcata L.	5		1	6
Medicago lupulina L.			1	1
Onobrychis viciaefolia Scop.	1	2		3
Trifolium repens L.	7	9	16	32
Trifolium pratense L.		26	21	47
Trifolium medium Grufb.		10	6	16
Trifolium campestre Schreb.		2		2
Trifolium aureum Poll.		1	1	2
Trifolium minus Sm.		2		2
Trifolium arvense L.			1	1
Trifolium montanum L.			1	1
Trifolium hybridum L.	4		8	12
Total legumes				**134**
Grand total				**557**

Forage collecting activities in Poland, 1997-99

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Introduction

The collecting activities on plant genetic resources of the Centre for Plant Genetic Resources of IHAR are spread over almost the whole year. This enabled collection of a wide range of species with different uses. Therefore people from different institutions took part in several expeditions. As of 1997 international cooperation was developed between neighbouring countries: Poland, Czech Republic, Slovakia and Ukraine. International expeditions were organized by the following institutes:

- Research Institute of Plant Production (RIPP), Piešťany, Slovakia
- Grassland Research Station (GRS), Zubří, Czech Republic
- Research Institute for Fodder Plants (RIFP) Ltd., Troubsko, Czech Republic
- Introduction and Storage of Germplasm of National Centre for Plant Genetic Resources, Kharkov (NCPGR), Ukraine
- Nikitskij Botanical Garden (BG), Jalta, Ukraine
- Centre for Plant Genetic Resources of IHAR (CPGR-IHAR), Poland
- Botanical Garden of IHAR (OBIHAR), Bydgoszcz, Poland.

Results

Tables 1, 2 and 3 provide details of collecting missions and collected accessions in 1997, 1998 and 1999.

Table 1. Collecting missions 1997-99

Date	Region and country code	Institution
1997		
10–20.08	Ojcowski and Magurski National Park, Zakopane	OBIHAR
01-10.09	Wołyń and Podole (UKR)	CPGR-IHAR
16-26.09	Javorniky, Stiavickie Vrchy (SLO)	RIPP
13-19.10	Beskid Mały, Makowski, Śląski and Żywiecki (POL)	CPGR-IHAR
1998		
20.07-01.08	Krym (UKR)	CPGR-IHAR
12.08–22.08	Zamość Region and Roztoczański National Park	OBIHAR
17-22.08	Zielona Góra region (POL)	CPGR-IHAR
30.08-13.09	Lwow and Kamieniec Podolski (UKR) west and south Moldavia	CPGR-IHAR
12-15.10	Bielsko-Biała region (POL)	CPGR-IHAR
19-22.10	Białystok region (POL)	CPGR-IHAR
26-29.10	Zamość region (POL)	CPGR-IHAR
03-06.11	Łomża region (POL)	CPGR-IHAR
1999		
21.06-03. 07	Krym (UKR)	CPGR-IHAR
20-25.07	Puszcza Białowieska and Narwiański National Park (POL)	CPGR-IHAR
23–31.08	Beskidy Mts. (POL)	CPGR-IHAR, RIPP, GRS
04-14.09	Transcarpathia (UKR)	CPGR-IHAR
11.10-16.10	Kielce region (POL)	CPGR-IHAR

Table 2. Details of collected accessions – Centre for Plant Genetic Resources, IHAR, Radzików

	Collecting year							
	1997		1998		1999		Total per species	
Genus, species	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
Aegilops biuncialis Vis.				2		15		17
Aegilops cylindrica Host				9		13		22
Aegilops geniculata Roth						1		1
Aegilops ovata L.				5				5
Aegilops truncialis L.				8		8		16
Agropyron caninum (L.) Beauv.					1		1	
Agropyron cristatum J. Gaertn.				3		1		4
Agropyron desertorum Schultes				3				3
Agropyron elongatum (Host) Beauv.				3				3
Agropyron sp.		2						2
Agrostis canina L.		1			1		1	1
Agrostis capillaris L.		7			3	14	3	21
Agrostis gigantea Roth		1		2	2	3	2	6
Agrostis sp.	1			1		11	1	12
Agrostis stolonifera L.		1			1		1	1
Aira elegans Wild. Ex Gaudin				1				1
Alopecurus arundinaceus Poir. in Lam.						1		1
Alopecurus pratensis L.			4	1	3	2	7	3
Anthoxanthum alpinum A. Love & D. Love					1	2	1	2
Anthoxanthum odoratum L.						4		4
Anthyllis vulneraria L.		2				6		8
Arrhenatherum elatius (L.) J.&C. Presl.		2	4	2	1	9	5	13
Astragalus arenarius L.		1						1
Astragalus cicer L.				1		1		2
Astragalus glycyphyllos L.		1			1	4	1	5
Astragalus onobrychis L.				1				1
Astragalus ponticus Pallas				1				1
Astragalus sp.				5		2		7
Avenula pratensis (L.) Dumort.					1		1	
Brachypodium pinnatum (L.) Beauv.						3		3
Brachypodium sp.				2		2		4
Brachypodium sylvaticum Beauv.						2		2
Briza media L.				1	3	10	3	11
Bromus cappadocicus Boiss. & Balansa				1				1
Bromus hordaceus L.			1				1	
Bromus madritensis L.				1				1
Bromus secalinus L.						1		1
Bromus sp.		1		3		7		11
Bromus squarrosus L.				3		1		4
Calamagrostis arundinacea (L.) Roth						2		2
Calamagrostis epigejos (L.) Roth		1	3				3	1
Calamagrostis sp.	2					2	2	2
Coronilla emeroides Boiss. & Sprunet				2				2
Coronilla varia L.		2		8	1	2	1	12
Corynephorus canescens (L.) P.B.			1				1	
Cynodon dactylon (L.) Pers.				1				1
Cynosurus cristatus L.	1	3		3	5	11	6	17
Cynosurus echinatus L.				3		1		4
Dactylis glomerata L.	1	8	7	14	5	25	13	47
Danthonia decumbens (L.) DC.					1	1	1	1
Deschampsia caespitosa (L.) Beauv.	1	7	1	3	5	15	7	25
Deschampsia flexuosa Trin.		1			6	1	6	2
Dorycnium graecum (L.) Ser.				1				1
Dorycnium herbaceum Vill.				1				1
Elymus panoramitanus (Bertol.) Tzvel.				1				1
Elymus stipifolius A. Melderis				1				1
Elytrigia besarabica Savuol. & Rayss				1				1
Elytrigia nodosa (Nevski) Nevski				2				2
Elytrigia repens (L.) Nevski				1		2		3
Elytrigia strigosa (Bieb.) Nevski				2				2
Elytrigia trichophora (Link) Nevski				1				1
Festuca arundinacea Schreb.		1		1				2
Festuca beckeri (Hackel) Trautv.				2				2
Festuca capillata Lam.		2				2		4
Festuca gigantea (L.) Vill.				1	1	1	1	2
Festuca glauca Vill.		1						1
Festuca orientalis A.Kerner ex Hackel				1				1
Festuca ovina L.	3	1	1				4	1
Festuca pratensis Huds.		11	1	1	6	22	7	34
Festuca rubra L.		8	2		5	25	7	33

	Collecting year							
	1997		1998		1999		Total per species	
Genus, species	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
Festuca sp.	2			4		5	2	9
Festuca sulcata (Hackel) Nyman		1		5		2		8
Festuca versicolor Tausch					3		3	
Haynaldia villosa (L.) Schur				4		4		8
Hedysarum candidum Bieb.				1		1		2
Hedysarum tauricum Pallas ex Will.				1		2		3
Holcus mollis L.					1	3	1	3
Hordeum bulbosum L.				4		7		11
Hordeum geniculatum All.						1		1
Hordeum glaucum Staudel						1		1
Koeleria brevis Steven				1				1
Koeleria glauca DC.		1		1		1		3
Koeleria macrantha (Ledeb.) Schult.				1				1
Koeleria sp.						2		2
Lathyrus pratensis L.		2						2
Leymus racemosus (Lam.) Tzvel.				2				2
Lolium multiflorum Lam.			1	1			1	1
Lolium perenne L.		11	1	9	2	18	3	38
Lotus corniculatus L.		8		5	5	19	5	32
Lotus sp.			2				2	
Lotus tenuis Waldst. & Kit. Ex Willd.				1				1
Lotus uliginosus Schkuhr					2	2	2	2
Lupinus polyphyllus Ldl.			1	1			1	1
Medicago arabica (L.) Hudson				2				2
Medicago falcata (L.) Arcang.		1		2	1	2	1	5
Medicago glomerata Balbis		1						1
Medicago lupulina L.		1	2	1	3	5	5	7
Medicago minima (L.) Bartl				4		4		8
Medicago orbicularis (L.) Bartl				3		4		7
Medicago romanica Prodan.				4				4
Medicago sativa L.				2	1		1	2
Medicago sp.	1		1		3	2	5	2
Medicago varia Martyn					2	1	2	1
Melica ciliata L.				2		3		5
Melica taurica C. Koch				1				1
Melilotus albus Med.	1	1	3	1		5	4	7
Melilotus neapolitana Ten.				1				1
Melilotus officinalis (L.) Lam.				1	1		1	1
Melilotus sp.		1		5				6
Melilotus taurica (Bieb.) Ser.				2				2
Milium effusum L.						1		1
Molinia caerulea (L.) Moench		1						1
Nardus stricta L.						4		4
Onobrychis pallasi (Willd.) Bieb.						1		1
Onobrychis sp.				5		2		7
Onobrychis viciifolia Scop.				1				1
Ononis arvensis L.					1	1	1	1
Ononis repens L.						1		1
Ononis spinosa L.					2	1	2	1
Ornithopus sativus Brot.					4		4	
Hainardia cylindrica (Willd.) W.Greuter						1		1
Phalaris arundinacea L.						3		3
Phleum alpinum L.					2	3	2	3
Phleum arenarium L.				1				1
Phleum boehmeri Wib.						2		2
Phleum nodosum L.						1		1
Phleum phleoides (l.) H. Karst.				1				1
Phleum pratense L.	2	13	3	4	7	23	12	40
Piptatherum holciformis (Bieb.) Roemer & Schultes				1				1
Poa alpina L.						1		1
Poa angustifolia L.				3		1		4
Poa chaixii Vill.						1		1
Poa compressa L.				1		1		2
Poa laxa L.					2		2	
Poa nemoralis L.		1				4		5
Poa palustris L.		1						1
Poa pratensis L.		12			6	19	6	31
Poa sp.				4		2		6
Poa sterilis Bieb.				2		2		4
Psilurus incurvus (Gouan) Schinz & Thell.				1				1

	Collecting year							
	1997		1998		1999		Total per species	
Genus, species	**Local**	**Foreign**	**Local**	**Foreign**	**Local**	**Foreign**	**Local**	**Foreign**
Puccinellia distans Parl.				1				1
Scleropoa rigida (L.) Griseb						2		2
Sesleria calcarea (Pers.) Opiz.						1		1
Stipa capillata L.				3		1		4
Stipa sp.						2		2
Taeniatherum asperum (Simonkai) Nevski						1		1
Taeniatherum crinitum (Schreber) Nevski				2		1		3
Tetragonolobus maritimus (L.) Roth				1				1
Trifolium alpestre L.				1	1	2	1	3
Trifolium ambiguum Bieb.						3		3
Trifolium angustifolium L.				2		1		3
Trifolium aureum Poll.						2		2
Trifolium campestre Schreb.				2		2		4
Trifolium caucasicum Tausch				2				2
Trifolium fragiferum L.		3						3
Trifolium hirtum All.				3		2		5
Trifolium hybridum L.						8		8
Trifolium leucanthum Bieb.						1		1
Trifolium medium L.		3		1	6	14	6	18
Trifolium montanum L.		2			1	5	1	7
Trifolium ochroleucum Hudson		2						2
Trifolium pannonicum Jacq.		1						1
Trifolium pratense L.		7	4	1	9	17	13	25
Trifolium repens L.		5	3	4	6	16	9	25
Trifolium rubens L.		1				2		3
Trifolium sp.	3		1	1		5	4	6
Trifolium spadiceum L.					1		1	
Trifolium strepens Cr.		1						1
Trifolium subterraneum L.				2				2
Trisetum flavescens (L.) Beauv.		1			1	9	1	10
Vicia cracca L.		1		1	4	12	4	14
Vicia narborensis		1						1
Vicia sepium L.				1	3	4	3	5
Vicia sp.		1	1	5	1	9	2	15
Vicia tetrasperma (L.) Schreb.				1			0	1
Vicia villosa Roth			1	1		1	1	2
Vulpia myuros (L.) C.C. Gmel.				1		2		3
Total per year	**18**	**150**	**49**	**242**	**134**	**529**	**201**	**921**

Table 3. Details of collected accessions – Botanical Garden, IHAR, Bydgoszcz

	Collecting year		
Genus, species	**1997**	**1998**	**Total per species**
Agrostis capillaris L.	7	4	11
Agrostis gigantea Roth	4	4	8
Agrostis stolonifera L.	2	2	4
Alopecurus pratensis L.	6	5	11
Anthoxanthum odoratum L.	2		2
Anthyllis vulneraria L.	5	2	7
Apera spica-venti (L.) P.B.	1		1
Arrhenatherum elatius (L.) J.&C. Presl.	6	6	12
Astragalus cicer L.		1	1
Astragalus glycyphyllos L.		1	1
Astragalus sp.		1	1
Avenula planiculmis (Schrad.) W.Sauer & Chmel.		1	1
Avenula versicolor (Vill.) Pilg.	2		2
Brachypodium pinnatum (L.) Beauv.	2	4	6
Brachypodium sylvaticum Beauv.	1	1	2
Briza media L.	13	2	15
Bromus benekenii (Lange) Trimen		1	1
Bromus inermis Leyss.	1	2	3
Bromus secalinus L.		1	1
Calamagrostis epigejos (L.) Roth	1	2	3
Calamagrostis pseudophragmites Koeler	1		1
Calamagrostis sp.	1	1	2
Coronilla varia L.	1	1	2
Corynephorus canescens (L.) P.B.		1	1
Cynosurus cristatus L.	17	4	21
Dactylis glomerata L.	23	21	44

Genus, species	Collecting year 1997	1998	Total per species
Danthonia decumbens (L.) DC.	3	2	5
Deschampsia caespitosa (L.) Beauv.	19	16	35
Festuca arundinacea Schreb.	3	1	4
Festuca capillata Lam.	1	4	5
Festuca gigantea (L.) Vill.	5	2	7
Festuca ovina L.	2	1	3
Festuca pallens Host.	1		1
Festuca pratensis Huds.	24	15	39
Festuca rubra L.	28	19	47
Festuca sp.	3		3
Glyceria fluitans (L.) R.Br.	1	5	6
Glyceria maxima (Hartm.) Holmb.		5	5
Glyceria plicata Fries	1	1	2
Holcus lanatus L.	8	2	10
Holcus mollis L.	1	1	2
Koeleria glauca DC.	2		2
Lathyrus pratensis L.	1	1	2
*Lathyrus vernus (*L.) Bernh.		1	1
Lolium perenne L.	15	20	35
Lotus corniculatus L.	2	5	7
Lupinus polyphyllus Ldl.		1	1
Medicago falcata (L.) Arcang.	1	4	5
Medicago lupulina L.	2	3	5
Medicago sp.		1	1
Melica nutans L.	3		3
Melica transsilvanica Schur	1		1
Melilotus albus Med.		1	1
Melilotus officinalis (L.) Lam.		2	2
Molinia caerulea (L.) Moench		1	1
Nardus stricta L.	1	1	2
Onobrychis arenaria (Kit.) Ser.		1	1
Ononis arvensis L.		1	1
Phalaris arundinacea L.	4	5	9
Phleum boehmeri Wib.	2		2
Phleum nodosum	2	2	4
Phleum pratense L.	21	21	42
Phleum sp.		1	1
Poa compressa L.	5	3	8
Poa nemoralis L.	2	1	3
Poa palustris L.		2	2
Poa pratensis L.	25	20	45
Puccinellia distans Parl.	1		1
Trifolium arvense L.	1	1	2
Trifolium aureum Poll.		1	1
Trifolium campestre Schreb.	1		1
Trifolium hybridum L.	2	6	8
Trifolium medium L.		3	3
Trifolium montanum L.	2		2
Trifolium pratense L.	4	7	11
Trifolium repens L.	4	4	8
Trifolium strepens Cr.	3		3
Trisetum flavescens (L.) Beauv.	3	1	4
Vicia angustifolia L.		1	1
Vicia cracca L.	1		1
Vicia hirsuta (L.) S.F.Gray	1		1
Vicia sepium L.	2	1	3
Vicia sp.	2		2
Vicia tetrasperma (L.) Schreb.	1	1	2
Total per year	**313**	**266**	**579**

Forage collecting activities in Slovakia, 1997-99

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In 1997-99 several collecting expeditions were carried out covering the west Carpathian flora (*Carpaticum occidentale*) and Pannonian flora (*Pannonicum*) (Table 1).

For the west Carpathian flora, samples were collected in submontane and montane regions of Levo…ské vrchy (Spiš 97), Tur…ianska kotlina, Malá Fatra and Veµká Fatra (Fatra 97), Javorníky and Kysucké vrchy (Kysuce 97), Štiavnické vrchy (Sitno 97), Čergov and Kremnické vrchy (Slovensko 99) and in a mountain range Beskydy spreading over the territory of Slovakia, Czech Republic and Poland (Beskydy 99). For the Pannonian flora, samples were collected in the area of Záhorská nížina (Záhorie 98) and in the territory of Cerová vrchovina and Juhoslovenská kotlina (Gemer 98). Apart from this, we took part in a collecting expedition in Krym peninsula (Krym 98) organized by the Institute of Breeding and Plant Acclimatization (IHAR, Radzików, Poland) and the National Centre for Plant Genetic Resources in Kharkiv. In 1999 we were invited to a collecting expedition in Poland organized by IHAR Radzików in the area of Ponidzie.

In 1997, 228 accessions of forages were collected, of which the most numerous were species of *Trifolium* (60) and *Festuca* (33). In 1998, 291 forages samples were collected, with a majority of grasses (178). During expeditions in 1999 we collected 249 samples, mostly grasses and clovers; forage legumes were collected in a relatively small number (Table 2).

The collected samples will be stored in the Gene Bank of RIPP Piešťany in the next stage after multiplication.

Table 1. Collecting expeditions in 1997-99 (see collecting site locations on Fig. 1)

Year	Country	Name of expedition	Collecting sites	No. of accessions
1997	Slovak Republic	Spiš 97	Levočské vrchy	75
1997	Slovak Republic	Fatra 97	Malá Fatra Vel'ká Fatra Žilinská kotlina Turčianská kotlina	67
1997	Slovak Republic*	Kysuce 97	Javorníky	32
1997	Slovak Republic*	Sitno 97	Štiavnické vrchy	54
Total				**228**
1998	Ukraine*	Krym 98	Crimean peninsula	145
1998	Slovak Republic**	Záhorie 98	Záhorská nižina	78
1998	Slovak Republic**	Gemer 98	Malé Karpaty Rimavsko-ipelská brázda	68
Total				**291**
1999	Slovak Republic	Slovensko 99	Čergov	98
1999	Slovak Republic**	Beskydy 99	Kremnické vrchy Morovsko-sliezske Beskydy Turzovská vrchoviny Javorníky, Malá Fatra Zywiec Beskydsky	132
1999	Poland	Kieleczszyzno	Ponidzie	19
Total				**249**

* in cooperation with IHAR Radzików, Poland

** in cooperation with the Gene Bank of RIPP Praha, Czech Republic

Table 2. Number of accessions collected in 1997-99

Genus	1997	1998	1999	Genus	1997	1998	1999
Agropyron Gaertn.	–	7	–	*Helictotrichon* Bess.	–	1	–
Agrostis L.	8	11	13	*Holcus* L.	–	1	1
Alopecurus L.	–	–	2	*Koeleria* Pers.	–	5	–
Anthoxanthum L.	1	–	3	*Lathyrus* L.	8	1	5
Anthyllis L.	11	1	5	*Leymus* Hochst.	–	2	–
Arrhenatherum P.B.	5	8	3	*Lolium* L.	5	21	6
Astragalus L.	1	7	1	*Lotus* L.	13	1	14
Brachypodium P.B.	–	3	–	*Lupinus* L.	1	–	1
Briza L.	1	–	3	*Luzula* DC.	–	–	2
Bromus L.	–	8	1	*Medicago* L.	7	19	12
Calamagrostis Adans.	1	–	–	*Melica* L.	–	5	–
Carex L.	–	1	2	*Melilotus* Mill.	1	7	2
Coronilla L.	2	13	2	*Nardus* L.	1	–	–
Corynephorus P.Beauv	–	1	–	*Onobrychis* Mill.	–	5	–
Cynodon (L.) Pers.	–	1	–	*Phalaris* L.	–	–	1
Cynosurus L.	3	1	4	*Phleum* L.	13	9	16
Dactylis L.	15	22	14	*Pisum* L.	1	–	9
Danthonia DC.	–	–	2	*Poa* L.	13	3	15
Deschampsia P.B.	8	3	6	*Sesleria* Scop.	–	–	1
Elytrigia Desv.	–	1	–	*Trifolium* L.	6	32	55
Eremopyrum (Ledeb.) Jaub. & Spach.	1	–	–	*Trigonella* L.	–	1	–
Eryngium L.	–	1	–	*Trisetum* Pers.	1	1	4
Festuca L.	33	38	27	*Vicia* L.	6	4	18
				Total	**228**	**291**	**249**
				Total 1997-99	**768**		

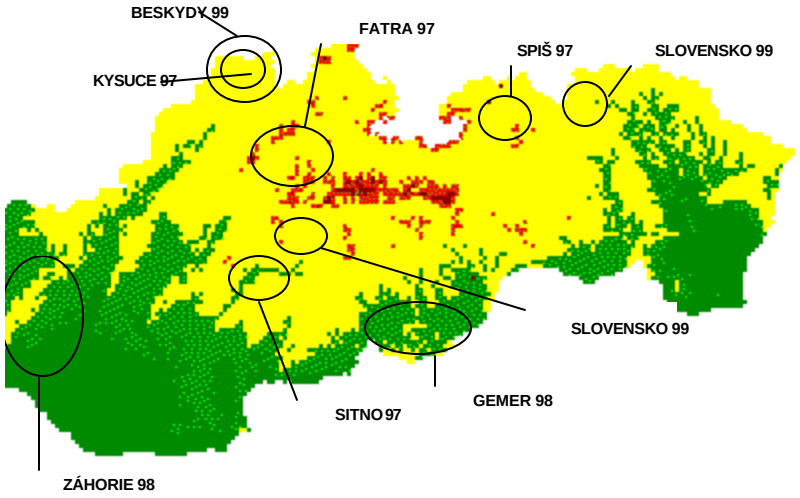

Fig. 1. Collecting expeditions in Slovakia, 1997-99.

Joint collection and characterization of forage and pasture germplasm in Portugal and Spain

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This activity was included in a joint Portuguese-Spanish research project, whose main objective is to collect material from species of natural pastures to be introduced in degraded areas with the same ecology. In April 1998, the areas for prospection of species of legumes and grasses interesting as pasture crops were established. The sites to be prospected were defined within the savannah of *Quercus rotundifolia* and *Quercus suber*. The soils of this area, in the southwest Iberian Peninsula, are often acid, thin, with low levels of phosphorus and organic matter, with natural pastures. In these conditions it is urgent to collect, characterize and evaluate these plant genetic resources in order to save and preserve them for the future.

The itinerary was as follows:

- Portugal (Alto and Baixo Alentejo interior): Elvas, Alandroal, Terena, Reguengos de Monsaraz, Mourão, Amareleja, Moura, Safara, Barrancoa, Vila Verde de Ficalho
- Spain (south of Extremadura and NW of Andaluzia): Rosal de la Frontera, Cortegana, Aracena, Santa Olalla de Cala, El Real de la Jara, Cazalla de la Sierra, Constantina, Las Navas de la Concepción, Guadalcanal, Belalcazar, Santa Eufemia, Almadén, Cabeza del Buey.

In this mission we selected 75 representative sites and found the following species: *Adenocarpus telonensis, Anthyllis lotoides, Astragalus hamosus, Biserrula pelecinus, Cytisus scoparius, C. striatus, Linum usitatissimum, Lolium rigidum, Lotus conimbricensis, L. corniculatus, L. parviflorus, Medicago arabica, M. doliata, M. orbicularis, M. polymorpha, M. truncatula, Onobrychis eriofora, Ornithopus compressus, O. pinnatus, Scorpiurus muricatus, S. vermiculata, Teline linifolia, Trifolium angustifolium, T. arvense, T. boconei, T. campestre, T. cernuum, T. cherleri, T. glomeratum, T. obscurum, T. scabrum, T. stellatum, T. striatum, T. subterraneum, T. suffocatum* and *T. tomentosum.*

After that, in July 1998, the collecting was done, visiting the same sites and others that seemed important and which could not be visited during the previous prospecting mission. We collected in 83 sites and recorded at each place the passport data as per the passport descriptors from IPGRI. To identify the place, photos were taken as well as soil samples to analyze pH (H_2O), texture, organic matter (%), extractable phosphorus (P-ppm), potassium (K_2O-ppm) and calcium (Ca-ppm). We collected those species that can have some forage value and contribute to improvement of these degraded pastures. Table 1 lists the 32 species and number of samples collected.

In 1998-99 the first seed multiplication and morphological characterization were carried out and in 1999-2000 the second year of morphological characterization and first agronomic evaluation will be undertaken simultaneously in ENMP (Elvas) and Finca la Orden (SIAEx-Badajoz).

Next spring and summer another collecting mission should be undertaken in the same sites to collect seeds which were lost in a few cases.

Table 1. Species and number of samples collected

Species	Number of samples
Adenocarpus telonensis	2
Biserrula pelecinus	14
Cytisus scoparius	2
Cytisus striatus	2
Dactylis glomerata	37
Linum sp.	7
Lotus conimbricensis	24
Medicago arabica	14
Medicago doliata	9
Medicago doliata aculeata	1
Medicago minima	3
Medicago orbicularis	14
Medicago polymorpha	59
Medicago polymorpha inermis	1
Medicago rigidula	1
Medicago truncatula	5
Ornithopus compressus	76
Ornithopus pinnatum	9
Scorpiurus muricatus	27
Scorpiurus sp.	2
Scorpiurus vermiculata	34
Teline linifolia	1
Trifolium bocconei	55
Trifolium cherleri	66
Trifolium glomeratum	78
Trifolium hirtum	1
Trifolium obscurum	1
Trifolium resupinatum	4
Trifolium sp.	4
Trifolium stellatum	41
Trifolium striatum	56
Trifolium subterraneum	46

Forage collecting activities in Bulgaria, 1997-99

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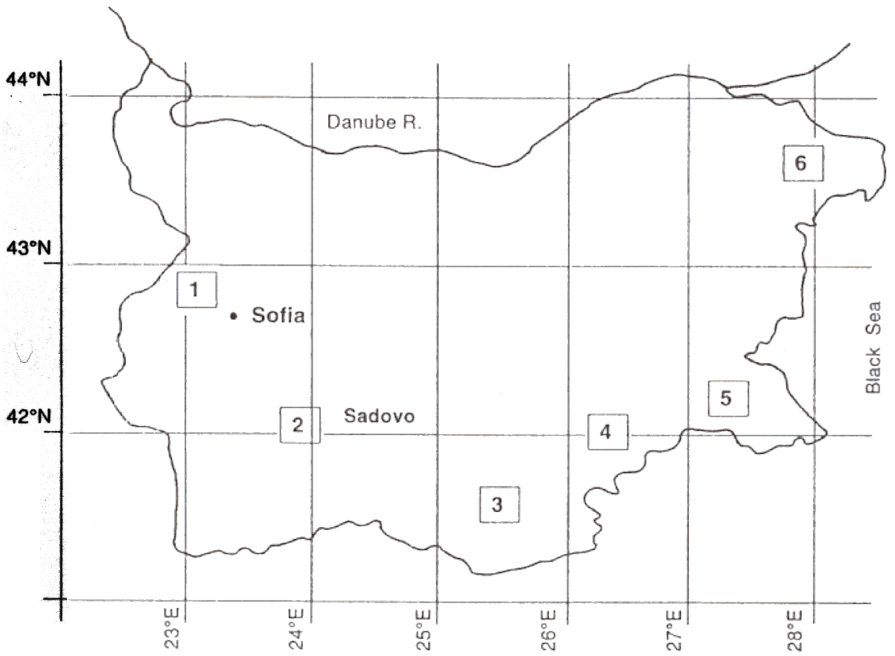
Collected species

Agropyron pectinatum	4	*Trifolium repens*	21
Dactylis glomerata	7	*Trifolium resupinatum*	2
Lolium perenne	15	*Trigonella coerulea*	2
Lotus corniculatus	6	*Vicia hybrida*	3
Medicago falcata	7	*Vicia sativa* complex	20
Onobrychis arenaria	5	*Vicia* spp.	11
Onobrychis viciifolia	4	*Vicia villosa*	3
Trifolium hybridum	3		
Trifolium pratense	11	**Total**	**124**

Collecting regions

Collecting sites are shown on the figure below: 1 = Vitosha; 2 = Rila; 3 = Central and East Rhodope; 4 = Sakar; 5 = Strandja; 6 = Dobrudja and North Black Sea coast.



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Forage collecting activities in Cyprus since 1978

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Year	Species	Collecting organization(s)	No. of accessions
1978	*Hordeum vulgare* L.	IBPGR/ARI	26
1984	*Lathyrus ochrus* L.	ARI/IBPGR/ICARDA	12
	Lathyrus sativum L.	ARI/IBPGR/ICARDA	19
	Pisum sativum L.	ARI/IBPGR/ICARDA	6
	Vicia ervilia L., wild	ARI/IBPGR/ICARDA	15
	Vicia sativa L.	ARI/IBPGR/ICARDA	67
	Medicago sativa L.	ARI/IBPGR/ICARDA	29
1987	*Medicago* species (annual), wild	WADA/ARI	41
1988	Wild forages	IBPGR/ARI	100
1993	Grasses (wild) (forage/turf)	ARI	73
1995	*Vicia* sp. L. and wild	ARI/FAO	16
	Avena sp., wild	ARI/FAO	13
	Lolium sp., wild	ARI/FAO	6
	Trifolium sp., wild	ARI/FAO	2
1997	*Dactylis glomerata* L., wild	ARI/FCPI	10
	Lolium perenne L., wild (forage/ turf grass)	ARI/FCPI	6
	Poterium spp., wild	ARI/FCPI	1
	Medicago varia L., wild (*in situ* conservation)	ARI/FCPI	3
1999	*Cynodon dactylon* (L.) Pers., wild (forage/ turf grass)	ARI	10

Seed samples of the 1997 collection are kept in Larissa (FCPI) and Nicosia (ARI).

Note: Collecting activities during 1978–93 were by Mrs Athena Della, PGR National Coordinator.

Underutilized forages

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Introduction

This paper would like to trigger discussion on the present status of the germplasm conservation of European minor forage crops (MFC).

It is assumed here that minor forages and the so-called neglected and underutilized species (NUS) share a common domain within genebank activities.

Underutilized and minor crops

FAO (1996) states that "The underutilized and minor crops are plants that fulfil a wide range of functions:

- Staple crops for specific regions or localities
- Vegetables, fruits and other species, including wild plants and "weeds" gathered for food which contribute to nutrition and dietary diversification
- Multipurpose trees, including both trees managed in agroforestry systems and wild species, which are harvested
- Crops which can contribute to agricultural diversification including uncultivated or little cultivated species with alimentary or agricultural potential."

If we accept this list as a hierarchical ranking of certain groups of crops within this domain, then forages would occupy the lowest rank. Of course we need not accept this ranking.

Justifications for special treatment

NUS benefits

According to Padulosi (1999), “The attention to the so-called "underutilized" species originates from a variety of human concerns, ranging from ethical considerations, humanitarian, economic or social considerations and the most important NUS contributions to our life are given as follows.

- Contribute to agricultural diversification
- Contribute to a greater use of marginal lands and changing environments
- Contribute to food security and a more balanced diet
- Contribute to safeguarding the agrobiodiversity heritage of the region
- Contribute to the preservation of cultural identities
- Contribute to enhancing self-reliance of agricultural systems, particularly in disadvantaged areas
- Provide additional / diversified sources of income to farmers
- Provide opportunities for employment.”

Minor forages benefits

It is obvious that the use of minor forages can meet the majority of the expectations deriving from the above justification:

- They undoubtedly promote agricultural diversification
- Their use on marginal lands is very often not only an option, but it may be an absolute necessity (*O. viciifolia, T. hybridum, T. incarnatum, A. vulneraria, P. limosa*) particularly in disadvantaged areas, where extensive animal husbandry is the only income source for local populations

- Their contribution to safeguarding agrobiodiversity is also clear, whether obtained via *ex situ* or *in situ* conservation or on-farm preservation
- The benefit of the balanced use of the full forage plant diversity for the cultural identity and tradition of the local people is perhaps not so evident in the case of field cultivation of forages, but it is quite evident in the case of grassland farming or grazing animal husbandry. There are many evidences of a dangerous genetic and cultural erosion that has taken place in the Hungarian grassland farming system during the past 150 years (Vinczeffy 1998)
- Even the question of contribution to food security and a more balanced diet is easily answered. On one hand the animals need a "diversity-rich" forage diet; on the other hand the effects of animal keeping, feeding, stress (animal-product quality complex) on the human diet and health are well known.

But it is easy to realize that nearly all benefits need to be clearly explained to the public (perhaps in the case of landscape improvement or soil protection the benefits are immediately noticeable). This means that only direct human concerns can strengthen the justification to work on minor forage crops.

Poor MFLDB

We have reasons to assume that because of the lower acceptance and awareness of their importance, the minor forage collections are rather poor, but we do not know whether these species are under-represented or not in the collections, although the absolute number of maintained accessions seems to be low, if compared with the intraspecific diversity found in the botanical literature. The present status of the European Minor Forage Legumes Database (MFLDB) reflects these assumptions: few represented species and/or accessions, erratic composition, low number of European collection holders responding to the call for data for MFLDB. The database contains the passport data of 1209 genebank accessions of 128 species of 13 genera, from only 9 institutions in total. It would be nice to hope that these numbers will increase in the future.

Genetic erosion

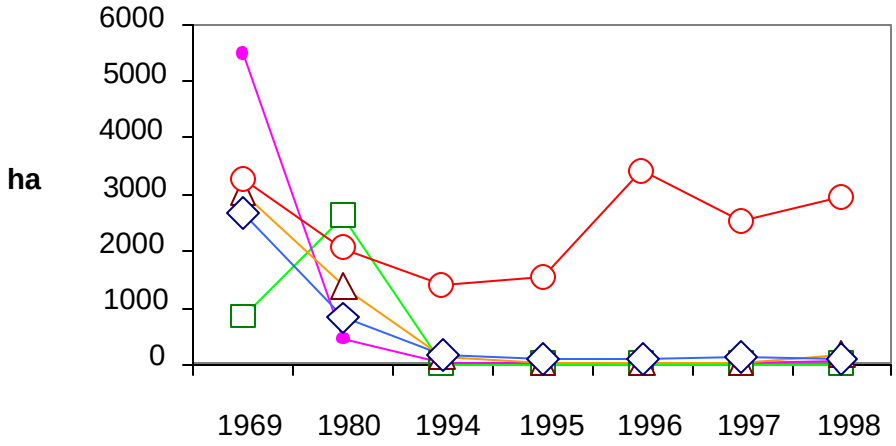
There are only few data available in the literature on concrete cases of genetic erosion among NUS, with the exception of general complaints about poor collections and very low sources of genetic material.

We may believe that the minor forages are in the same situation. But Figure 1 gives us an insight of a possible "turning into underutilized" process. Furthermore, data in Table 1 already show a direct genetic erosion danger. "The history of genetic resources always has been closely linked with the history of people" (Padulosi 1999). There is no doubt that the recent socioeconomic events have caused the dramatic decline of the seed production area of given forage legume species, but the "comet crop" phenomenon is also apparent in Figure 1.

Although this trend may be balanced by different trends in other areas, it should be kept in mind that any case of genetic erosion is irreversible.

Seed stocks

Within certain genebanks the NUS species are conserved as a low priority, so that seed availability to users is also poor. Unfortunately, the databases do not hold data about seed availability, but it is almost certain that we could find the same situation in the case of minor forages. Although a majority of the species are field crops, the multiplication is not an easy task for genebanks. Beyond the problem of maintaining genetic integrity within the population of mostly cross-pollinating species, many other practical difficulties exist, such as perenniality, low fertility, pests, etc. which impede the success of small- or medium-scale multiplication.



	1969	1980	1994	1995	1996	1997	1998
Melilotus albus	834	2625	0	0	0	0	0
Onobrychis viciifolia	5497	437	29	33	29	29	63
Lotus corniculatus	3051	1368	134	30	34	37	181
Vicia pannonica	2678	829	164	93	93	146	81
Trifolium incarnatum	3264	2043	1398	1520	3400	2522	2949

Fig. 1. Seed production areas (ha) of some "minor" forages in Hungary in seven different years.

Then there are the grasslands with the enormous number of (semi)cultivated and wild species. “Grasslands differ from all other crops in a number of features that affect optimal strategies for the conservation, utilization and improvement of plant genetic resources. On the one hand, comprehensive *ex situ* conservation of genetic diversity of all grassland species is financially impossible, and so must focus on a small number of species. On the other hand, options for conserving genetic diversity on-farm and *in situ* are limited”(Sackville Hamilton 1999).

As frequently experienced in daily practice, users have special requests for large seed stocks of these accessions, to start a given research project. However the genebank is the only source of sowing material.

Conclusion

There is no doubt that dealing with underutilized forages is an integral part of the general genebank activity. Nevertheless, genebank work on these species deserves more attention. Besides the moral obligation of preserving genetic diversity, there is another strong incentive: most of these crops are of European origin.

But beyond this double obligation this is a chance to increase the poor genebank stocks and to practise conservation through use.

In the case of some field-grown minor forages it may be too late and immediate collecting could be necessary.

For other field-grown minor forages, conservation through use may be accomplished by keeping the farming and breeding practices of certain countries under permanent monitoring, with an emphasis on “running-out” varieties and “comet crops”.

The conservation of grassland species is loaded with the difficulties mentioned above, but the monitoring of the use of these territories, the good connections with the national parks and related organizations, and also the recent attention given to *in situ* and on-farm conservation can be promising steps forward.

Table 1. Field-grown forage species in Hungary, their seed production area and the number of varieties and genebank accessions at the Institute for Agrobotany in Tápiószele in 1998

Genus	Species	Area (ha)	Variety no.	Accessions in ABI
Ornithopus	*sativus* Brot.	0	+	0
Trifolium	*subterranum* L.	0	+	1
Spergula	*arvensis* L.	0	‡	4
Anthyllis	*vulneraria* L.	0	‡	8
Trifolium	*hybridum* L.	0	‡	15
Melilotus	*alba* Medik.	0	1	4
Trigonella	*foenum-graecum* L.	0	1	26
Trifolium	*resupinatum* L.	0	2	3
Trifolium	*alexandrinum* L.	0	3	6
Trifolium	*repens* L.	0	5	186
Bromus	*erectus* Huds.	1	1	34
Festuca	*rupicola* Heuff.	1	2	43
Festuca	*pseudovina* Hack. ex Wiesb.	4	1	39
Agropyron	*cristatum* (L.) Gaertn.	5	1	78
Festuca	*valesiaca* Shchleich.	7	1	13
Festuca	*ovina* L.	20***	1	12
Lathyrus	*sativus* L.	32	2	226
Agrostis	*stolonifera* L.	43	4	32
Onobrychis	*viciifolia* Scop.	63	2	69
Phleum	*pratense* L.	67**	3	62
Phalaris	*arundinacea* (L.) Rausch.	69	2	23
Vicia	*pannonica* Crantz	81	1	21
Bromus	*inermis* Leyss.	83	2	120
Poa	*pratensis* L.	93*	5	82
Dactylis	*glomerata* L.	114**	2	252
Coronilla	*varia* L.	176	1	0
Vicia	*sativa* L.	176	1	213
Lotus	*corniculatus* L.	181	5	162
Festuca	*pratensis* Huds.	293*	2	135
Festuca	*arundinacea* Schreb.	338*	2	144
Vicia	*villosa* Roth	339	1	144
Festuca	*heterophilla* Lam.	370	1	100
Lolium	*perenne* L.	675*	6	276
Festuca	*rubra* L.	1827*	4	112
Trifolium	*incarnatum* L.	2949**	2	6
Lolium	*multiflorum* Lam.	5429***	1	60
Trifolium	*incarnatum* L.	2949**	2	6
Trifolium	*pratense* L.	4496**	8	541
Medicago	*sativa* L.	11311**	29	751

+: never cultivated but recommended.

‡: cultivated in the past, but currently neglected.

: >50%; ** :>50%<100%; *** :100% growing of foreign varieties in lease work.

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The *Lolium* core collection

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Introduction

There have been two main areas of effort on the *Lolium* core collection since 1997.

First, a two-week visit to Clermont-Ferrand was funded by a UK-France exchange agreement in March 1999 to focus on preparation of the data for analysis and planning of publications.

Second, full AFLP analysis of all accessions was undertaken in Belgium, using six primer pairs. A preliminary analysis of the results was brought to the meeting by An Ghesquière.

Data standardization

The procedure for standardizing data was as follows.

Files of data received from participants were edited only to conform to a simple tabular structure comprising one row of column headers, followed by the data. The structure of rows and columns was not altered. The files were imported into Microsoft Access.

A translation table of accession identifiers was constructed, for translating the identifiers used by each participant to one standard form.

A metadata table was constructed for each variable, containing 1 row of data describing each column of data received for that variable.

A visual basic program was written to read the metadata and construct a corresponding SQL query for each variable.

Each SQL query was run to combine and standardize all data on each variable. The resulting standardized data were exported for analysis.

In total, over 405 000 scores have been assembled and standardized for analysis, including over 155 000 scores on plant bulk under the frequent cutting regime (Table 1). This represents a substantial dataset that will provide important information.

Table 1. Summary of the metadata, SQL query and total number of records for each recorded variable

	No. of objects contained in metadata table		Size of resulting SQL query (characters)	No. of records in final table of merged data
Character	**Raw data tables**	**Columns of data**		
Aftermath heads	15	18	9 152	17 002
Inflorescence abundance	14	49	23 913	19 525
Heading tendency	12	12	5 586	23 772
Leaf width	24	73	34 224	30 737
Disease	19	38	23 879	32 742
Emergence date	29	98	67 268	33 606
Growth habit	24	62	29 117	35 824
Winter damage	34	45	33 747	56 053
Freq bulks	46	290	177 413	155 748
Total		**685**	**404 299**	**405 009**

On-farm conservation in the Nordic countries

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On-farm conservation has not been much considered as an alternative for *ex situ* conservation in the Nordic countries. One reason for this may be that agriculture in these countries was already advanced many decades ago. Despite high-input cultivation methods, there are still areas in the Nordic countries where old cultivars, landraces and natural pastures can be found in cultivation. There is also an increasing interest in reintroducing old, well-adapted material with special farming qualities. For these reasons, on-farm conservation of crops is getting more attention in the Nordic countries and at the Nordic Gene Bank.

The most advanced system for on-farm conservation in the Nordic area has been designed in Finland. The background for this project was the growing interest in cultivating and producing seed of Finnish landraces and old cultivars. Consequently the Finnish on-farm conservation programme was initiated in 1997 by the Seed Testing Department of the Plant Production Centre (KTTK), Loimaa, Finland.

The project proposal was presented after completion of an inventory of Finnish landraces. The proposal includes different elements in order to satisfy all the actors in this field:

1. **Management of varietal research.**
   The purpose of this activity is to study whether landraces and old cultivars can be distinguished from the modern varieties. If so, landraces could be registered and maintained under "normal seed certification and production system".
2. **Establishment of the landrace register.**
3. **On-farm maintenance of landraces and old cultivars.**

The different actors would have different tasks:

- **Farmers** who have cultivated landraces over decades may apply for their registration or be contracted by a breeder to be responsible for seed production of an old variety
- **The Seed Testing Department** is suggested as a central partner in the programme. As a seed production authority they would be responsible for (1) characterization of landrace/identity of an old variety; (2) registration; (3) field inspection and documentation of on-farm data; (4) contracting, and (5) cataloguing for official lists of varieties
- **The Ministry of Agriculture and Forestry** would manage fees and eventual subsidies for on-farm maintenance
- **Plant breeders** could apply for registration of old varieties no longer on the official lists of varieties and send samples of these varieties to the Nordic Gene Bank
- **The Nordic Gene Bank** would be responsible for conservation of back-up samples *ex situ* and function as a central information centre for on-farm information in the Nordic countries.

It is hoped that the programme will start within the framework of the European Council's Agrienvironmental Programme for the years 2000-2006. It is suggested to start with cross-pollinated crops such as rye, forage grasses and clovers because of their greater evolutionary potential than the self-pollinated crops.

The project was described earlier in detail by Onnela (1999).

Reference

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Research Activities

Morphological and physiological variability of Phalaris arundinacea *L. in Romania*

***Teodor Marusca*[1] *and Ionel Samfira*[2]**

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Phalaris arundinacea L. is a forage plant very well adapted to excessive moisture and flooding; it is also known as *Typloides arundinacea* (L). Mnch, *Digraphis arundinacea* Trin., or red canary grass. In temperate climates, *Phalaris arundinacea* is the most productive perennial forage grass, surpassed only by *Phragmites australis* which has a very low quality. *Phalaris arundinacea* is characterized by its adaptability to moisture, high productivity and poor forage quality, which makes it an important species for ecological restoration of degraded lands.

In the Danube Delta of Romania, generally in the lowlands up to 1100 m altitude in mountainous zones of spruce fir forests, there are considerable numbers of populations of *P. arundinacea*. Their morphological and physiological parameters are presented in this paper.

Seeds and rhizomes from the spontaneous flora were collected, seven samples in 1978 and 10 in 1998, on the two itineraries shown in Figure 1.

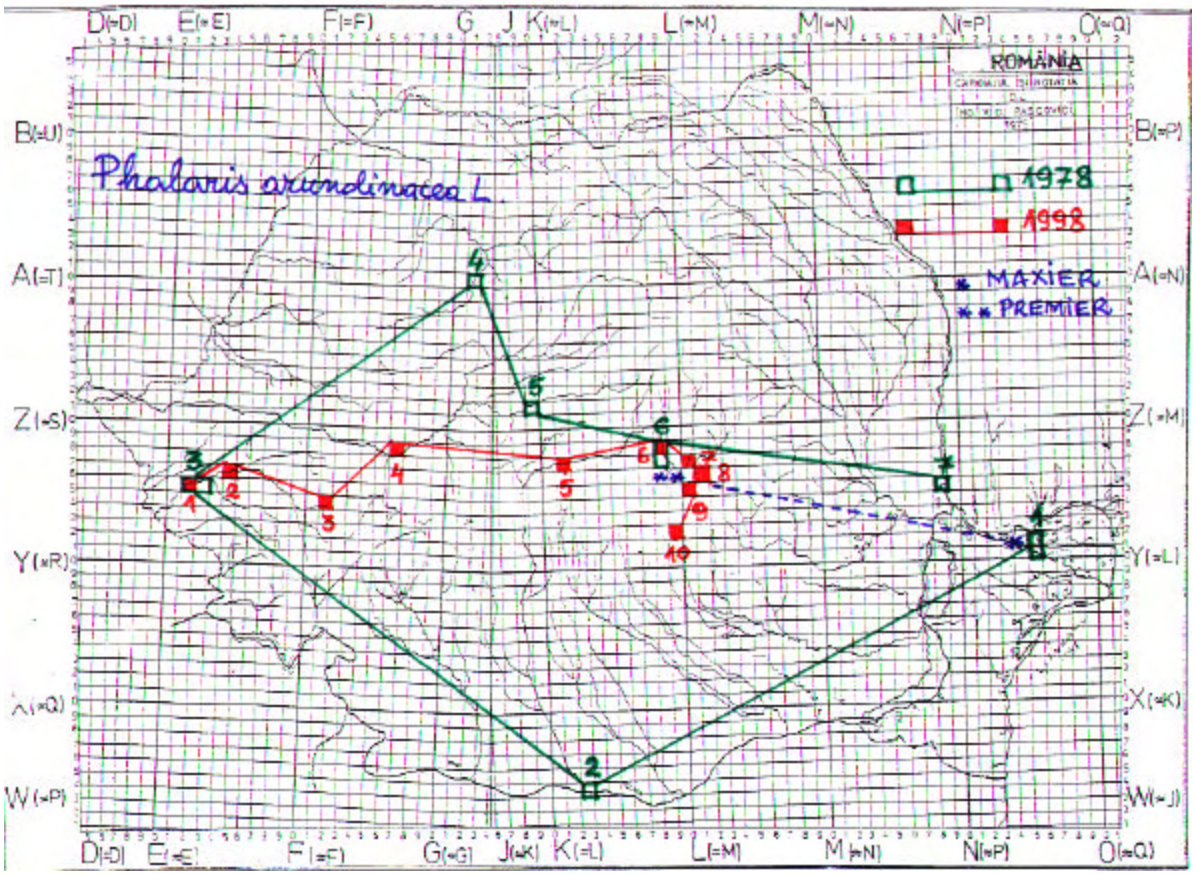

Fig. 1. Itineraries of collecting missions in Romania, 1978 and 1998

The results obtained in the field collection at Prejmer-Braûov demonstrated a significant morphological variability with plant height between 0.8 and 2.5 m, leaf width between 12 and 35 mm, very different degrees of resistance to diseases, etc. (Table 1).

Table 1. Characteristics of Romanian ecotypes of *Phalaris arundinacea* (after Marusca and Marusca 1985), Prejmer–Braõov, 1978-89

No.	Population	Plant height (m)	Plant density†	Leaf width (mm)	Forage quality	Disease incidence‡		Green matter yield
						Mean	Range	
1	Danube Delta	2.0 - 2.5	2	25 – 35	4	1.2	1 – 3	5
2	Tr. Magurele	1.8 - 2.5	1	20 – 30	3	3.0	1 – 6	4
3	Jebel	1.4 - 2.0	5	18 – 25	2	2.1	1 – 7	4
4	Morau	0.8 - 1.6	4	12 – 18	1	6.8	1 – 9	1
5	Tg. Mures	1.4 - 1.8	3	15 – 25	3	1.7	1 – 9	3
6	Feldioara	1.2 - 2.2	4	12 – 25	5	2.6	1 – 7	5
7	Tulucesti	1.6 - 2.0	3	18 – 20	2	2.1	1 - 3	4
Mean / Range		**0.8 - 2.5**	**3.1**	**12 – 35**	**2.9**	**2.8**	**1 – 9**	**3.7**

† Density, quality and production: scale 1–5 (1 = very low, minimum; 5 = very high, maximum).
‡ Disease incidence: scale 1–9 (1 = very low; 9 = very high).

Phenological aspects were studied in the western part of the country, in Timisoara (90 m asl), showing the precocity of the cultivar of the Danube Delta 'Maxier' compared with populations of the Feldioara, cultivar 'Premier' and also to those of 'Gruzia' of the Caucasus (Table 2).

Table 2. Phenological aspects of *Phalaris arundinacea* (after Samfira and Nedelea 1998) USAMVB-Timisoara

No.	Populations *Cultivars	Vegetation start	Elongation		Floral development	
			Beginning	Maturity	Beginning	Maturity
1	Danube Delta	16 Apr.	5 May	19 May	20 May	26 May
2	*Maxier	0	0	- 2 days	- 4 days	- 2 days
3	Feldioara	+ 4 days	+ 2 days	0	+ 1 day	– 1 day
4	Reci	+ 2 days	+ 6 days	+ 1 day	– 1 day	+ 2 days
5	*Premier	+ 2 days	+ 2 days	– 2 days	– 3 days	– 1 day
6	Gruzia	+ 3 days	+ 7 days	0	0	– 2 days
Mean	**Date**	**18.04**	**8.05**	**18.05**	**19.05**	**25.05**
	Days	**0**	**20**	**28**	**29**	**35**

In similar conditions to Timisoara, productivity aspects such as inflorescence and green matter yield were studied for the two cultivars 'Maxier' and 'Premier', which were the best compared with the population in the Danube Delta, considered as control (Table 3).

Table 3. Productivity elements of *Phalaris arundinacea* mature plants (after Samfira 1999), USAMVB-Timisoara

No.	Populations *Cultivars	Circum-ference (cm)	Brothers/ clone (no.)	Inflorescences (no.)	Green matter			
					Cut I	Cut II	Total (kg)	%
1	Danube Delta	216	213	45	1.12	0.41	1.53	100
2	*Maxier	388	295	63	2.36	1.14	3.50	229
3	Feldioara	366	245	52	0.90	0.35	1.25	82
4	Reci	377	265	54	1.54	0.72	2.26	148
5	*Premier	388	264	87	2.08	0.98	3.06	200
6	Gruzia	322	217	50	1.63	0.46	2.09	137

Mathematical regression was used to analyze the correlations between quantitative characters in *Phalaris arundinacea*. The matrix is given in Table 4.

Table 4. Matrix of correlations between some quantitative characters of *Phalaris arundinaceea* (after Samfira and Nedelea 1998)

	Leaf foliage	Total surface	Leaf length	Leaf breadth	No. of leaves	No. of internodes
Leaf foliage	–	**0.67**	**0.59**	**0.72**	0.43	0.44
Total surface		–	0.39	**0.63**	**0.61**	**0.61**
Leaf length			–	**0.57**	0.22	0.27
Leaf breadth				–	0.51	0.53
No. of leaves					–	0.92
No. of internodes						–

In this matrix the following production characters of the plant were included: leaf foliage surface (cm^2), total surfaces for a tiller (cm^2), leaf breadth, number of leaves and number of internodes.

Its ranges are very large for the tested characters, from 0.22 between leaf breadth and number of leaves to 0.92 between number of leaves and number of internodes.

For the 10 populations harvested in 1998, some morphological parameters were analyzed during the first year of vegetation in the field collection of GRI-Braõov (Table 5).

Table 5. Some morphological and physiological characteristics of *Phalaris arundinacea* in the first year of vegetation at ICPCP (GRI) Braõov, 1999 (see also Fig. 2 for illustration of bulk variation)

	Populations	Bulk		Tillers (no.)		Leaf width		Disease incidence	
No.	***Cultivars**	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
1	Jebel	4.7	2 – 7	106	30 – 149	3.6	2 – 5	2.7	1 – 6
2	Topolovat	4.5	3 – 6	136	105 – 171	3.1	2 – 5	2.5	1 – 6
3	Marga	4.2	2 – 6	112	37 – 142	3.1	1 – 5	2.6	1 – 5
4	Geoagiu	4.7	2 – 6	132	69 – 159	2.1	1 – 3	3.2	2 – 8
5	Arpas	4.1	1 – 6	122	59 – 146	3.1	1 – 4	3.1	1 – 7
6	Braõov	4.5	2 – 6	118	67 – 137	3.0	1 – 6	2.3	1 – 3
7	Reci	4.4	1 – 7	117	77 – 176	2.8	1 – 4	3.2	2 – 9
8	Sanpetru	4.6	1 – 7	122	71 – 156	2.9	1 – 5	4.0	3 – 6
9	Podu–Olt	4.2	2 – 6	111	55 – 141	2.1	1 – 3	3.4	1 – 6
10	Predeal	4.6	2 – 6	127	88 – 167	2.7	1 – 5	3.6	1 – 6
11	*Premier	5.7	3 – 8	122	67 – 200	4.6	3 – 7	2.5	1 – 7
12	*Maxier	5.4	3 – 9	71	26 – 119	5.7	4 – 9	3.6	2 – 6
Mean (Range)		**4.6**	**1 – 9**	**116**	**26 – 200**	**3.2**	**1 – 9**	**3.1**	**1 – 9**

Bulk, leaf width and diseases incidence: scale 1–9 (1 = very low, minimum; 9 = very high, maximum).

As shown in Table 1, great variability of morphological characters was observed. The number of tillers per clone ranged between 26 and 200 and the disease incidence was from 1 to 9 on the scale.

In the future, we propose to continue the complex study of this exceptional species which can become an important perennial forage grass for the restoration of degraded lands, especially of those damaged by floods, slag and ash from thermoelectric power station which used coal, and other situations.

Fig. 2. Collection of *Phalaris arundinacea* in Braşov, Romania. **1-9:** Bulk variation (ratings 1, 5 and 9 on the 1-9 scale). **A:** General view.

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An ecogeographic classification of Mediterranean countries

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A project on the *ex situ* conservation of forage legumes in the Mediterranean in relation to their natural distribution (Sackville Hamilton *et al.* 2000) has generated an ecogeographic classification of Mediterranean countries based on their native species of forage legumes.

Data on the native distribution of forage legumes were obtained from ILDIS (the International Legume Database and Information System: <http://www.ildis.org/>). ILDIS records 739 forage legume species native to the Mediterranean, of which 354 are endemic to the Mediterranean. Dice's "ecological similarity index" was used to calculate the similarities between pairs of countries, based on the presence or absence of 739 native species, and a cluster analysis was applied to the matrix of similarities.

Four main clusters of countries were identified (Fig. 1): a western cluster, a northeastern cluster, a southeastern cluster, and an eastern cluster. The eastern cluster (Iran and Iraq) is the most distinctive group, containing a large proportion of species not found elsewhere in Europe. The western cluster spans a European subcluster and an African subcluster. These regions are exceptionally rich in species, and distinctive from other regions of the Mediterranean. The northeastern group is also rich in species, but most of the species in these countries also occur as natives in one of the other regions. The southeastern group contains the smallest number of species and is also the least distinctive in terms of number of species not occurring elsewhere.

The classification could contribute to subregional planning. Of particular interest is the similarity of the western European countries to northwestern African countries. This should provide good grounds for collaboration between ECP/GR and CWANA.

Reference

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Table 1. A classification of Mediterranean countries into regions based on the species of forage legumes native to each country, and showing, for each region, the total number of native species present, the number present in all countries in the region, the number that are present in the region but nowhere else within the Mediterranean, and the number that are endemic to the region

			Number occurring:		
Region	Region / Countries	Total no. in the region	in all countries of the region	nowhere else in the Mediterranean	nowhere else in the world
1	Western Mediterranean	442	85	173	151
1a	France, Italy, Spain, Portugal, Sardinia	340	103	39	32
1b	Algeria, Tunisia, Morocco	321	151	81	80
2	Northeastern Mediterranean	402	115	65	39
2a	Greece, Turkey	361	213	26	13
2b	Albania, Yugoslavia, Bulgaria	265	135	21	13
3	Iraq, Iran	281	117	104	76
4	Southeastern Mediterranean	285	41	26	18
4a	Israel, Jordan, Lebanon, Syria, Cyprus, Malta	240	65	10	8
4b	Egypt, Libya	157	77	15	10

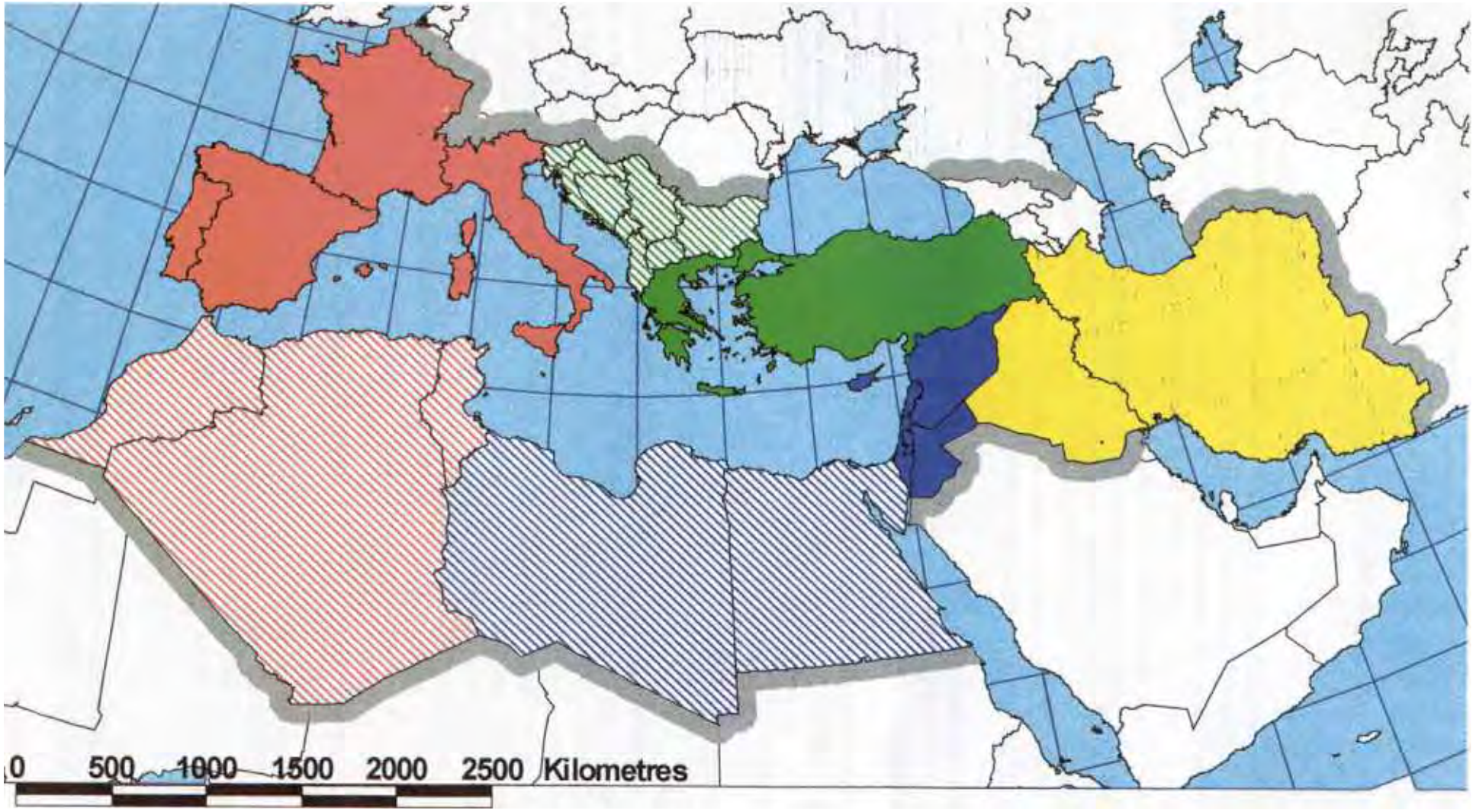

Fig. 1. An ecogeographic classification of European countries based on their native forage legume species. Different colours indicate the main groupings. Solid and hatched regions of the same colour indicate different subgroups within the major group. Red = western group; green = northeastern group; dark blue = southeastern group; yellow = eastern group.

Cyprus: The role of local germplasm in forage development

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Introduction

Cyprus is not self-sufficient in animal feeds. Average roughage production from arable land, pastures and other by-products covers only 50% of the maximum requirements of livestock. Therefore, increases in production of local roughages (pastures and hay and the full utilization of straw) and barley grain under rain-fed conditions are necessary to satisfy the present and future needs of the livestock industry.

Many forage species, both annual and perennial, have been introduced and tested in Cyprus under rain-fed conditions. The results indicate that the introduced material was not always successful and therefore it was decided to put more emphasis on the use of local genetic material for improving fodder and pasture crops. Priority was given to *Medicago*, *Vicia*, *Hordeum, Dactylis, Cynodon* and various other grass species for forage/turf purposes.

Materials and methods

All the promising genetic material collected from different parts of the island at various times was multiplied. When sufficient seed was available, the material was evaluated for several parameters in replicated trials at two or three locations. The parameters tested were date of flowering, plant height at flowering, dry matter yield, dry matter content, nitrogen yield and content, digestible organic matter yield in herbage, dry matter and percentage digestibility. In many cases this genetic material was also used in the breeding programmes of the Institute.

Results and discussion

Medicago *species*

Medicago species were given special attention in the past. They are known to grow as indigenous populations in Cyprus (Meikle 1977, 1985). Their testing to estimate a possible role in Cyprus agriculture began in the 1950s using local and introduced material and has been intensified since 1975. The aim was to explore the possibility of using medics in a cereal–forage legume rotation and/or as a permanent self-regenerating or partially reseeded pasture for the marginal lands. The main conclusion of the tests is that medics were not successful either in rotations with cereals on arable land or for pasture improvement on marginal lands (Droushiotis 1980). The main reasons for their failure were (1) the extremely slow growth of medics during winter (December-February) resulting in severe weed competition and late availability of forage for grazing; (2) the much lower dry matter yield compared with that of other legumes (common and lana vetch) and barley, and (3) the unsatisfactory regeneration of medics for establishing a good pasture stand in the following season. Studies at ICARDA and Cyprus have shown that locally selected medic germplasm shows more promise than those introduced from Australia (Abd-El Moneim and Cocks 1986; Cocks and Ehrman 1987). A result of medic collections done in Cyprus by Australian scientists in 1951, 1963, 1967 and 1970 was the release of a new variety, namely Cyprus barrel medic (Crawford 1963). The advantages of this variety are its earliness and resistance to drought.

Vicia *species*

In the early 1970s local populations of *Vicia sativa* were evaluated for several years and it was observed that the variety 'Local' was a mixture of different types regarding seed size, seed

shape and seed colour. As a result of a purification programme carried out at the ARI, a selection with uniform seeds of large size was recommended for release (Agricultural Research Institute 1972-77). The forage yield of this line was not higher than that of the mother variety, but its uniform seed type satisfies the seed market. Also during 1995 in cooperation with FAO (Regional Office for the Near-East), which partially financed the collection and evaluation of the most important forage crops, 16 accessions belonging to *Vicia* sp. were collected for evaluation. The seed of each accession was sown in autumn 1995 for multiplication and further evaluation. During the last two growing seasons, i.e. 1997-98 and 1998-99, the best six accessions were promoted for further evaluation in replicated trials at two locations.

Hordeum *species (wild barley)*

Observations in Cyprus have shown that wild barley behaves as a pasture crop (Hadjichristodoulou 1988), and it was thought that with proper management it may be used for pasture development. Wild barley, *Hordeum spontaneum* and *H. agriocrithon* (natural outcrosses of *H. spontaneum* with *H. vulgare*) are found in abundance in the Mediterranean region and is distinguished from *H. vulgare* by its brittle rachis, shrunken kernels and seed-dispersing mechanisms. Owing to these characteristics, both species of wild barley are able to regenerate naturally, except where overgrazing is practised. In addition, wild barley also has a certain level of seed dormancy, thus safeguarding the survival of the species. Taking advantage of the pasture characteristics of wild barleys, Hadjichristodoulou (1995b) established pastures in Cyprus to test the performance of these crops and their crosses with *H. vulgare* under grazing conditions. In those trials it was shown that there were no adverse effects on crop growth when the herbage was grazed by sheep two or three times depending on weather conditions, particularly rainfall, from mid-December to mid-April. However, by the end of April the crop must be left to produce seed. After seed maturity the dry herbage can also be grazed (July). By applying this procedure, reseeding is not required. Since barley is not a nitrogen-fixing crop, ample amounts of nitrogen fertilizer are necessary for maximizing forage production. Research work is now under way to study the possibility of using mixtures of wild barley with either medics or with *Vicia amphicarpa* (a species that produces seeds both above and below ground), so that the legume component will provide mainly the nitrogen, and the cereal, the herbage production. Results so far show that wild barley is very aggressive and suppresses the legume component in the mixture. Therefore, research is being redirected to study the performance and methods of management of wild barley in pure stands.

Genes of wild barley were also used to produce grain barley varieties tolerant to heat and drought stress (Hadjichristodoulou 1992, 1993, 1995a). These varieties are now under evaluation.

Medicago sativa *(lucerne)*

Lucerne is considered to be the most nutritious and profitable perennial forage crop grown in Cyprus. Since the results from the introduction and testing of new varieties were disappointing it was decided in 1984 to select from farmers' fields populations belonging to the 'Local' variety with the aim to select the most productive ones. Twenty-nine populations were evaluated in replicated trials for four years. The results showed that there were large differences among locally selected populations in the various parameters examined. The dry matter yield over the whole experimental period (May 1985-December 1988) ranged from 68 t/ha to 116 t/ha, while herbage yield of the check (variety 'Local') was 108 t/ha.

It appears, therefore, that selection of local germplasm holds more promise in the search for improved material than the introduction of foreign varieties (Droushiotis 1994). Following this conclusion, the best four accessions will be promoted for further evaluation in larger plots for their persistence and other agronomic parameters.

Avena *species*

The seed of ten *Avena* species (oats) accessions collected from several parts of Cyprus in 1995 was multiplied and evaluated in replicated trials during the 1997-98 and 1998-99 seasons. The two commercial forage oat varieties, 'Mulga' and 'Algerian', served as controls. The forage yield of the accessions tested ranged from 4576 to 7170 kg dry matter/ha. The yield of the best accession, 'Sarantascalon', was 7170 kg/ha while that of the commercial varieties 'Algerian' and 'Mulga' was 8398 kg and 5935 kg/ha respectively. Differences were not significant. The evaluation continues.

Dactylis *species*

The seed of 30 genotypes, 9 collected from Cyprus and 21 collected from Greece during 1997, were sown in plots of 0.9 m^2 each at the end of 1997. Observations so far confirm that there are very promising genotypes for forage production among the populations under evaluation.

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Breeding perennial forages for drought resistance, persistence and forage productivity

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Medicago sativa - Medicago arborea

Old landraces – native or wild populations of *M. arborea, M. falcata, M. sativa* and *M. varia* – have been collected and large variability was found when part of this indigenous germplasm was given preliminary evaluation. The existing variability was used to select *Medicago sativa* for earliness, drought resistance, persistence and forage production. *M. sativa* traditional varieties and modern bred varieties, indigenous or introduced, were screened in dense sowing for persistence and hay production under irrigated or rain-fed conditions. The most promising of them were further evaluated in contrasted environment sites under irrigated or rain-fed conditions. Greek varieties performed better than the introduced varieties. Eight of them have been registered in the national list of varieties. Semi-dormant varieties 'Dolichi', 'Hyliki' and 'Hypati' have been proved the best for all over Greece, both with and without irrigation. 'Cheronia' is a non-dormant alfalfa variety, suggested for southern Greece under irrigation. *Medicago arborea* has been selected for leaf/stem ratio, cold resistance, forage production and more green leaves during the summer. Forty-five clones and ten mass selections have been created. The mass selection variety named 'Naxos' has been registered in the national list of varieties and is suggested for multipurpose uses in rocky soils of southern Greece. Drought-resistant *M. sativa* and *M. arborea* varieties are currently evaluated under rain-fed conditions in the island of Rhodes and in Cyprus.

Dactylis glomerata - Festuca arundinacea - Lolium perenne

These three species are the most important cool-season perennial grasses in the floristic composition of natural pastures in Greece. The same species are usually used in mixtures, when small areas are sown as temporary meadows. As there was no Greek variety available, wild indigenous germplasm has been collected during the last 15 years. Part of it was given preliminary evaluation under rain-fed conditions, in individual plants or in dense sowing. A large variability was found within and between populations for heading time, drought resistance, persistence and forage production. The existing variability was used to select for more productive and more persistent varieties, better adapted in dry-hot conditions. The Greek varieties persist longer and produce much more in comparison with foreign varieties, when tested under rain-fed conditions. Three varieties – 'Metsovo' *(Festuca arundinacea)*, 'Olympion' *(Lolium perenne)* and 'Perrevia' *(Dactylis glomerata)* – have been registered in the national list of varieties. 'Metsovo' and 'Olympion' are suggested only for northwest uplands under rain-fed conditions. 'Perrevia' is suggested for all over Greece, even in dry-hot southeastern Greece under rain-fed conditions. A preliminary evaluation experiment, including 10 indigenous populations from Cyprus and 20 from Greece, was established in autumn 1997. Data of 1998-99 indicate that germplasm collected from extremely dry sites is more drought resistant, as expected.

Hedysarum coronarium – Poterium sanguisorba – Onobrychis viciifolia

Some new, drought-resistant populations of these species have been created by selection from traditional cultivated populations. Two varieties, 'Aegean Sea' *(H. coronarium)* and 'Amphiklia' (*P. sanguisorba),* have been registered in the national list of varieties.

Preliminary evaluation of the small grain legumes collection in the Botanical Garden of IHAR, Bydgoszcz, Poland

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Introduction

A large number of Leguminosae species, both native and introduced, are grown for food, fodder and ornamental purposes in Europe. Species from genera such as *Glycine, Phaseolus, Pisum, Vicia, Lathyrus* or *Medicago* and *Trifolium* are cultivated for fodder on a large scale and are planted to improve pastures. In the majority of European genera of Leguminosae some ornamental species can also be found (Heywood and Ball 1980). With great respect to the quality and value of most popular species it is also valuable to collect some less popular species.

To improve our knowledge on less-known legumes, a new activity was established in 1997 in the Botanical Garden of the Plant Breeding and Acclimatization Institute in Bydgoszcz, Poland. During two years, 224 samples from 104 taxa were collected and grown in a field collection to evaluate basic morphological, phenological and decorative traits.

Methods

The main subjects of the reported work were 159 ecotypes from 65 species belonging to 17 genera. The field collection was established in 1998 on the basis of seed accessions collected during expedition missions to Poland and neighbouring countries (Ukraine, Slovakia) or received from international seed exchange. Seeds were sown in germination tanks (Jacobsen type) or directly to pots to receive seedlings planted into small pots (6 cm) with standard soil-peat-gravel (2:2:1) mixture. Seedlings were further grown in a glasshouse and then moved to the field.

During early spring 1999 overwintering of plants was evaluated on a 1-9 scale (1 = all plants damaged, 9= no visible damage on plants). The beginning of flowering was also observed and expressed as number of days from 1 April to appearance of flowers on 30% of the total number of plants per ecotype.

Results

The majority of species included were of European origin and the taxonomic nomenclature given by seed donor was checked according to Flora Europea Vol. 2 (Heywood and Ball 1980). The list of identified and examined species with observed traits is given in Table 1. Most of the species in the collection were perennial, and most of them survived well after winter 1998-99. Only a few species did not flowered.

First flowers occurred 34 days after 1 April on *Lotus alpinus* plants. This species, together with *Oxytropis campestris, O. halleri* and *Hedysarum hedysaroides*, belongs to the group of very early species (flowering after 35-54 days).

Apart from differences between species, differences between ecotypes within species were also visible. Polish ecotypes of *Trifolium montanum* (3 ecotypes) flowered nearly 14 days later than foreign ones (4 ecotypes). Similar differences were observed between ecotypes of *Lotus corniculatus*, *Oxytropis campestris* and *Anthyllis vulneraria.* For the last species mentioned, differences between flowering of ecotypes reach 19 days.

Some species are very attractive as decorative plants owing to their numerous, fine flowers, original shape of leaves or whole plants, etc.

The observed differences indicate great possibilities for the use of less-known legume species. The above collection will be further examined for more precise results.

Table 1. Leguminosae species examined from the field collection in the Botanical Garden of IHAR, Poland

Genus, species, subtaxa, cultivar	No. of objects	Overwintering (range) scale	Flowering days from 01.04 (range)
Amorpha fruticosa L.	1	3	70
Anthyllis vulneraria L.	9	1	51 - 70
Anthyllis vulneraria L. subsp. *alpestris* Aschers. et Graeb.	2	1 - 3	44 - 58
Anthyllis vulneraria L. subsp. *lapponica* Jalas	2	1 - 3	51 - 59
Anthyllis vulneraria L. subsp. *maritima* Corbiere	1	3	65
Astragalus alpinus L.	3	3 - 5	58 - 70
Astragalus alpinus L. subsp. *arcticus* Lindm.	1	3	44
Astragalus arenarius L.	2	5	68 - 70
Astragalus centralpinus Braun-Bl.	2	2 - 3	68 - 72
Astragalus cicer L.	4	7	58 - 70
Astragalus falcatus Lam.	1	5	58
Astragalus glycyphyllos L.	1	7	70
Astragalus mongholicus Bge.	1	7	56
Astragalus norvegicus Weber	1	5	x
Astragalus onobrychis L.	2	4 - 5	58 - 72
Astragalus penduliflorus Lam.	4	3 - 5	65 - 70
Astragalus purpureus Lam.	3	5	58 - 70
Astragalus sempervirens Lam.	1	3	61
Astragalus uliginosus L.	1	3	61
Chamaecytisus ratisbonensis (Schaeff.) Rothm.	1	7	x
Chamaecytisus ruthenicus A. Klaskova	1	5	x
Chamaecytisus tommasinii (Vis.) Rothm.	1	7	x
Cytisus emeriflorus Rchb.	1	3	x
Dorycnium pentaphyllum Scop. subsp. *herbaceus*	3	3 - 5	72
Genista germanica L.	1	5	56
Genista pilosa L.	1	1	x
Genista radiata (L.) Scop.	1	1 - 3	x
Hedysarum hedysaroides (L.) Schinz & Thell.	1	3	42
Lathyrus aureus (Stev.) Brandza	1	5	54
Lathyrus heterophyllus L.	1	3	70
Lathyrus pratensis L.	2	5	70
Lembotropis nigricans (L.) Griseb.	1	3	72
Lotus alpinus (DC.) Scheicher ex Ramond	2	4 - 5	35 - 42
Lotus corniculatus L.	11	3 - 7	54 - 68
Lotus tenuis Waldst. & Kit ex Willd.	2	3	54
Lotus uliginosus Schk.	2	3	70
Lupinus polyphyllus Ldl.	4	7	54 - 58
Lupinus x regalis Bergmans	1	5	54
Medicago carstiensis Jacq.	1	5	61
Medicago lupulina L.	2	1	54
Medicago sativa L. subsp. *sativa*	2	5	72 - 77
Medicago sativa L. subsp. *falcata* (L.) Arcangeli	2	5	71 - 72
Onobrychis arenaria (Kit.) DC.	2	3	65
Onobrychis montana DC.	2	3 - 5	54
Onobrychis saxatalis (L.) Lam.	1	9	54
Onobrychis viciifolia Scop. 'Skrzeszowicka'	1	7	58
Oxytropis campestris (L.) DC.	8	3 - 5	40 - 56
Oxytropis fetida (Vill.) DC.	1	5	x
Oxytropis halleri Bunge ex Koch	2	5 - 7	44 - 54
Oxytropis lapponica (Wahlenb.) Gay	1	5	58
Oxytropis pilosa (L.) DC.	1	3	61
Trifolium alpestre L.	7	3 - 5	56 - 61
Trifolium alpinum L.	2	1 - 3	x
Trifolium aureum Pollich	2	1	x
Trifolium badium Schreb.	2	1	54 - 61
Trifolium caucasicum Tausch.	2	3 - 7	70
Trifolium hybridum L.	2	4	58 - 63
Trifolium lupinaster L.	1	3 - 3	x
Trifolium montanum L.	7	3 - 5	35 - 49
Trifolium pannonicum Jacq.	2	4 - 5	54 - 68
Trifolium pratense L.	8	3 - 5	54 - 61
Trifolium repens L.	11	2 - 6	61 - 70
Trifolium rubens L.	3	5	70 - 77
Trifolium thalii Vill.	1	1	54
Vicia sepium L.	3	5	54

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Evaluation and characterization of wild ecotypes of tufted hairgrass [Deschampsia caespitosa *(L.) P.B.*] *collected from East Poland*

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Introduction

Tufted hairgrass (*Deschampsia caespitosa* (L.) P. Beauv.) is a widespread species, particularly in the northern hemisphere (Clarke 1980). In Poland it is found in the whole country, in very diversified habitats. It is a member of the *Molinion* alliance, most frequent in the lowlands of western and central Poland (Frey 1984). The best habitats for this species are those disturbed by human activity and where the availability of water and oxygen is irregular (Nowiński 1967; Grynia 1967 after Frey 1984). It is a perennial caespitose plant, up to 50 cm high, known as an aggressive weed on pastures and meadows. Much work has been done on the selection of *Deschampsia caespitosa* for the purpose of turf grass breeding. Natural adaptation to a wide range of ecological conditions (including grazing, trampling) as well as a high natural concentration of chlorophyll are perfect recommendations for turf grass. There are only a few wild accessions of tufted hairgrass stored in European genebanks, as is the case for the most aggressive weeds (Frison and Serwiński 1984). New breeding programmes need new genetic variation and collectors should provide them with a satisfactory amount of material.

The objective of the following study was to present variation of tufted hairgrass ecotypes in the light of preliminary characterization and turf quality evaluation.

Material and methods

In 1993 a collecting mission was organized to eastern Poland to collect wild ecotypes of forage and turf grasses. Natural and semi-natural pastures and meadows were visited and many seed samples collected. One of the collected species was tufted hairgrass - 19 ecotypes from Łomżńa, Siedlce, Lublin, Olsztyn and Chelm region were gathered to examine its morphological and phenological variability as well as ability to grow as turf (Table 1).

Tufted hairgrass populations were grown in the field in the Botanical Garden of the Plant Breeding and Acclimatization Institute (IHAR) in Bydgoszcz, Poland. Observations and measurements of phenotype variation were carried out during 1995 on 30 plants per ecotype planted in spaced-plant nursery in 3 replications, 10 plants per replication. The characters were as follows: number of days from 1 April to beginning of heading [HEAD] and flowering [FLOW], plant height [PLHEIGH], inflorescence length [INFLO], stem leaf length [LEFLEN] and width [LEFWID]. Morphological characters were recorded after the 100% flowering state and expressed in centimetres.

After characterization was completed, seed from each ecotype was collected and cleaned to prepare seed samples for the turf experiment which was established in 1996. Seed samples of 5 g were sown on 0.5-m^2 plots. For three subsequent years plots were evaluated for the following characters: aesthetic value of turf in early spring [AVES], spring [AVSP], summer [AVSU], autumn [AVAU] and winter [AVWI], sward density in spring, summer and autumn [SDSP, SDSU, SDAU] and slow regrowth (once a year) [SG]. All characters were scored visually on a 1-9 scale (1 = no plants, 9 = ideal turf or 100% sward density) according to IHAR standards for turf experiments (Prończuk 1993).

Statistical parameters such as mean, variance and standard deviation as well as analysis of variance were calculated. Relationships among characters were identified and populations were classified using Principal Component Analysis (PCA). The K-mean clustering method was used to separate similar groups of ecotypes.

Table 1. Passport data of 19 ecotypes collected in eastern Poland

	Origin of accession		
Accession number	**Town/village**	**Region**	**Habitat**
237658	MOCARZE	Łomża	pasture
237659	PASYM	Olsztyn	old pasture
237661	ŚWIDRY	Łomża	pasture
237663	LEMAN	Łomża	pasture
237664	PELCH	Łomża	pasture
237667	BABIANKA	Chełm	pasture
237668	ROGATKA	Łomża	pasture
237669	NUR	Łomża	pasture
237670	ZGRYZ	Łomża	old pasture
237672	UŚCIMÓW STARY	Lublin	pasture
237673	CHMIELEWO	Łomża	old pasture
237674	MYSZENIEC	Łomża	old pasture
237675	BUŻYSKI	Siedlce	wasteland
237676	GRABNIAK	Chełm	wasteland
237677	ŁĘCZNA	Lublin	wasteland
237679	PESY	Łomża	wasteland
237680	RYKOWIEC	Olsztyn	pasture
237682	WIŚNIEW	Siedlce	wasteland
237683	ZAWIEPRZYCE	Lublin	pasture

Results and discussion

There were significant differences among ecotypes for all phenological and morphological characters. Despite the above variation, ecotypes differed only in a few evaluation traits, i.e. AVES, AVSP and AVSU.

Cluster analysis separated three different clusters with 8, 7 and 4 ecotypes per cluster (see Table 2). Ecotypes from cluster no. 3 were very late and tall with very long inflorescence and long leaves. There was also rather low variation in heading date but very high variation in morphological characters in cluster no. 3. Turf quality parameters from cluster no. 3 were lower than in clusters no. 1 and 2. Best turf quality was observed in cluster no. 2. Ecotypes from this cluster were very early, with short inflorescence and leaves. There were negative and significant correlations between some characterization and evaluation traits (Table 3).

Early ecotypes have higher AVWI, AVES, AVSP, AVSU and AVAU. Ecotypes with short inflorescence and short, narrow leaves have better AVWI and SDSP. Difference in earliness between clusters no. 2 and 3 was more than 3 weeks (25 days) meaning that flowers on plants from ecotypes of cluster no. 2 appeared at the same time as flower heads emerged on plants from ecotypes of cluster no. 3.

Observed differences in earliness and morphology were similar to data given by Grynia and Kryszak (1998) for ecotypes observed in natural pastures in the Wielkopolska region. It was suggested that for very late and smaller plants the name *serotina* should be given.

The influence of phenological and morphological characters on the total variation of 19 ecotypes of tufted hairgrass was also visible in Principal Component Analysis (Table 4).

The first four components expressed 79.16% of total variation. Almost all characters recorded during characterization (excluding PLHEIGH) together with AVWI, SDSP and AVAU were the main contributors to the first principal component which covered 46.12% of the total variation. Component 2, accounting for 13.75% of variation, consisted mainly of SG and AVES. The third component is made mainly of sward density: SDSU, SDSP and SDAU with 10.79% of variation. From the above analysis it is clear that total variation of tufted hairgrass population collected in east part of Poland consists mainly of morphological and

Table 2. Results of characterization and evaluation of 19 ecotypes of *Deschampsia caespitosa* (L.) P. Beauv.

No. of	Accession	Characterization						Evaluation								
cluster	number	HEAD	FLOW	PLHEIGH	INFLO	LEFLEN	LEFWID	AVWI	AVES	AVSP	AVSU	AVAU	SDSP	SDSU	SDAU	SG
1	237658	65.0	86.0	114.8	25.6	14.3	0.34	5.2	5.8	8.3	8.2	7.0	8.2	8.8	8.7	7.3
1	237661	66.0	91.0	136.7	29.0	21.9	0.28	4.8	5.8	7.0	7.5	6.7	8.2	8.7	8.7	7.0
1	237663	67.0	91.0	137.2	28.3	18.0	0.35	4.8	6.0	7.0	7.3	6.7	8.2	8.7	8.5	7.0
1	237667	66.7	91.0	113.1	24.4	17.0	0.35	5.0	5.8	7.7	7.8	7.2	8.8	9.0	8.8	7.0
1	237672	55.0	76.0	115.9	24.4	15.7	0.33	4.8	5.2	8.0	7.7	6.3	8.5	8.8	8.5	7.3
1	237673	57.0	84.3	112.0	26.2	14.8	0.33	5.0	5.5	6.8	7.5	6.3	7.8	8.5	8.3	7.0
1	237679	68.3	91.0	128.1	23.9	13.0	0.24	4.7	5.0	7.3	7.2	6.3	8.5	8.7	8.5	7.3
1	237680	65.0	84.3	120.4	28.1	18.9	0.37	5.0	5.5	7.2	7.8	6.5	8.5	8.8	8.5	7.0
Mean for cluster # 1		63.8	86.8	122.3	26.2	16.7	0.31	4.9	5.6	7.4	7.6	6.6	8.3	8.8	8.6	7.1
Standard deviation		4.9	5.3	10.4	2.0	2.9	0.06	0.2	0.3	0.5	0.3	0.3	0.3	0.1	0.2	0.2
Variance		24.3	28.6	107.8	4.0	8.2	0.00	0.0	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.0
2	237659	64.0	79.0	91.9	23.6	16.6	0.33	5.0	5.8	7.7	7.3	6.7	8.7	8.8	8.7	7.0
2	237664	56.0	77.0	105.5	18.6	11.3	0.32	5.2	6.0	7.2	7.7	6.8	8.5	9.0	8.7	8.0
2	237668	65.0	81.0	99.4	25.5	13.2	0.33	4.8	5.5	7.7	7.3	6.8	8.5	8.8	8.5	7.7
2	237669	64.0	85.0	91.8	24.6	17.1	0.33	5.2	5.5	7.8	7.5	6.7	8.5	9.0	8.7	7.7
2	237670	65.0	79.0	86.5	24.1	12.8	0.36	4.7	5.0	7.3	8.0	6.8	8.5	8.7	8.5	7.3
2	237674	60.0	83.0	103.7	26.1	14.4	0.32	4.8	5.0	8.2	8.2	6.5	8.2	8.8	8.3	7.7
2	237682	62.0	79.0	108.1	25.9	15.7	0.32	4.8	5.3	6.5	7.5	6.8	8.3	8.7	8.7	7.0
Mean for cluster # 2		62.3	80.4	98.1	24.1	14.4	0.31	4.9	5.4	7.5	7.6	6.7	8.5	8.8	8.6	7.5
Standard deviation		3.3	2.8	8.2	2.6	2.1	0.04	0.2	0.4	0.5	0.3	0.1	0.2	0.1	0.2	0.4
Variance		10.9	7.6	66.7	6.7	4.6	0.00	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.2
3	237675	86.0	104.7	103.4	32.9	22.8	0.38	4.7	5.0	7.3	7.2	6.3	8.0	8.7	8.2	7.3
3	237676	86.0	104.0	108.4	23.6	18.9	0.39	4.5	4.3	6.7	6.8	5.7	8.2	8.8	8.5	7.5
3	237677	87.7	107.0	123.8	36.3	29.3	0.43	4.3	5.2	7.0	7.2	6.0	8.0	8.8	8.3	7.3
3	237683	89.3	106.3	130.0	28.5	25.6	0.40	4.5	5.0	6.2	7.3	6.5	8.0	8.7	8.5	6.8
Mean for cluster # 3		87.3	105.5	116.4	30.3	24.1	0.4	4.5	4.9	6.8	7.1	6.1	8.1	8.8	8.4	7.2
Standard deviation		1.6	1.4	12.6	5.5	4.4	0.0	0.2	0.4	0.5	0.2	0.4	0.1	0.1	0.2	0.3
Variance		2.5	1.9	157.6	30.3	19.3	0.0	0.0	0.2	0.2	0.0	0.1	0.0	0.0	0.0	0.1
Diff. between ecotypes		0.00 *	0.00	0.00	0.00	0.00	0.00	n.s.	0.04	0.00	0.03	n.s.	n.s.	n.s.	n.s.	n.s.
Diff. between clusters		0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.02	n.s.	0.04	0.01	0.04	n.s.	0.01	n.s.

* = probably significant difference; n.s. = non significant difference.

Table 3. Correlation coefficients between characterization and evaluation traits in 19 ecotypes of tufted hairgrass

Trait	EVWI		EVES		SDSP		EVSP		SDSU	EVSU		SDAU		EVAU		SG	
HEAD	-0.73	***	-0.54	**	-0.44		-0.47	**	-0.12	-0.60	**	-0.37		-0.51	**	-0.21	
FLOW	-0.67	**	-0.44		-0.55	**	-0.46	**	-0.16	-0.57	**	-0.40		-0.53	**	-0.24	
PLHEIGH	-0.31		0.14		-0.36		-0.39		-0.30	-0.20		-0.06		-0.17		-0.48	**
INFLOR	-0.58	**	-0.16		-0.59	**	-0.24		-0.37	-0.25		-0.57	**	-0.34		-0.39	
LEFLEN	-0.62	**	-0.21		-0.49	**	-0.45		-0.13	-0.44		-0.32		-0.42		-0.42	
LEFWID	-0.46	**	-0.28		-0.37		-0.41		-0.13	-0.20		-0.39		-0.31		-0.22	

, * = Significant at P <0.05 and 0.001.

Table 4. Principal component coefficients for characterization and evaluation traits

	Principal component coefficients			
Character	**1**	**2**	**3**	**4**
HEAD	0.853	-0.089	-0.424	-0.036
FLOW	0.866	0.026	-0.343	-0.060
PLHEIGH	0.435	0.617	0.058	0.129
INFLO	0.762	0.246	0.004	-0.484
LEFLEN	0.820	0.263	-0.349	-0.233
LEFWID	0.619	0.001	-0.215	-0.322
EVWI	-0.842	0.184	0.034	-0.111
EVES	-0.564	0.656	-0.080	-0.173
SDSP	-0.711	-0.060	-0.450	0.194
EVSP	-0.634	-0.262	-0.024	-0.521
SDSU	-0.501	-0.201	-0.780	-0.157
EVSU	-0.613	0.122	0.248	-0.565
SDAU	-0.638	0.394	-0.476	0.332
EVAU	-0.715	0.488	-0.143	-0.190
SG	-0.365	-0.746	-0.148	-0.145
Eigen values	**6.92**	**2.06**	**1.62**	**1.28**
Percentage variance	**46.12**	**13.75**	**10.79**	**8.51**
Cumulative variance	**46.12**	**59.86**	**70.65**	**79.16**

phenological traits and turf quality parameters recorded in spring. High spring aesthetic value of turf is closely related with high spring chlorophyll content (even more than 1054 mg%) (Falkowski 1982). Factors that can affect turf during summer and autumn (water deficit, fertilization, insects and diseases, etc.) make it difficult to find any clear differences among turf quality parameters recorded in the second part of the vegetative season.

The above results indicate future collection needs in view of the wide range of natural variation observed and analyzed, as well as for breeding purposes of tufted hairgrass.

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Appendices

Appendix I. The identification of most original samples (MOS)

Provisional identification

Provisional identification of the **original status** (i.e. bred or collected) and the **originality** (i.e. how close they are to being MOSs) of accessions is based on values in the four fields containing institute codes:

GBK	Code of institute holding the accession
DON	Code of donor's institute
COL	Code of collector's institute
BRE	Code of breeder's institute

Some examples of what can be deduced from contents of fields for holding institute, donor institute, collector institute and breeder institute are given in the following table, in which "A", "B" and "C" indicate an institute code, and a blank value under the institute indicates no data are available.

GBK	DON	COL	BRE	Comment
A				Incomplete. From where did GBK get the accession?
A		B		Incomplete. The original sample (OS) was collected, but from where did GBK get the accession?
A			B	Incomplete. The OS was bred, but from where did GBK get the accession?
A		any	any	Incomplete/invalid (could be valid if cultivar was collected from farmer's field, but not a good MOS-candidate).
A	A			Incomplete/invalid. (ignore DON because GBK cannot be same as DON).
A	B			Incomplete. Who collected or bred the OS?
A		A		Good MOS candidate. Provisionally designate the accession as MOS unless other data indicate another accession is genetically closer to the OS.
A			A	Good MOS candidate.
A	B		B	1 donation away from MOS ("one away"), but probably the best MOS-candidate if DON no longer has the material.
A	B	B		1 donation away from MOS ("more away"), but probably the best MOS-candidate if DON no longer has the material.
A	B	C		2 or more donations away from MOS ("more away"). Check DON and COL for more information.
A	B		C	2 or more donations away from MOS ("more away"). Check DON and BRE for more information.
A	B	A		Repatriated from B to A, but B's sample may be better MOS candidate. Check whether A also still retains the original.
A	B		A	Repatriated from B to A, but B's sample may be better MOS candidate. Check whether A also still retains the original.

These conditions may be summarized as follows.

A. Original status

		Breeder's institute	
		Blank	Non-blank
Collector's institute	Blank	Unknown original status	Collected accession
	Non-blank	Bred accession	Invalid data

B. Originality

Comparison of the values of GBK and DON with those of BRE and COL provisionally identifies the originality of an accession.

Special cases have to be treated first. Missing values for GBK are not allowed. It is meaningless to maintain data on an accession whose location is not known. DON should never be the same as GBK, since an institute does not donate accessions to itself. However, this error may safely be ignored by treating accessions where DON=GBK as if they had no value for DON.

If GBK is the same as either COL or BRE, then the institute is, or at least was, the holder of the Original Sample (OS). Two cases must be considered depending on the value of DON.

If DON has no value (including the invalid case DON=GBK), then the accession is provisionally classified as the MOS. This classification may be changed at a later date if it is subsequently determined that other samples with the same origin have been conserved to a higher standard, such that they are genetically more similar to the OS.

If, however, DON has a value different from GBK, the implication is that a sample of the OS must have been donated to another institute, and subsequently (directly or indirectly) donated back to the institute. Thus the accession is probably not itself an MOS, but the MOS of that accession is another accession in the same collection. The originality of the accession is provisionally classified as “with MOS”.

IF GBK is not the same as COL or BRE, we must consider three cases depending on the value of DON.

- If DON has no value (including the invalid case DON=GBK), then there is no information (at least within the institute codes) on the originality of the accession. It is provisionally classified as “unknown”.
- If DON has a value, and that value equals COL or BRE, then the donor’s institute holds, or at least used to hold, the OS of the accession. That is, there is only one cycle of donation between the accession and its OS. It is classified as “one away”.
- If DON has a value and that value is not the same as COL or BRE, then the donor’s institute does not hold, and never has held, the OS of the sample. There are two or more cycles of donation between the accession and its OS. It is classified as “more away”.

This algorithm may be specified more succinctly in pseudo-pascal form as follows:

```
if GBK=COL or GBK=BRE then
    if DON=null or DON=GBK then
            originality := “MOS”
    else
            originality := “with MOS”
else if DON=null or DON=GBK then
    originality := “unknown”
else if DON=COL or DON=BRE then
    originality := “one away”
else
    originality := “more away”
```

Problems

Application of the above algorithms is necessarily only provisional, for the following reasons:

- First, failure to standardize institute codes adequately will result in different codes being used for the same institute, in which case the above algorithm would generate incorrect results.
- Second, other passport data also indicate whether an accession was collected or bred. There is a need to use the other passport data to check for inconsistencies with the classification by BRE and COL, and also to assign status to accessions without values for BRE or COL.
- Third, because of variation in standards of conservation and regeneration, a donated accession may be genetically closer to the OS than the accession currently held by the institute that originally held the OS. In particular, if the OS holder failed to keep a subsample of the OS purely for conservation, and if several cycles of regeneration have been undertaken, the current sample may be genetically distinct from the OS. Therefore, when two or more accessions with the same origin are identified, their histories must be compared to confirm which sample should be the MOS.
- Fourth, special attention must be paid to the collection of advanced cultivars from the field. A value may be entered for the breeder's institute as well as the collector's institute. Such cases should not be treated as values.
- Fifth, the protocol does not take into account joint collecting expeditions, which generate two questions. How should such duplicate MOSs be identified? Which institute should be designated the primary MOS holder? The standards adopted for entering data for such collections vary between institutes. Codes for both institutes may be entered in COL, separated by a ";". The algorithm as specified above does not allow for this situation but is easily modified to do so. Alternatively, the two collaborating institutes may enter different data in their corresponding documentation systems.

The recommended procedure

To overcome the above problems, a four-step procedure is recommended as follows.

Step 1

1a ECCDB manager provisionally classifies accessions by their original status and originality following the algorithm above.

1b Notify curators of the results and ask them to comment on the accuracy of the classification. Particularly highlight provisional collected MOSs where the country of origin is not the country of the collecting institute, and request clarification from the curator regarding possible joint collecting expeditions. In the case of ECP/GR countries with appropriate facilities, it is preferred to assign the MOS to an institute in the country of origin.

1c Response from curators.

Step 2

2a Unification of institute codes. Ideally codes should follow internationally agreed (FAO) system, but this is not essential. If a universal standard is not forthcoming, each ECCDB manager may proceed by establishing a personal system in agreement with curators. ECCDB managers will tabulate all codes used in the DB, provisionally identify all codes in use for each institute, identify unique codes, and ask curators for a response on the accuracy of the classification of institute codes. Curators may then update their own contributions to the ECCDB, or the ECCDB manager may apply a translation table.

2b Using the revised institute codes, the ECCDB managers re-classify accessions.

2c Notify curators of the results and ask them to comment on the accuracy of the revised classification.

2d Response from curators.

Step 3 For accessions with a value for DON (other than =GBK), the ECCDB manager traces the donation history, seeking to identify the original accession from which the accession was derived.

Step 4 Network Coordinating Group to discuss how to sort out remaining uncertainties establish

- algorithms for identifying and resolving internal data inconsistencies,
- alternative algorithms for identifying origins,
- procedures for comparing the conservation history of accessions with the same origin, and therefore their probable genetic similarity to the OS.

Appendix II. Meeting of the provisional Forages Network Coordinating Group, Elvas, Portugal (17 November 1999)

List of participants

L. Horváth
M. Hulden
L. Maggioni
P. Marum
V. Negri
N.R. Sackville Hamilton
M. Ševcíková
E. Willner

Introduction

L. Maggioni presented the outcomes of the last ECP/GR Steering Committee meeting (June 1998). He mentioned that new Working Groups (WG) were created (increase from 8 to 12) and that the Steering Committee had stressed the need to increase coordination between different networks and to decrease the number of WG meetings. They recommended the establishment of coordinating groups to promote coordination at the Network level and to oversee the activities of the Working Groups. The selection of a provisional Forages Network Coordinating Group (NCG) was made on an *ad hoc* basis by the WG Chairperson, in consultation with the ECP/GR Secretariat and according to the criteria of balanced expertise and geographical representation. The ECP/GR Coordinator thanked all the participants who had accepted to serve as Forages NCG members.

P. Marum opened the discussion by asking the opinion of the Group about the new mode of operation of ECP/GR during Phase VI. Overall, the establishment of a Forages Network Coordinating Group was welcomed as a useful forum where issues can be prepared in advance by a small group of technicians and valid recommendations be brought to the attention of the WG. However, concern was raised that a meeting of the entire Working Group on Forages was not planned in the next four years. A number of reasons were given **to raise the attention of the Steering Committee on the need to hold WG meetings more frequently and with larger representation**:

- Commitment to operate for WG activities is usually offered by WG members during the meetings and in the absence of these it will become increasingly difficult to agree on group workplans.
- During a 4 to 5-year time span, many WG members are likely to change. In the absence of meetings, these people will find it difficult to integrate in the group. The continuity of the programme is bound to suffer.
- Experience says that WG activities are more intense around the meeting's event, which is essential to give momentum to the action of the Working Group.
- It is important that the meetings are representatives of all the European countries, if ECP/GR has to live up to being the "Platform for the Implementation of the GPA in Europe".
- While the NCG is composed of a group of experienced people who know how to operate by correspondence, it is especially important that WG members who are not fully integrated meet with the rest of the Group.
- M. Hulden and P. Marum stressed the need to have communication among networks and not only within networks. L. Maggioni informed that the Industrial Crops NCG had already suggested a meeting of the WG Chairpersons, to be held back-to-back with the next meeting of the Documentation and Information Network. He also informed

that the ECP/GR Secretariat would make sure that all the NCG meeting reports are made available.

Crop Working Group Process Analysis

L. Maggioni explained that the Steering Committee (SC) attempted to develop a matrix that distinguishes minimum and additional tasks for the Working Groups (see Annex VIII of SC meeting report, Braunschweig 1998). The SC will use the (still provisional) matrix to review the Working Groups' progress and the WGs were encouraged to use it as a basis for the identification of minimum and additional objectives that they should try to achieve.

The NCG discussed and revised the WG Process Analysis matrix, with specific adaptations to the needs of the WG on Forages (see Table 1).

The revision of the table resulted from specific comments listed below.

Conservation regular

Duplicates and synonyms: it is important to define "similar" material, not "duplicates". It would be useful to identify Most Original Samples rather than duplicates.

Tasks remaining to be completed by the Group: to really adopt standards, identify MOSs, determine appropriate methods and implement appropriate strategies for conservation.

Conservation emergency

Safety-duplication implemented should be in the "conservation regular" column.

Tasks remaining to be completed by the Group: regeneration needs were identified in part. All the rest remains to be done.

Documentation

Considering that today there is a tendency toward relational DBs, we should talk about one Database, not several Databases. "European Databases established" should be changed to "Contributing to the European Database". However, "Crop group" DB managers should be nominated.

It is suggested to mention the implementation of quality control, since the original data entry is a problem. The wording "integrity check on data implemented" is suggested.

Accessibility of databases on Internet: "downloadable" access is considered the priority, "searchable" access as a second priority.

Tasks remaining to be completed by the Group: passport data are included to a large extent, but still need to be validated. Several data are still missing (passport coverage is not complete, several national collections are missing (i.e. VIR collection).

Collecting

Tasks remaining to be completed by the Group: all are far from being achieved. Completion of databases is necessary first.

Characterization/evaluation

The word "finalized" is considered too strong for the definition of descriptors lists. It is suggested to change to "agreed".

"Core collection established" should be part of a column of its own.

"Evaluation of collections carried out". Suggested removing the word "experiments".

Tasks remaining to be completed by the Group: most activities still need to be carried out. Descriptors list is to be made simpler and more specific. Pre-breeding is carried out by a number of institutes, but not as a group activity.

Core collection

A new column is suggested for Core collection activities.

Tasks remaining to be completed by the Group: a preliminary core collection for Lolium *was already established.*

Collaboration

Tasks remaining to be completed by the Group: all.

Sharing of responsibility

As an introduction, P. Marum distributed the section on sharing of responsibility published in the report of the last meeting (Discussion and Recommendations, pp. 12-16 and Appendix II, pp. 162-166). The group discussed the need to get started with the establishment of European Forages Collections, as suggested by the Steering Committee. The need was expressed to simplify the mechanism originally proposed and published in the report of the sixth meeting of the WG on Forages. The agreement made by the Working Group on *Beta* was chosen as an example. Common feeling was that the Most Original Samples (MOSs) would be the ideal candidate accessions to be included in the European Forages Collection. Efforts to identify MOSs were felt to be more effective than the identification of probable duplicates.

M. Hulden highlighted with theoretical examples how to use data integrity checks to identify MOSs (e.g. same code for genebank and collecting institute), invalid records (e.g. same code for genebank and donor), incomplete records and how to correct/complete the data.

Further to this discussion, M. Hulden reminded the Group of the need to decide on the standardization of Institutes acronyms to be used in databases and suggested that each institute decide what acronym they want to be known by. L. Maggioni explained that the official responsibility for maintaining this list is in the hands of FAO and that following the departure of J. Serwiński it remains to be made clear how this update would be carried out.

On the basis of M. Hulden's proposal, R. Sackville Hamilton suggested an algorithm that the ECCDB managers could use to quickly analyze their database and identify Most Original Samples. A proposal based on the NCG discussion was presented on 19 November to the plenary meeting (see Part I, p. 20).

Minimum standards for regeneration

This topic was discussed in preparation for the plenary meeting of the following day. The question was asked whether the minimum standard guidelines published in the report of the sixth meeting can be adopted or need any change.

E. Willner reported that minimum standards are not realistic in their experience (e.g. distance plot, harvest system). It is considered more urgent to multiply more accessions with lower standards rather than less with higher standards.

M. Ševcíková confirmed that standards are also too high in their case. They do multiplication of collected samples, not regeneration of stored samples (no request from the genebank).

However, R. Sackville Hamilton's and V. Negri's opinion was that it is better to regenerate fewer samples with higher standards, rather than losing genetic diversity between accessions.

R. Sackville Hamilton encouraged people to use isolation chambers more, which is often cheaper than using more land.

Difficulties in the application of the higher standards were acknowledged, but it was

suggested to keep the same standards until alternative solutions to preserve the same level of genetic diversity can be demonstrated.

It was agreed that at least the regeneration of MOSs should be of high quality.

Reference was made to the decision of the WBN (World *Beta* Network) to use ISO 9000 standard for quality control.

A report of the NCG discussion was made to the plenary meeting, where the discussion was continued (see Part I, p. 22).

Creation of core collections in other species

A discussion on the opportunity to proceed with the establishment of core collections was introduced by V. Negri. The NCG agreed that this is an important task for the Network. The idea of establishing a core collection (CC) across species was presented by R. Sackville Hamilton. Overall, it was felt that the Group should focus on one crop for which a large collection exists. *Medicago* was proposed as a Mediterranean crop and *Trifolium repens* as a crop of wider European interest.

M. Hulden proposed the establishment of a virtual CC, considering that on the basis of given criteria, a search engine could build subsets. In this way, the collection would not be static, but evolving (criteria may change over time).

The choice of an appropriate algorithm for the selection of core accessions was discussed.

It was recommended that a subgroup would study details in step implementation, once the species is chosen.

A report of the NCG discussion was made to the plenary meeting, where the discussion was continued (see Part I, p. 24).

Evaluation of forage accessions

The issue was introduced by P. Marum, who asked if the Group should take the opportunity to prepare guides on technical assistance for evaluation of forage crop genetic resources for different genera and he gave an example from Japan.

The Group agreed that this topic will be studied further by the Coordinating Group.

Table 1. Crop Working Group Process Analysis (modified from Annex VIII, Report of the Seventh Steering Committee meeting, Braunschweig, Germany, June – July 1998)

	Conservation						
Activities	**Regular**	**Emergency**	**Documentation**	**Collecting**	**Characterization/ Evaluation**	**Collaboration**	**Core collection**
Minimum	Uniform standards for regeneration, multiplication and conservation adopted. Most original samples identified. Most appropriate methods of conservation determined. Safety-duplication implemented.	Regeneration needs identified. Procedures for emergency regeneration established. Emergency regeneration carried out.	Contribute to the European database. Crop group data set manager identified Passport data included. Protocol for updating data elaborated. Implementation of integrity check.	Genetic diversity of crops inventoried based on available data. Gaps and potential needs for collecting identified.	Descriptor lists for characterization and evaluation agreed.	Priorities for complementary activities identified in collaboration with other relevant actors.	Core collection established.
Undecided			Database accessible through Internet.		Descriptor lists for further characterization and evaluation finalized.		
Additional	Appropriate alternative/ complementary *ex situ* conservation strategies implemented.		Characterization data included. Evaluation data included. Crop-specific links with other programmes/ Networks/databases established.	Collecting activities, where needed, carried out.	Characterization of collection carried out. Evaluation of collection carried out. Pre-breeding (base broadening) undertaken.	Above priorities implemented Collaboration with other regions established.	

Appendix III. Abbreviations and acronyms

AARI	Aegean Agricultural Research Institute, Turkey
ACVF	Association des Créateurs de Variétés Fourragères, France
AFLP	amplified fragment length polymorphism
ARI	Agricultural Research Institute, Cyprus
ASSINSEL	Association internationale des sélectionneurs, Switzerland
BAZ	Federal Centre for Breeding Research on Cultivated Plants, Germany
BGRC	Braunschweig Genetic Resources Collection, Germany
BRG	Bureau des ressources génétiques, France
CBD	Convention on Biological Diversity
CGN	Centre for Genetic Resources, The Netherlands
CGRFA	Commission on Genetic Resources for Food and Agriculture (FAO)
CIAM	Centro de Investigaciones Agrarias de Mabegondo, Spain
CPRO-DLO	Centre for Plant Breeding and Reproduction Research, The Netherlands
CTPS	Comité technique permanent de la sélection des plantes cultivées, Ministère de l'Agriculture, France
DBF	database file
EC	European Community
ECCDB	European Central Crop Database
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
EIARD	European Initiative on Agricultural Research for Development
ENMP	Estação Nacional de Melhoramento de Plantas, Portugal
EU	European Union
FAO	Food and Agriculture Organization of the United Nations, Italy
FNAMS	Fédération Nationale des Agriculteurs Multiplicateurs de Semences, France
FTP	File Transfer Protocol
GEVES	Groupe d'Etude et de Contrôle des Variétés et des Semences, France
GIS	Geographic Information System
GNIS	Groupement national interprofessionnel des semences, graines et plants, France
HRI	Horticulture Research International, UK
HTTP	Hypertext Transfer Protocol
ICARDA	International Center for Agricultural Research in the Dry Areas
IHAR	Plant Breeding and Acclimatization Institute, Poland
IGB	Israel Gene Bank
IGER	Institute of Grassland and Environmental Research, UK
INRA	Institut National de la Recherche Agronomique, France
IPK	Institut für Pflanzengenetik und Kulturpflanzenforschung, Germany
IPR	Intellectual Property Rights
IU	International Undertaking on Plant Genetic Resources
LCC	*Lolium* Core Collection
MAA	Material Acquisition Agreement
MBG	Misión Biológica de Galicia, Spain
MTA	Material Transfer Agreement
MOS	most original sample
NCG	Network Coordinating Group
NGB	Nordic Gene Bank, Sweden
NGO	non-governmental organization
PGR	plant genetic resources
PGRFA	Plant Genetic Resources for Food and Agriculture
RAPD	random amplified polymorphic DNA
RFLP	restricted fragment length polymorphism
RICP	Research Institute of Crop Production, Prague, Czech Republic
RIPP	Research Institute of Plant Production, Piešťany, Slovak Republic
SIA	Servicio de Investigacione Agraria, Spain
SQL	Structured Query Language
VIR	N.I. Vavilov Research Institute of Plant Industry, Russian Federation
ZADI	Central Agency for Agricultural Documentation and Information, Germany

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