

# Report of a Workshop on Wheat Genetic Resources

21-23 March 1996  
Paris, France

**T. Gass, M. Ambrose, I. Faberová, A. Le Blanc  
and J. Weibull, compilers**



In collaboration with  
the Bureau  
des Ressources  
Génétiques



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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, technical 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.

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IPGRI  
Via delle Sette Chiese 142  
00145 Rome  
Italy

Bureau des Ressources Génétiques  
57 rue Cuvier  
75231 Paris cedex 05  
France

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## Part A: Discussion and Recommendations

### Introduction

#### Summary of the introductory session

The ECP/GR Wheat Genetic Resources Workshop was held in Paris, France, from 21 to 23 March 1996. It was attended by 23 delegates representing 27 of the 30 countries participating in ECP/GR. ASSINSEL, the Bureau des Ressources Génétiques (BRG), INRA, IPGRI and the Nordic Gene Bank were also represented. Representatives from Belgium, Bulgaria, Romania and the FAO were unable to attend (see list of participants in Appendix I).

The meeting was opened by Dr Michel Chauvet of the Bureau des Ressources Génétiques. He welcomed the participants and expressed his pleasure that this first ECP/GR workshop on wheat genetic resources was being held in Paris. France first initiated networking activities on wheat genetic resources at the national level 5 years ago. The experiences gained through this collaboration, which includes public and private research and breeding institutions, have led to the establishment of a large number of such crop-specific networks in France. Dr Chauvet reiterated France's firm commitment to Europe-wide cooperation on genetic resources, a commitment which it is prepared to support *inter alia* by co-managing the European Wheat Database as an input in kind to ECP/GR. Dr Chauvet wished the participants a successful meeting.

Dr Thomas Gass, ECP/GR Coordinator and Director of IPGRI's Regional Office for Europe, gave a brief overview of recent developments within ECP/GR. He explained how the implementation of Phase V of the Programme, with increased financial resources and changes in *modus operandi* which were decided by the Steering Committee at its last meeting in Nitra, Slovakia (September 1995) have enabled several new activities to be initiated.

Dr Gass mentioned a number of ongoing international initiatives on wheat genetic resources. He emphasized the importance of taking these into account when setting priorities for activities within the framework of ECP/GR. The Group will need to be proactive in its interaction with CIMMYT and ICARDA, which both have comprehensive databases and germplasm evaluation networks; with the Cereals Working Group of the West Asia North Africa Genetic Resources Network (WANANET); and with the International Wheat Genetic Resources Network (IWGRN) established in Beijing in 1993.

The following are important international events, at which ECP/GR activities on wheat should be presented: the 3rd International Triticeae Symposium (Aleppo, Syria, 4-8 May 1997); the 9th International Wheat Genetics Symposium (Saskatoon, Canada, Summer 1998). The 5th International Wheat Conference in Ankara, Turkey (June 1996) is also of relevance to the Group.

Dr Gass went on to outline the objectives of the workshop, namely the setting of priorities for activities on wheat genetic resources within the framework of ECP/GR. This requires discussion and agreement on the scope of activities, complementarity and interaction with other initiatives and could include the recommendation to formally establish a Wheat Working Group within the Cereals Network of ECP/GR. Dr Gass reminded the participants that discussions should bear in mind the overall objectives of ECP/GR, in particular:

- to ensure the long-term conservation and to facilitate and encourage the increased utilization of plant genetic resources in Europe,
- to strengthen links between east and west European plant genetic resources programmes,
- to contribute to monitoring the safety of plant genetic resources collections and take appropriate action when required.

## Wheat collections in Europe

Europe is an important region for wheat genetic resources with production in every country. It is also a primary centre of diversity for certain wild species.

### **Synthesis of the information obtained from national collections**

The importance of the resources across the whole region was highlighted in the development of a wheat proposal for the EU regulation 1467/94 which included non-EU partners as well as those within the EU. The primary aim of this programme to construct a European Wheat database required a sharing of the task of data compilation between A. Le Blanc for the EU and I. Faberová for the non-EU countries.

#### ***EU countries***

A. Le Blanc presented a compilation of the information received from 11 countries representing 23 collections for a total number of 95 000 accessions in excess. The data presented information on the basis of crop type and accession holdings were broken down into categories including populations or local cultivars, varieties, research material and wild relatives. The computerized status data show that 13 of the collections are computerized for passport data, the majority of which have been developed under dBase IV software.

#### ***Non-EU countries***

I. Faberová informed the Group that a total of 62 questionnaires had been sent to a total of 21 countries. Prior to the meeting 36 had been returned and 6 more were received at the meeting. She thanked all those who had replied.

Results were broken down on the basis of total holdings and holdings of indigenous origin according to type of institution and by country. A total of 141 692 accessions were recorded, of which 32 117 were classified as of indigenous origin (22.7%).

### **Discussion**

The estimated European wheat holdings total around 220 000 accessions. The development of computerized databases shows differences between collections within EU and non-EU countries. The figure conceals an unknown degree of duplication.

The recommendation of this working Group is for institutions holding wheat genetic resource to work together in greater collaboration. The objectives are clearly to:

- ensure the computerization of passport data for all European collections;
- standardize passport field structures as a prerequisite to the initiation of a European Wheat database.

## The European Wheat Database (EWDB)

### Objectives and implementation

I. Faberová reminded the Group of the basic principles and definitions regarding crop genetic resources databases. She presented the context within which RICP, Prague and GEVES, Le Magneraud had been motivated to collaborate on initiating the European Wheat Database (EWDB).

France had been asked by EU-member countries to prepare a cooperative project on wheat genetic resources. This responsibility was given to A. Le Blanc. She wrote a proposal which was submitted in 1995 to the European Commission in the framework of the first call for proposals on 'The Conservation, Characterization, Collection and Utilization of Genetic Resources in Agriculture'. Coordination of EU-member countries appeared to be necessary. It included the setting up of a centralized database.

At the same time, the Czech Republic (RICP, Prague) was asked to manage genetic resources data from Eastern European countries and started to develop a database. Faced with a number of genetic resources and data to manage, and because Europe represents a very large group to coordinate, IPGRI suggested that both countries collaborate in order to share the work. It was recommended to harmonize the resulting databases and to join efforts for the coordination of the whole group.

To link the two groups of countries, to be effective in data and seed management and to offer breeders (and any other users) an interesting tool for improving the wheat crop, it was decided to initiate a common European Wheat Database (EWDB) in both coordinating countries.

In December 1994, I. Faberová and A. Le Blanc met in Clermont-Ferrand to agree on the basic elements and workplan for the development of the structure of the EWDB. Much progress has been made since then. However, I. Faberová explained that prior to further work on this database a number of decisions need to be taken regarding scope and structure of the database and the descriptors it should include.

The following objectives were defined and have conditioned the EWDB structure presented below by A. Le Blanc.

- to provide passport data concerning the wheat genetic resources conserved in the European countries to which access is not restricted;
- to provide a minimum description and some evaluation data of these resources;
- to direct users toward countries and genebanks responsible for conservation, distribution and more detailed description of the resources.

### Demonstration of a prototype version

A. Le Blanc presented a possible structure for the EWDB and outlined the reasons that had led to choosing this structure (see **Part B, The European Wheat Database**). She went on to give a demonstration of the prototype version and user interface developed by GEVES. This prototype version is built around a central table containing the basic part of passport data and linked to a large number of complementary tables through a key code. The complementary tables include information on morphological characters, evaluation data, pedigree, synonyms, etc.

### Scope of the European Wheat Database

Considering the size of wheat genetic resources holdings in Europe, it was felt that a central database could be an extremely useful tool to the Group, in order to facilitate access to the collections and, in the longer term, enable the rationalization of conservation activities. The potential users of this database could include curators, breeders and researchers.

The reduced resources available do, however, impose a setting of priorities. With regard to the EWDB, this implies focusing on well-characterized and documented material. The sharing of tasks with other groups, such as those having expertise in the area of conservation of specialized genetic stocks or of wild species related to wheat, is equally important.

It was agreed that, initially, the EWDB should include material of all *Triticum* species (*sensu stricto*) including wild species. *Aegilops*, *Agropyron* and other wild related genera of the tribe Triticeae could be taken care of within a separate initiative. P. Perrino agreed to contact ICARDA, and forward a report to the Chair of the Group on the status of the database maintained there. On the basis of this report, the Group would then decide on further activities with regard to these genera, which may require the definition of different descriptors. It was agreed that specialized genetic stocks presenting reproduction problems should not be included in the EWDB at this stage.

The question was raised of possible expansion of the database to widen the scope and include additional types of data. A. Le Blanc assured the Group that the current structure allowed such an expansion. Consequently, and with regard to types of information contained in the database, it was felt that the Group should determine which information needs to be included as a priority.

It was agreed that to reduce the duplication of information in the database, each country would, as a priority, contribute data regarding:

- material for which distribution is not restricted;
- material of indigenous origin (bred or collected);
- material collected and obtained from other countries (providing reference to that country in the field 'original country of origin');
- material missing from other collections or of which safe conservation is doubtful.

Each country will screen the accessions on the basis of these criteria before forwarding the data to the database manager. In doing this, agronomic selection criteria should not be taken into account, as the usefulness of an accession may vary between countries.

Accessions of foreign origin will be listed in a summarized form and circulated among the Group to facilitate the eventual repatriation of material. Breeding lines should be included in the EWDB only if they are well documented.

It would also be useful to include information on currently registered varieties as they provide valuable quantitative traits and represent the most frequent source of material for further breeding. It was recognized that in many countries access to this material requires prior informed consent from breeders.

It was agreed that the members of the Group would be responsible for ensuring that all valuable material conserved in their country is documented in the EWDB.

The Group thanked I. Faberová and A. Le Blanc for the work already undertaken and recommended that the EWDB be implemented as one database managed jointly by GEVES and RICP in order to share the work of loading the database.

A discussion on descriptors is included in **Standardization of data for the EWDB**.

#### **Workplan for the establishment of the EWDB**

The following steps were agreed upon to establish the EWDB:

- Agreement on the descriptors for which data is required as a minimum (by 1 June 1996);
- RICP and GEVES to send out requests for data (with a copy to the National Coordinator and respective member of the Group, by 15 June 1996);
- answers to be sent back to the database managers via the respective members of the Group who are responsible for checking the data for completeness and conformity to the EWDB format:
  - by end of October 1996: Czech Republic, Denmark, France, Germany, Italy, Nordic countries, Poland, Slovak Republic.
  - by end of December 1996: Austria, Cyprus, Greece, Hungary, Ireland, Spain, Switzerland, Turkey, UK, Yugoslavia.
  - by end of December 1997: Croatia, Lithuania, Portugal.
- loading of the data by the database managers (by beginning October 1996).

## Standardization of data for the EWDB

### Standardization of passport data

I. Faberová presented a draft list of passport descriptors to the Group and provided an overview on the frequency of their use in a number of existing databases. The Group discussed this list at length and agreed that passport data need to be well documented for each accession recorded in the EWDB.

English for all field names and descriptors should be used for data input.

**Table 1.** List of passport data and their use in major databases. (The number of asterisks (\*) following a descriptor indicates its frequency of utilization.)

Sources of information:

IPGRI Descriptors for barley. Rome 1994.

NGB descriptors for wheat (presently used).

IBPGR Descriptors for wheat. Rome 1985.

COMECON International descriptor list, genus *Triticum*. Leningrad 1984

IPGRI (barley)	NGB	IBPGR	COMECON
<b>Accession data</b>			
<b>Accession no.</b> ****	<b>Accession no.</b> ****	<b>Accession no.</b> ****	<b>Accession no.</b> ****
Donor name***		Donor name***	Donor country***
Donor ID number***		Donor ID number***	National ID number
Other number (2 fields)**		Other number (2 fields**)	
Ploidy			Ploidy
	Family		
<b>Genus</b> ****	<b>Genus</b> ****	<b>Genus</b> ****	<b>Genus, subgenus</b> ****
			Subgenus
<b>Species</b> ****	<b>Species</b> ****	<b>Species</b> ****	<b>Species</b> ****
			Section
Subspecies***	Subspecies***	Subspecies***	
	Subgroup		
Botan. variety***		Botan. variety***	Varieties, form***
Pedigree+lit.citation		Pedigree number	
<b>Cultivar name</b> ****	<b>Name</b> ****	<b>Cultivar name</b> ****	<b>Name of variety</b> ****
	Country of origin**		Year of entering
	Genetic origin (state)**		Country of origin**
	Breeding company		Status**
Year of release/registr.**	Year of release**		
			Method of breeding
Principal attribute			Growth class

Collection data

IPGRI (barley)	NGB	IBPGR	COMECON
	Collector's initials		
	Sample number		
Site number**	Site number**		
	Collector's name		
	Collection number**	Collector's no.**	
Collect. institute**		Collect. institute**	
Date of collection***	Collection date***	Date of collection***	
Country of collection***	Country of collection***	Country of origin***	
Province/state**		Province/state**	
Department/county**	County**		
	Commune		
	Village		
Location of site***	Name of area***	Location***	
	Name of farm		
	Land owner + address		
	National name of species		
Latitude***	Latitude***	Latitude***	
Longitude***	Longitude***	Longitude***	
Elevation***	Altitude***	Altitude***	
Collecting source**		Collecting source**	
Status**		Status**	
Local/vernacular name***	Local cultivar name***	Local/vernacul. name***	
Type of sample**	Type of sample**		
	Genetic base		
	Composition of collection		
	Landscape (2 fields)		
	Geogr. landscape		
	Landform		
	Slope aspect		
	Soil type (2 fields)		
	Soil pH		
Number of plants**		Number of plants**	
Weight of seeds			
Companion species			
Cropping system			
Plant population density			
Genetic erosion			
Ethnic group			
Primary grain use			
Primary fodder usage			
Sowing date			
Harvest date			
Irrigation			
Prevailing stress			
Frequency of accession			
Photograph**		Photograph**	
Herbarium**		Herbarium**	
Other notes**		Other notes**	

**Set of passport descriptors agreed upon by the Group**

EWDB identification number  
Genebank/informant

Genebank accession number  
Scientific name

Cultivar name	Year of first registration
Other name(s)	Pedigree
Original country of origin	Collecting
Year of introduction into genebank/informant	Collecting institution name
Donor of accession	Collecting number
Donor accession number	Collecting date
Other number(s)	Location
Status	Site description
Ploidy	Longitude
Availability	Latitude
Breeder's institution name	Altitude
	Comment

### Minimum set of characterization/evaluation descriptors

It was re-emphasized that the most comprehensive information for each accession is desirable. The Group agreed that a limited number of descriptors should be considered as priority in order to guarantee the usefulness of the database. The desirable list of minimum descriptors was discussed at length. Descriptors used in Germany and The Netherlands were presented and the list was finalized after the meeting by the database managers.

**Table 2.** List of characterization and evaluation descriptors and their use in major databases. (The number of asterisks (\*) following a descriptor indicates its frequency of utilization.)

Sources of information:

Descriptor set for wheat used currently by GRIN

Descriptor set for wheat used currently by NGB

Descriptors for wheat. IBPGR, Rome 1985.

International (COMECON) descriptor list, genus *Triticum*. Leningrad 1984

PC GRIN	NGB	IBPGR/IPGRI	COMECON
<b>Morphology</b>			
Growth habit***		Growth habit (young)***	Type of bush***
<b>Awnedness****</b>	<b>Awnedness****</b>	<b>Awnedness****</b>	<b>Spike awnedness****</b>
Awn colour**			Awn - colour**
<b>Glume colour****</b>	<b>Colour of paleae****</b>	<b>Glume colour****</b>	<b>Glume colour****</b>
<b>Glume pubescence****</b>	<b>Pubesc. of paleae****</b>	<b>Glume hairiness****</b>	<b>Glume pubescence****</b>
<b>Spike density****</b>	<b>Density of ear****</b>	<b>Spike density****</b>	<b>Spike density****</b>
Spike type**			Spike shape**
Kernels per spike***		Seeds per spikelet+	Seeds per spike***
<b>Kernel colour****</b>	<b>Colour of pericarp****</b>	Spikelets per spike+	<b>Kernel colour*</b>
Straw colour		<b>Seed colour****</b>	
Leaf pubescence	Attachment of paleae		Leaf length, width,.. Glume shape, G. texture.. Kernel shape, K.surface
	Length of ear**		Spike length** (+ other descriptors.....)
		Seed size	
<b>Biology and cytology</b>			
Plant height***		Plant height***	Plant height***

PC GRIN	NGB	IBPGR/IPGRI	COMECON
Shattering**			Grain shattering res.**
Days to anthesis***	Lateness of ear emerg.***	Days to flower**	
Straw lodging***	Lodging***		Lodging resistance***
	Sprouting susceptibil.***	Pre-harvest sprouting***	Sprouting resistance***
		Tillering capacity**	Tillering productive**
	Spring habit**		Seasonality**
		Degree of seed shrivelling	
	Seed dormancy		
		Daylength sensitivity	
Straw breakage**			Straw solidness**
Chromosome number**			Ploidy**(passport)
Stem rust resistance genes		Identified genes	
	Growing time to harvest		
<b>Disease susceptibility</b>			
Dwarf bunt			
Common bunt**			<i>Tilletia caries**</i>
Barley yellow dwarf vir.**		Barley yellow dwarf v.**	
	Eye spot***	Eye spot***	<i>Cercospora herp.***</i>
<b>Leaf rust****</b>	<b>Brown rust****</b>	<b>Leaf rust****</b>	<b>Brown rust****</b>
Hessian fly**		Hessian fly**	
Stem rust - seedling +		Stem rust***	Stem rust***
Stem rust - adult +			
<b>Stripe rust severity****</b>	<b>Yellow rust****</b>	<b>Stripe rust****</b>	<b>Stripe rust****</b>
Stripe rust - seedling +			
Stripe rust - adult +			
Russian aphid			
Russian aphid-leaf roll			
<b>Septoria nodorum****</b>	<b>Glume blotch****</b>	<b>Glume blotch****</b>	<b>Septoria diseases****</b>
		<i>Fusarium sp.**</i>	<i>Fusarium culmorum**</i>
		<i>Ophiobolus graminis**</i>	<i>Ophiobolus foot rot**</i>
	Fungus sensitivity		
			Powdery mildew ( <i>Erysiphe gram.</i> )
			Loose smut ( <i>Ustilago tritici</i> )
Soil-borne mosaic		Nematode sp.	
<b>Abiotic stress susceptibility</b>			
	Winter hardiness***	Winter susceptibility***	Overwintering***
	Cold susceptibility**	Cold susceptibility**	Frost resistance+
		High temperature	
	Moisture absorbance**	Excess soil moisture**	
		Drought	
		Salinity	
		Soil acidity	
		Low nitrogen	
<b>Yield and content characteristics</b>			
1000-kernel weight***	100-grain weight***		1000 grain mass***
	Endosperm structure***	Seed vitreousness***	Kernel texture***
		Protein content**	Protein content**
Percent lysine ***		Lysine content***	Lysine content***
		Quality in baking pro.**	Baking quality**
	Gluten content**		Gluten content**
			Gluten swelling
	Sedimentation value**		Sedimentation test**

PC GRIN	NGB	IBPGR/IPGRI	COMECON
	Faling number		
	Flour volume weigh**		Flour swelling**
	Milting quality		
	Relative grain yield**		Grain yield to standard**
	Relative straw yield		
	Flour content		
	Nitrogen content		
Market class		Gel electrophoresis	Valorimetric number

### Minimum set of characterization/evaluation descriptors, agreed by the Group

#### Priority

- Awnedness
- Pericarp (grain) colour
- Glume colour
- Glume pubescence
- Spike density
- Seasonality
- Principal utilization
- Plant height
- Lodging
- 1000-kernel weight
- Susceptibility to:
  - *Puccinia striiformis*
  - *Puccinia recondita*
  - *Erysiphe graminis*
  - *Fusarium* spp.
  - *Septoria* spp.
  - *Ophiobolus graminis*
  - *Pseudocercospora herpotrichoides*
- Protein content
- Yield level
- Cold susceptibility

## Objectives of an ECP/GR Wheat Working Group

The Group discussed the needs of wheat genetic resources in Europe, possible future trends and the comparative advantages that a Working Group could offer. The following objectives of an ECP/GR Wheat Working Group were agreed upon:

- promote the effective management of wheat collections in Europe by providing a forum (the Group itself) and a tool (the database) to take informed decisions;
- monitor the safety of wheat collections and formulate recommendations for actions to avoid/overcome emergency situations;
- facilitate the use of collections by promoting interactions with breeders of the public and private sector on topics such as utilization, pre-breeding, etc. and by maintaining an updated and well-documented database of wheat accessions maintained in Europe;
- take initiative in organizing ‘targeted collaborative actions’, i.e. project-specific activities that require external funding;
- raise public awareness regarding the value of wheat genetic resources and the importance of their conservation;
- promote interaction with researchers developing molecular characterization techniques that could be of use in the management and study of collections;
- stimulate concerted conservation and utilization activities at the national level;
- set priorities for research and communicate these to policy and funding bodies;
- implement actions on behalf of ECP/GR as recommended or deriving from the FAO Global Plan of Action;
- promote the rationalization of the collections in Europe.

The Group strongly recommends that the Steering Committee of ECP/GR establish a standing working group on wheat genetic resources.

The Group welcomed the offer of the Federal Research Station of Changins, Nyon, Switzerland to establish a *Triticale* database and agreed that if a Wheat Working Group is established it would welcome close collaboration and be available for advice to this database as necessary.

## Enhancing utilization

### National coordination of wheat activities in France

A. Le Blanc presented the French network for the cooperative management of small grain cereals. France does not have a central genebank for long-term *ex situ* storage. Collections are dispersed among public and private breeding institutes. To achieve better coordination of these collections, the establishment of this network was mutually agreed upon to ensure the long-term conservation and promote the utilization of wheat genetic resources by breeders. The network's activities include conservation (including safety-duplication), multiplication/regeneration, distribution, characterization and evaluation of wheat germplasm.

The French Institute for Agronomic Research (INRA) is an important element in this programme. Its role includes introducing new germplasm from various sources (other breeders, international nurseries, genebanks, research institutes and other holders of collections) and executing initial pre-screening of this material. Material which is found to be of interest is introduced into the network. The 'national collection' is defined as a subcollection containing material of French origin, some foreign material and genetic stocks. The inclusion of an accession into the network requires due justification.

Each year a little more than 50 accessions are distributed among those cooperating on the project, including French breeders and foreign companies active in the country. Each breeder receives the same set of germplasm. Diseases are evaluated following natural infections or artificial inoculation.

The private companies involved do not have to pay to enter the network as they support it by investing time, labour and facilities for analyses to be made (baking quality, electrophoresis for glutenin patterns, tests of flour quality, etc.). Funding from the Ministry of Agriculture, the Board of Genetic Resources (BRG) and the National Interprofessional Office for Cereals (ONIC) covers the coordination of the project by A. Le Blanc.

### Cooperation with the private sector in the Czech Republic

I. Faberová gave an overview of how genetic resources are coordinated between public and private sector institutes in the Czech Republic. All breeding was done at government institutes after the Second World War. In 1989 this structure entered a phase of decline due to lack of funding and a number of privatization programmes. The adoption of the Convention on Biodiversity in 1991 offered new opportunities to reorganize the former network. In 1993 a National Plant Genetic Resources Conservation Programme was launched to improve germplasm conservation and utilization, and to bring the public and private sector closer to one another. Today ten institutions (three governmental and seven private) are involved in this programme. Financial support is being given by the Government to the maintenance of the network.

Presently, in the Czech Republic, 60% of all accessions are located at public institutes and the remaining 40% within private companies. Although duplicate collections have been deposited at the Czech Gene Bank (Ruzyne, Prague) the present situation for conservation is insecure as the legal status of plant genetic resources at the private companies has not yet been solved satisfactorily. There is also the opinion, from the public sector, that the private sector should fund more future activities, e.g. pre-breeding.

### **Sharing responsibilities with the private sector: discussion**

L. van Soest briefly described a similar type of network that has operated in the Netherlands for 6 years (1985-90) and has now been terminated.

Following the presentations of the Czech and French national programmes the Group discussed ways in which the interest of the private sector could be increased in the area of conservation of wheat genetic resources.

The importance of widening the genetic base of modern varieties was re-emphasized. It was argued that although landraces could contribute usefully to this broadening of the genetic base, it was often easier to introduce a particular gene or desirable trait from already improved breeding material. L. Broers questioned whether one would really find more variation in the landraces than is already available in more advanced material. A more fruitful approach would perhaps be to work on the wild relatives or re-synthesized cultivars. A simple and concrete action to increase utilization would be to talk to the breeders and try to identify where problems of limited genetic variation lie. The importance of broadening the genetic base, through the utilization of landraces, was re-emphasized.

S. Abbo suggested, as a concrete contribution to the breeders, that the databases be completed with the gene symbols, where known, as a means of providing more precise information than evaluation data.

H. Walther argued that the wheat network in France is unique in that INRA plays such an essential part in the programme. No other country has substantial support from a governmental organization of such a size. T. Gass responded that the proposed ECP/GR Wheat Working Group could very well play the role of a moderator and link between germplasm management people/institutes and the breeding community.

This tendency was also stated to be emerging in a number of other European countries. L. van Soest said that discussions are ongoing in the Netherlands regarding a way to recover the costs involved with packing and distribution. M. Lefort also mentioned that discussions are underway nationally to introduce a form of fee in compensation for the maintenance and distribution of large samples: 'free access, but not free distribution'.

L. Broers emphasized the private sector's willingness to cooperate with this network. He also stated that his company was prepared to increase the amount of pre-evaluated material introduced into the breeding process.

## Research related to wheat genetic resources in Europe

### Workshop on the use of molecular techniques in the assessment of diversity

T. Gass opened this session by indicating the value of recent developments in molecular techniques for assessing patterns of diversity, identification of specific traits through linked markers and aspects of genebank management, such as the question of duplication within collections.

He outlined the workshop hosted by IPGRI from 9 to 11 October 1995 to review the state of the art in molecular genetics applied to genetic resources. He stressed the importance of clearly defining the question that was being addressed so that the most appropriate technique could be selected. An output of this workshop is a schematic flow diagram to guide decisions on which technique to use in order to answer specific questions related to biodiversity. A report of the workshop, including updates on the various techniques and their comparative advantage, will be sent to the members of the Group by T. Gass upon publication.

M. Ambrose stated that, as learned from collaborative work he was associated with, these techniques had made significant contributions to a range of important questions, including establishment of patterns of diversity, phylogenetic relationships and varietal duplications. AFLP technology, in particular, looks set to play an important role in PGR in the coming years and is proving reliable, quick, cheap, reproducible and yields large quantities of data.

L. Horvath mentioned two practical examples in which biotechnology has proved useful to genebanks. The simple gliadin-electrophoresis methodology has been successfully used in the identification of duplicates of the old Hungarian wheat variety Bánkúti 1201. The identification of regenerated *in vitro* stored potato varieties has been made possible with the aid of tuber-protein electrophoresis.

P. Perrino expressed the view that molecular techniques do not stand alone but still require significant reliance on morphological characterization and evaluation data when dealing with large collections. H. Walther added that, while useful, these techniques still have serious limitations with regard to application in important areas of quantitative traits where there is significant gene x gene and gene x environment interaction.

### Biotechnology for Biodiversity Platform

M. Ambrose presented an overview of the EU generic programme 'Molecular tools for diversity' which has been operating for 4 years and is coordinated by Dr Angela Karp at Long Ashton Research Station, UK. The programme aims to assess a range of molecular techniques including RAPDs, RFLPs, microsatellites and AFLPs for their suitability for use in a number of contexts. To this end they have been using a range of case studies. Considerations are made on the level of detail, reproducibility both within a laboratory and between labs, and on costs. A further outcome of the programme is the establishment of a 'Biotechnology for Biodiversity Platform' (BBP) in October 1995. The objectives of the Platform are to provide a forum for dialogue between molecular biologists developing the techniques and end-users, to ensure that potential users of these technologies are kept up to date. It will also enable those involved in the development and assessment of methodologies to be kept fully aware of constraints and the practical problems faced by end-users.

End-users were identified as coming from a very wide range of disciplines.

Another important function of the Platform relates to training and the transfer of technologies from the developers to the end-users. It is planned to provide a level of 'after care' for end-users who are starting to utilize these techniques to ensure their most efficient use and the correct interpretation of the data. Short training courses will also be organized and advertised through the Platform. The first course (10 days) was held in April.

M. Ambrose is a member of this Platform and the current steering group for the genetic resources community. He agreed to represent the ECP/GR Wheat Working Group on this Platform and to report back to the Group on any developments at yearly intervals or more frequently if necessary. The Group also was made aware that individuals are eligible to join by contacting Dr J. Reeves (National Institute of Agricultural Botany, Huntingdon Road, Cambridge CB3 0LG, UK).

### **Project proposal on the conservation of specialized genetic stocks**

M. Ambrose then presented the Group with details of a proposal submitted to the EU under regulation 1467/94 relating to the conservation and utilization of precise genetic stocks in bread wheat, durum wheat and rye. The project gained an A rating and was shortlisted but did not receive funding.

The project focuses on establishing a network for the many hundreds of precise genetic stocks which have been developed across Europe over the past 40 years. The project aims to ensure the safety of these valuable resources through regeneration and multiplication followed by division into subsamples, which are to be sent for safety-duplication at the different coordinating centres. A centralized database is to be established to include basic passport data as well as information relating to the cytological and genetic details to define the stocks. A diagramme of the structure of the network and the categories on stocks was presented. This served to underline the distinct nature of the stocks and the fact that they are held and maintained by specialist groups outside ECP/GR. The support from industry was noted, as well as the existence of the European Wheat Aneuploid Cooperative (EWAC), which has been in existence for the past 30 years holding regular meetings and workshops as well as producing an annual newsletter.

It is planned to revise and resubmit this proposal under the forthcoming second call for proposals as well as submitting a modified version under the Framework IV (Biotechnology area 8. Infrastructures).

Concern was expressed as to whether the submission of two separate wheat proposals meant that they were competing with each other. The group was of the opinion that the two projects were clearly separate in their objectives and coverage and should be submitted separately.

### **Research on wild wheat species in Israel**

S. Abbo presented work done by a large number of institutes in Israel on the evaluation and study of Israel's indigenous wild wheat species.

Ten years ago the Israeli Gene Bank initiated an *in situ* conservation programme on *T. dicoccoides* at Amiad. A comprehensive research effort at the site was evaluated after 5 years of research and published in a special issue of the Israel Journal of Botany<sup>1</sup>. Last year two additional projects were successful in securing funds for an additional 3-year period to continue this work.

<sup>1</sup> Israel Journal of Botany, 1991, 40:5-6.

S. Abbo went on to suggest that in light of current funding restrictions, this Group should consider becoming active in lobbying at national and international levels for the funding of research to support and promote the use and evaluation of wheat genetic resources.

### **Consequences for the Group**

The opportunities for development, as a consequence of new technologies, are of great interest to the Group. It is important that information is made available to the Group and members of the Group with experience and contacts in this area were encouraged to share information. The Biotechnology for Biodiversity Platform was recognized as an important forum in this respect. The Group recommended that M. Ambrose be its representative at meetings of the Platform and pass information on any developments back to the Group.

The Group encouraged coordinators of wheat proposals to continue their efforts in seeking funds for collaborative activities and to ensure that the proposed networks include as wide a range of partners (EU and non-EU) as possible. It was also recognized that the Group could play an important role in setting priorities for research which could be communicated to policy and funding bodies.

## **Project on wheat submitted to the EU programme on genetic resources (EC 1467/94)**

### **Results of the evaluation**

A. Le Blanc presented the results of the evaluation of the project, which had been submitted to the first call for proposals of the EU programme on genetic resources (EC 1467/94). The objectives of the project, although regarded as interesting and well presented, did not fulfil the perceived priorities of the Programme. In view of the extent of work involved, the Group had decided to focus the activities undertaken within the project to the first three steps outlined in the Programme's workplan. This was criticized by the experts.

From the comments received, it seems clear that the establishment of a network, the development of a database and loading of passport data are not sufficient to retain the interest of the Commission. If the project is resubmitted this work should constitute the initial steps of a more user-oriented version.

It seems likely that the important criteria for the selection of projects include the risk of genetic erosion of the species and the degree of utilization by farmers. The objectives will need to take into account the priorities of the Common Agricultural Policy and to be oriented toward improvement of quality, diversification of products, reduction of inputs and protection of the environment. Characterization and evaluation focusing on these objectives are necessary, and the use of modern but well-developed characterization techniques, including molecular techniques, would probably be an advantage.

### **Consequences and further actions to be taken**

The Group agreed to resubmit a completely revised version of the project. A. Le Blanc will prepare a new version with the assistance of a drafting group including M. Ambrose, T. Gass, L. van Soest, H. Walther and J. Weibull. The objectives of this new version will be to:

- emphasize interest for the production and transformation industry as well as for the breeders;
- establish the database and network, which will be considered partially implemented and requiring only restricted additional attention;
- emphasize the interest to future generations of access to well-documented collections, which will ensure the safe and continued availability of genetic diversity of wheat;
- commit to the cooperation between relevant partners, giving a strong Community dimension to the project;
- describe and illustrate through diagrams the expertise and tasks of each partner;
- give more attention to harmonizing the presentation of the partners;
- increase the total budget, if necessary.

## Conclusion

The Group adopted the report with the revisions tabled. It also agreed that a subgroup comprising L. Broers, M. Kanbertay, A. Merezhko and H. Walther assist the managers of the database in the preparation of the minimum descriptors.

Election of the Chairperson: there was a unanimous decision to elect Iva Faberová and Annick Le Blanc to jointly chair the Group until its next meeting.

The Bureau des Ressources Génétiques was thanked for its hospitality and the very efficient hosting of the meeting.

## Part B: Papers Presented

### Status of wheat genetic resources in Europe

**Iva Faberová<sup>1</sup> and Annick Le Blanc<sup>2</sup>**

<sup>1</sup> Research Institute of Crop Production, Prague-Ruzyne, Czech Republic

<sup>2</sup> GEVES, Le Magneraud, Surgères, France

#### Introduction

The genetic resources of wheat, one of the most important crops, have been maintained in large collections in all European countries. Of course, many recently or currently registered accessions are included, often simultaneously, in various collections. On the other hand, rare local varieties and primitive cultivars, as sources of valuable genes, are not available for direct utilization in a wide community of wheat breeders owing to a lack of ready information. Several catalogues, or lists, were created to enable better orientation within wheat collections at a regional level. The present situation requires compilation of a reliable list of all accessible wheat materials with a necessary basic description and characterization within the whole of Europe.

The first survey on the state of the wheat collection was made at the beginning of 1995 for the draft project on cereals collection. This survey was first carried out in the EU countries and its results were used for the submission of the project 'Development of a network for the management of wheat genetic resources for Europe and the establishment of an European Catalogue'. Fourteen EU-member countries participated in this project which was coordinated by GEVES, INRA, Clermont-Ferrand (France). RICP, Prague (Czech Republic) was involved as an additional fifteenth partner but was not included in the group of countries which had been financially supported. This institution was ready to share co-responsibility for the gathering of wheat collections data from 21 non-EU member countries, including Turkey and Israel.

#### Wheat collections in the EU countries

A questionnaire (see Appendix II) was sent to EU-member countries in the framework of the first EU call for a proposal on 'Conservation, Characterization, Collection and Utilization of Genetic Resources in Agriculture'. Concerning wheat, about 100 000 genetic resources accessions are maintained in genebanks throughout the EU (Table 3). The majority of these accessions relate to *Triticum aestivum* (bread wheat) and *Triticum turgidum* (durum wheat). About 5% are of other species, including wild relatives, maintained for their potential value as sources of resistance to pests and diseases. Up to 40% of these EU accessions are estimated to be duplicates (i.e. also conserved in the country of origin).

In addition to the genetic resources maintained in genebanks or public institutes, approximately 25% of the accessions are maintained in private breeders' collections. In the context of the competition in commercial breeding, breeders have increasing difficulty in investing in long-term conservation of genetic resources and the systematic enlarging of the genetic base of their breeding pools.

**Table 3.** Accessions held by country with type of material<sup>†</sup>.

Partner	Crop	Collection content					No. of acc. (total)
		Pop./loc.v	Varieties	Res. mat.	Wild rel.	Not def.	
Germany	Wheat	<--- 15 500 --->		–	700	–	16200
	Wheat	4259	3751	7532	363	203	16108
United Kingdom	Wheat	3896	1787	1519	–	–	7202
France	Bread wheat	800	5000	300	1500	–	7600
	Durum wheat	1200	700	400	307	–	2607
The Netherlands	Wheat	2469	1488	673	234	396	5260
Sweden	Wheat	256	433	682	–	–	1371
Austria	Wheat	557	949	350	69	120	2045
Spain	Soft wheat	1135	348	135	340	249	2207
	Durum wheat	859	85	4	–	–	948
Greece	Bread wheat	250	729	697	70	–	1746
	Durum wheat	139	403	119	48	–	709
Italy	Wheat	>25000	>5000	–	1523	–	>31000
Portugal	Wheat	2371	36	812	255	518	3992
Belgium	<i>T. spelta</i>	113	8	246	–	–	367

<sup>†</sup> Pop./loc. v. = Populations, local varieties; Varieties = Varieties; Res. mat. = Research material; Wild rel. = Wild relatives; Not def. = Not defined.

This survey did not permit an overview of the level of computerization. It did not list the descriptors used in the respective databases and the level of loaded data for each descriptor. However it showed that, besides Belgium where computerization for *T. spelta* will soon begin, all major collections are computerized and data are already available, or will be available, in the short term (Table 4).

In all EU countries, seeds are stored under controlled conditions: cold room and, in most cases, long-term storage in freezers (Table 5).

### Scope within wheat collection in the non-EU section

The questionnaire was sent to the partners in non-EU countries at the end of 1995. It gave basic information on wheat collections. Regardless of the restructuring of the EU project wheat catalogue in the first call, 62 questionnaires were sent to 21 countries. The addresses used were according to the 1995 *Directory of European Institutions Holding Crop Genetic Resources Collections* published by IPGRI and FAO. Letters were sent to the national PGR coordinator and directly to the collection curator.

A total of 42 answers were received by the Genebank, RICP Prague. Five were negative, giving no possibility of collaboration. Representatives from all countries answered, except Slovenia. Therefore, 20 countries are included in the wheat network in the non-EU section.

The results were summarized according to number of accessions, type of collection, status and data accessibility, to give the first estimation of the number of wheat accessions. Some results are very precise, some of them are rounded to thousands. Altogether 141 692 wheat accessions are held in the non-EU part of Europe (Table 6). Traditionally, the largest part represents the collection of VIR, St. Petersburg (Russia): above 35 000 accessions.

**Table 4.** Computerization, availability of data and collection purposes (EU member countries).

Country	Crop	Comput.	Software	Data supply	Data exchange	Representative	No. of coll.	Purpose
Germany	Wheat	Yes	Foxpro	September 1996	Paper/diskette	H. Knüpfner	1	Breeding/Research
	Wheat	Yes	Oracle 6.0			L. Frese	1	Conservation, breeding
United Kingdom	Wheat	Yes	dBase 4			M. Ambrose	1	Breeding, research, reference collections
France	Bread wheat	Yes	ACCESS (ERGE)	End of 1996	Paper/diskette	J. Koenig	3	Conservation, multiplication, characterization, breeding and research
	Durum wheat	Yes	dBase	immediately	Paper/diskette	F. Kaan	2	Study of variability-quality & abiotic stress, breeding
	Tetrapl. wheat relatives	No		immediately	Paper/diskette	F. Kaan	1	Dynamic management, abiotic stress, disease resistance, quality
The Netherlands	Wheat	Yes	Oracle (GENIS)	immediately	Paper/diskette/Email/Internet	L. van Soest	1	Breeding, research
Nordic Countries	Wheat	Yes	dBase			M. Hulden	3	Long-term conservation
Austria	Wheat	Yes	dBase 4			R. Schachl	3	Breeding, research
Spain	Soft wheat	Yes	dBase 4	immediately	Paper/diskette	M. Ruiz	1	Conservation, multiplication, characterization
	Durum wheat	Yes	dBase 4	immediately	Paper/diskette	M. Ruiz	1	Conservation, multiplication, characterization
Greece	Bread wheat	Yes	dBase 4	September 1996	Paper/diskette	D. Gogas	1	Breeding, evaluation
	Durum Wheat	Yes	dBase 4			P. Grivakou	1	Breeding, evaluation
Italy	Wheat	Yes		April 1996	Paper/diskette/Email	P. Perrino	1	Conservation, characterization, utilization
Portugal	Wheat	Yes	dBase 4			B. Maças	1	Conservation, characterization, utilization. Local origin: 90%
Belgium	<i>T. spelta</i>	No	–			A. Dekeyser	1	Breeding

**Table 5.** Storage methods used in EU countries.

Country	Crop	Storage method
Germany	Wheat	<u>Long term</u> : -15°C in glass jars with silica gel <u>Medium term</u> : 0°C in glass jars with silica gel
	Wheat	Dried seeds with 4-6% moisture content stored in common tins at -10°C
United Kingdom	Wheat	Medium term storage at 4-5°C, 7-10% relative humidity
France	Wheat	Cold room at 4°C, 30% humidity, paper bags, plastic bags with zip strip or plastic tubes with silica gel in the cap - Safety-duplication at -18°C (freezer) in laminated foil bags.
	Durum wheat	Cold room at 5°C - spikes and bulk
	Tetrapl. wheat relatives	see above
The Netherlands	Wheat	<u>Long term</u> : -20°C, Humidity not controlled, but dried seeds packed in laminated foil bags. <u>Medium term</u> : +15°C under conditions as in long term storage. Notice : Seeds dried to 5-6% moisture content
Nordic Countries	Wheat	Dried and stored at -20°C
Austria	Wheat	<u>Long term</u> : -20°C, Humidity not controlled, but dried seeds packed in glass jars or laminated foil bags. <u>Medium term</u> : +15°C under relative humidity of 20-25%. Notice : Seeds dried to 6-8% moisture content
	Spain	Wheat
Greece	Soft wheat	<u>Base collection</u> : -18°C, Seed humidity content 6%, in metal containers. <u>Active collection</u> : -2°C, Seed humidity content 6%, in glass containers.
	Durum wheat	see above
	Bread wheat	<u>Long term storage</u> : -22°C, air hum. 20%, in sealed packages, cloth bags and sealed cans. <u>Medium term storage</u> : 5 to 8°C, air hum. 40% in cloth or plastic bags and paper envelopes.
Belgium	Durum wheat	see above
	<i>T. spelta</i>	Short term

**Table 6.** Summary of wheat accessions held in non-Eu collections.

Country	Total accessions	Local accessions
Albania	9650	860
Bulgaria	6672	150
Croatia	2319	300
Cyprus	80	80
Czech Republic	9428	684
Estonia	30	6
Hungary	10149	1927
Israel	14592	12128
Latvia	677	21
Lithuania	300	8
Poland	11177	746
Romania	9139	934
Russia	35213	5776
Slovakia	2384	146
Sweden	1400	700
Switzerland	6604	579
Turkey	10365	5307
Ukraine	8100	840
Yugoslavia	3413	925
<b>Total</b>	<b>141692</b>	<b>32117</b>

The standard size of the wheat collection is about 10 000 accessions. Not only the amount of accessions is important, but also the quality and reliability of accompanying data. Many duplicates and a variable level of accession status are expected among all these collections. A large amount of research or breeder's material occurs in east European collections.

The most valuable part of the collection is represented by the accessions of local origin. A total of 32 117 wild species, landraces and primitive cultivars are included in non-EU collections (Table 7). The amount of indigenous materials increases toward the southeast, where hypothetically developing centres of cereals are located. Most voluminous, in this regard, are the collections of Israel, Russia and Turkey.

Central European countries generally have very poor collections of indigenous material. Few local varieties are involved and wild species are also exceptional. Focus will be particularly set on all material of indigenous origin in an effort to save genetic material for the future. Common collections of wheat, in central and east Europe, include many accessions in the category of research material and cultivars, and only a few in the category of wild and local cultivars, or material with unknown accession status.

#### Wheat accessions according to collection type

Table 7 presents the situation from the point of view of collection type. It is sometimes very difficult to assign one type of collection utilization, because the genebank collections often serve as national collections. Most important are a number of accessions stored under climatized conditions in genebanks. About 40% of all the material and 58% of indigenous accessions only are held in long-term or medium-term storage. National collections also represent a significant part of all samples (41 and 23% respectively), but the storage conditions are not specified.

**Table 7.** Wheat accessions in non-EU collections, grouped by collection type.

	Total accessions		Accessions of indigenous origin	
	Number	%	Number	%
Genebanks	58 499	40	18 712	58
National collections	55 177	41	7 507	23
Institutional collections	26 512	18	5 119	17
Regional collections	1 504	1	779	2
Total	141 692	100	32 117	100

#### Computerization of passport data

Table 8 presents the situation in data computerization and availability, which is unsatisfactory. About 26% of the information is represented by nearly 37 000 accessions, which are not computerized or are unavailable. This is probably caused by the later start in computerization and by the lower level of technical equipment in this part of Europe.

**Table 8.** Computerization and availability status of non-EU wheat collections.

	Total accessions		Accessions of indigenous origin	
	Number	%	Number	%
Computerized and available	104 849	74	19 591	61
Not computerized or not available	36 843	26	12 526	39

Total	141 692	100	32 117	100
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The availability of passport data matches their level of computerization, estimated at only 74%. Much work is necessary for the transformation of all computerized data into standardized format and for the search of duplicates within the European wheat catalogue. Solving the problem of non-computerized data will be much more difficult.

#### Estimated availability of evaluation data

Completion of characterization and evaluation data is not as high as in the case of passport data (Table 9). It has not yet been examined, because the first step of the survey focused only on passport data. In general, about 30% of characterization and evaluation data are available, but it is not clear in which form. A level of data standardization, which is crucial for synthesis and data comparison concerning evaluation, is inevitable.

**Table 9.** Availability of evaluation data on wheat accessions in non-EU collections.

	Total accessions		Accessions of indigenous origin	
	Number	%	Number	%
Available	43 925	31	9 313	29
Not available	97 767	69	22 804	71
Total	141 692	100	32 117	100

#### Summary

Wheat collections in Europe involve about 220 000 accessions, about 20% of which are of indigenous origin. It is estimated that 17% of the data are not computerized or are unavailable. The first step will be to create the list or catalogue of European wheat collections with the basic passport data. Additional information on a minimal set of characterization and evaluation data will be added. This commonly accepted minimal set of descriptors should preferably consist of highly heritable traits. It will be necessary to ensure sufficient amount of viable seed material of all samples documented in this catalogue and make it accessible to users. The most valuable indigenous material should be stored under long-term conditions as base collections and secured as safety duplicates.

From this point of view, now is the right time to propose a minimal descriptor set and design the standard structure for the evaluation part of further data processing. Characterization and evaluation data are the information most required by users. Many characterization and evaluation data have been stored at specialized institutions on paper and in fieldbooks only, but in such a format it is not feasible to have them summarized at an international level. The importance of wheat data preparation for the European catalogue is that the data can contribute to more intensive transformation into electronic format. Data processing, for both passport and characterization/evaluation, could be carried out simultaneously.

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NGB Wheat Database. 1996.

## The European Wheat Database (EWDB): structure and presentation

**Annick Le Blanc<sup>1</sup> and Iva Faberová<sup>2</sup>**

<sup>1</sup> GEVES, Le Magneraud, Surgères, France

<sup>2</sup> Research Institute of Crop Production, Prague-Ruzyne, Czech Republic

*The structure of the EWDB has evolved further since the ECP/GR Wheat Workshop. The structure presented in this article is the most up-to-date at the time of publishing and takes into account the changes recommended by the Workshop.*

### Definitions

(As given by the International Undertaking on Plant Genetic Resources, 1989, undergoing review).

**Plant genetic resource:** the reproductive or vegetatively propagating material of the following categories of plants:

- wild and weedy species, near relatives of cultivated varieties;
- primitive cultivars (landraces);
- obsolete cultivars;
- cultivated varieties (cultivars) in current use and newly developed varieties;
- special genetic stocks (including elite and current breeders' line and mutants).

**Collection of plant genetic resources:** a collection of seed stock or vegetatively propagating material (ranging from tissue cultures to whole plants) held for long-term security in order to preserve the heritage and genetic variation for scientific purposes and as a basis for plant breeding.

Preserving biodiversity has become an important issue at the international level and genetic resources have become a major concern. Setting up a European collection and database for wheat goes much further than the simple definition of the genetic resource.

Negotiations are underway at an international level on the problems of access to genetic resources, in the framework of the Rio Convention, and will lead to the identification of national collections. National collections must list genetic resources which effectively belong to the country. A status must be found for foreign material, especially for material kept under poor conditions in another country or even missing from other collections.

### Objectives for EWDB

The database is structured according to the objectives agreed upon by the Group:

- to provide passport data concerning the wheat genetic resources listed in European countries (exchangeable material);
- to provide minimum descriptors and some evaluations of these genetic resources;
- to direct users toward countries responsible for conservation, distribution and complete description of the requested genetic resource.



- **Genebank accession number** = National identification accession number, genebank or informant accession number - unique number within national collection
- **Year of introduction into genebank** or informant collection
- **Original country of origin**
- **Status**
- **Ploidy**
- **Donor** = Institution donating accession or information on accession to genebank or informant institution
- **Donor accession number** = Accession number in the institution donating accession to the genebank or informant institution
- **Other number** = Number(s) associated with the accession in other collections
- **Synonym** = Synonym(s) or other names associated with the accession
- **Breeder** = Institution or person who bred the accession
- **Year of first registration** in national list of registered cultivars
- **Availability**
- **Herbarium** = Presence or absence of herbarium or spike
- **Pedigree**
- **Safety-duplication site** = Institution holding safety-duplication of the accession
- **Duplicate** = Probable duplicate of other EWDB accession(s)
- **Remark** = Comments or supplements related to the passport descriptors.

(for collected material only)

- **Name of expedition**
- **Collecting institution** = Institute or person collecting/sponsoring the original sample
- **Collecting number** = Unique collector's number of accession within expedition
- **Collecting date of original sample**
- **Location description** = Distance and direction of the nearest town or village
- **Site description** = Topographic description of site
- **Collecting source**
- **Longitude** = Geographic coordinates for longitude
- **Latitude** = Geographic coordinates for latitude
- **Altitude** = Elevation above sea level.

#### ***Description data***

Concerning these descriptors, their respective lists could be unrestricted in the future. However, for better understanding, a minimum list of descriptors to be documented as a priority was initially established. Descriptor lists published by IPGRI use the following definitions for genetic resources data management:

**Characterization descriptors:** enable an easy and quick discrimination between phenotypes. They are generally highly heritable, can be easily seen by the eye and are equally expressed in all environments. In addition, they may include a limited number of additional traits thought desirable by a consensus of users of the particular crop.

**Evaluation descriptors:** many descriptors in this category are susceptible to environmental differences, but are generally useful in crop improvement. In addition, others may involve biochemical or molecular characterization. They include yield, agronomic performance, stress susceptibility and biochemical and cytological traits.

For the purposes of EWDB data management, it was decided to use **a joint category for characterization and evaluation**. The minimal list of descriptors will be established according to their low level of interaction with the environment or the importance of information for users:

- **Growth habit** = Growth class (seasonality) in the country of genebank / informant
- **Principal attribute** = The most useful characteristics of the accession or principal interests and uses of the accession. It could be the reason why the accession is referenced in the collection, or the principal characteristics which best describe the accession (briefly formulated)
- **Principal utilization** = Way of main utilization
- **Morphological descriptors** = Awnedness, pericarp colour, glume colour, glume pubescence, spike density
- **Cytological characteristics and identified genes**
- **Gel electrophoretic patterns** = Gliadins, glutenins
- **Plant height**
- **Protein content**
- **1000-kernel weight**
- **Yield level**
- **Lodging**
- **Cold susceptibility**
- **Biotic stress susceptibility** = Susceptibility to main diseases in Europe.

These last five types of descriptors, which are more susceptible to the environment, should be evaluated in reduced scoring classes (3-point or 5-point scale). This information should be based on long-term experimental results and evaluated in comparison with reference cultivars commonly used in each country. It must be the best representative value of the accession in the informant country. For diseases, it is advised to input the worst score obtained in the country of the genebank/informant, specifying in the corresponding "comment" field, if necessary, the location, scoring period, mean, minimum and maximum.

**Table 10.** EWDB descriptors list.

Field name	Format	Description	Linked table
<b>1 - Genotypes</b>			
ge_c_ge	key	EWDB identification number	
ge_c_tax	num *	Scientific name code	Table 2
ge_n_ge	txt 30	Cultivar name	
ge_c_statu	num *	Status code	Table 3
ge_p_orig	txt 3 *	Original country of origin code	Table 4
ge_ploidy	num *	Ploidy	Table 5
ge_growth	txt 1	Growth class in the country of the genebank/informant	
ge_c_gb	num *	Genebank code	Table 6
ge_ref_maint	txt 15	Genebank accession number	
ge_c_donn	num *	Donor code	Table 6
ge_ref_donn	txt 15	Donor accession number	
ge_y_introgb	txt 4	Year of introduction into genebank	
ge_c_breed	num *	Breeder code	Table 6
ge_y_regis	txt 4	Year of first registration	
ge_avail	txt 1 *	Availability	Table 7
ge_c_sd	num *	Safety duplication code	Table 6
ge_c_hc	txt 1 *	Herbarium code	Table 8
<b>1a - Collected material</b>			
cm_c_cm	key	key	
cm_c_ge	num *	EWDB identification number	Table 1
cm_n_exp	num *	Expedition code	Table 9
cm_c_addr	num *	Collecting institution code	Table 6
cm_c_cs	num *	Collecting source	Table 10
cm_acc_num	txt 10	Collecting number	
cm_dat_coll	txt 10	Date of collecting	
cm_locat	txt 180	Location	
cm_sit_descrip	txt 180	Site description	
cm_long	txt 7	Longitude	
cm_lat	txt 7	Latitude	
cm_alt	txt 4	Altitude	
<b>2 - Scientific name</b>			
tax_c_tax	key	Scientific name code	
tax_gen	txt 20	Genus	
tax_spe	txt 20	Species	
tax_spe_auth	txt 40	Species authors	
tax_ssp	txt 20	Subspecies	
tax_ssp_auth	txt 40	Subspecies authors	
tax_var	txt 20	Varietas	
tax_var_auth	txt 40	Varietas authors	
tax_validity	logical	EWDB validity of the taxon	
<b>3 - Status</b>			
st_c_statu	key	Status code	
st_explan	txt 30	Status	
<b>4 - Country</b>			
cc_c_c	txt 3 - key	ISO code	
cc_country	txt 35	International name	

Field name	Format	Description	Linked table
<b>5 - Ploidy</b>			
pl_c_pl	key	ploidy code	
pl_ploidy	txt 20	ploidy description	
<b>6 - Addresses</b>			
addr_c_addr	key	Address code	
addr_instc	txt 6	Institute code (IPGRI)	
addr_acron	txt 15	Acronym	
addr_n_inst	txt 60	Name of institute/firm	
addr_address	txt 100	Address	
addr_post_cod	txt 15	Post code	
addr_town	txt 30	Town	
addr_country	txt 3 *	Country	Table 4
addr_tel	txt 20	Tel number	
addr_fax	txt 20	Fax number	
addr_email	txt 30	E.mail	
addr_comment	memo	Comment - Information	
<b>6a - Correspondents</b>			
cor_c_cor	key	key	
cor_c_addr	num *	Address code	Table 6
cor_name	txt 40	Name of correspondent	
cor_pos	txt 30	Position	
<b>7 - Availability</b>			
av_c_av	key - txt 1	Availability code	
av_expl	txt 20	Explanation	
<b>8 - Herbarium</b>			
herb_c_herb	key	Herbarium code	
herb_expl	txt 10	Explanation	
<b>9 - Expeditions</b>			
exp_c_exp	key	Expedition code	
exp_acron	txt 15	Expedition acronym	
exp_name	txt 50	Expedition name	
exp_memb	txt 150	Members	
<b>10 - Collecting source</b>			
cs_c_cs	key	Collecting source code	
cs_expla	txt 15	Explanation	
<b>11 - Other names</b>			
s_c_s	key	key	
s_c_ge	num *	EWDB identification number	Table 1
s_i_s	txt 30	Synonym / other name	
<b>12 - Other numbers</b>			
on_c_oc	key	key	
on_c_ge	num *	EWDB identification number	Table 1
on_other	txt 30	Other number	

Field name	Format	Description	Linked table
<b>13 - Duplicates</b>			
du_c_du	key	key	
du_c_ge	num *	EWDB identification number	Table 1
du_dupl	num 6	EWDB identification number of duplicate	
<b>14 - Pedigree</b>			
ped_c_genea	key	key	
ped_c_ge	num *	EWDB identification number	Table 1
ped_genea	txt 200	Pedigree	
ped_c_ps	txt 1 *	Code of pedigree source	Table 15
ped_c_lit	num *	Code of literature	Table 16
<b>15 - Pedigree source</b>			
ps_c_ps	txt 1-key	key	
ps_source	text 25	Pedigree source	
<b>16 - Literature</b>			
lit_c_lit	txt 1-key	key	
lit_literature	txt 250	Literature reference	
<b>17 - Comments</b>			
co_c_co	key	key	
co_c_ge	num *	EWDB identification number	Table 1
co_type	txt 3 *	Type of comment	Table 18
co_comment	txt 250	Comment	
<b>18 - Types of comments</b>			
tc_c_tc	txt 3-key	key	
tc_explan	txt 25	Explanation	
<b>19 - Description</b>			
des_c_desc	key	Key	
des_c_ge	num *	EWDB identification number	Table 1
des_c_sc	num *	Score	Table 20
des_info	memo	Information or comment	
<b>20 - Scoring scales</b>			
ss_c_sc	key	key	
ss_c_desc	num *	Descriptor code for Description	Table 21
ss_c_score	num 1	Score	
ss_explan	txt 30	Explanation	
<b>21 - Descriptor list</b>			
ldes_c_desc	key	Descriptor code for Description	
ldes_explan	txt 50	Explanation of descriptor	
<b>22 - Principal attribute</b>			
pa_c_pa	key	key	
pa_c_ge	num *	EWDB identification number	Table 1
pa_type	num *	Type of attribute	Table 23
pa_attribute	txt 50	Attribute	

Field name	Format	Description	Linked table
<b>23 - Type of attribute</b>			
ta_c_ta	key	key	
ta_abbrev	txt 10	Abbreviation for type of attribute	
ta_explan	txt 25	Explanation	
<b>24 - Genes</b>			
gen_c_gen	key	key	
gen_c_ge	num *	EWDB identification number	Table 1
gen_c_gene	num *	Gene code	Table 25
gen_allele	txt 10	Allele	
<b>25 - Gene list</b>			
lgen_c_lgen	key	Gene code	
lgen_n_gene	txt 8	Gene name (abbreviation)	
lgen_explan	txt 25	Explanation	

## Examples of national coordination structures which promote the use of wheat genetic resources

### Collaboration in plant genetic resources activities between state and privatized institutions in the Czech Republic

#### *Iva Faberová and Ladislav Dotlacil*

Research Institute of Crop Production, Genebank Department, Praha 6, Ruzyne, Czech Republic

#### Introduction

The Czech Republic has a long tradition of plant breeding and work associated with crop collections in general. In the second half of this century, there were many changes in ownership related to the political situation after the Second World War. Until 1948, the situation in the country was similar to other European countries. Many private breeders and breeding stations were active in former Czechoslovakia. However, all private undertakings were nationalized after 1948.

In the 1950s, a network of newly founded or nationalized state-owned institutions was established: research institutes, breeding stations and sections of the Central Institute for Testing and Control in Agriculture. Most research institutes specialized in specific crops and maintained large crop collections. During this period there were no private institutions.

In the early 1990s, many state-owned institutions were privatized, and there were many budget cuts in connection with this change, both in private institutions and in the remaining state-owned institutions. Some institutions were closed, such as the Research Institute of Vegetables in Olomouc, or sold (Research Institute of Beet at Semcice, presently owned by the breeding company Hilleshog). Therefore, the status of PGR collections became very unstable and some collections were endangered.

#### Position of the RICP Prague-Ruzyne in national activities on PGR

The Research Institute of Crop Production in Prague held the central position in the network of genetic resources research institutions, because it mediated an introduction of foreign material used for research purposes into Czechoslovakia during 1970-1992. All requests from collaborating crop-specific institutes were gathered in the department of genetic resources at RICP Prague, and plant material was imported via the foreign trade company Koospol.

Distribution of the material received also was carried out by RICP Prague, according to requests from collection curators. Until 1989 this activity was financed by the Ministry of Agriculture. Strong links were established between RICP Prague and the other 29 crop-specific institutes. Collaboration in plant genetic resources was managed by the Board on Plant Genetic Resources directed by the national PGR coordinator. All activities related to plant genetic resources were carried out in close collaboration with breeders. The meetings of Board members were organized regularly twice a year.

In 1976 the computerization of PGR data started in the department of genetic resources at RICP Prague. At first, only data on imported materials were computerized. Later the documentation of all crop collections was developed. A

special computer programme was developed for the central data processing of all crop collections in Czechoslovakia.

The Genebank at RICP Prague was established in 1989. Large collections of wheat, winter barley and smaller collections of *Triticale*, sunflower, buckwheat, other alternative crops and special vegetables research material, held at RICP Prague, were transferred, as the first acquisitions, into the genebank. The supply of seed material from other collaborating institutions was not very intensive at the beginning. This was due to the absence of legal support or a convention concerning the transfer of seeds into long-term climatized storage at the genebank.

### The recent situation

Since the splitting of Czechoslovakia in 1992, ten institutions holding PGR collections have been collaborating in the now Czech Republic. At present, besides RICP Prague-Ruzyne which is managed by the Ministry of Agriculture and includes the Station of Viticulture in Karlstejn and the working station at Olomouc, only three are state-owned: the Institute for Ornamental Gardening in Pruhonice, near Prague, managed by the Ministry of Environment; the Faculty of Horticulture in Lednice and the Mendel's University of Agriculture, in Brno, managed by the Ministry of Education.

All other former crop-specific institutes have been privatized; most of them have been reduced in size and expanded to present a broader spectrum of activities. During this stage the existence and safety of many PGR crop collections were severely endangered.

The establishment of the National Programme on Plant Genetic Resources Conservation and Utilization, and its adoption by the Ministry of Agriculture in 1993, was the main goal of these intensive activities of the Czech Board on PGR. Since 1993, the ten abovementioned PGR institutions have all participated in the National Programme covering all basic activities of the work on PGR: increasing collections (including collecting missions); their documentation, basic evaluation, conservation and service to users within the country and abroad.

The National Programme of Plant Genetic Resources Conservation and Utilization is fully financed by the Ministry of Agriculture of the Czech Republic and it has recently been adopted as a long-term project of a non-competitive character. Private crop institutions, which are involved in the National Programme, take part in the work on PGR conservation along with their own activities which are, among others, breeding and advisory services in agriculture.

The establishment of contracts between RICP Prague and these private crop institutions ensures a regular supply of seed material to genebanks and the maintenance of vegetatively propagated materials in field collections. State financial support is provided for activities closely related to PGR; although not high, it is very much appreciated by the newly privatized institutions as a welcome supplement to their budgets.

**Table 11.** Survey of plant genetic resources collections in the state sector.

Institution	Total no. of accessions in collections	Crop	No. of vegetatively propagated accessions
RICP Prague-Ruzyne + Olomouc+ Karlstejn	21692	wheat, w. barley, <i>Triticale</i> , alternative crops, vegetables, grapevine	1066
Res. Inst. for Ornamental Gardening, Pruhonice	1600	ornamental plants	1400

Mendels' Univ., Faculty of Horticult., Lednice n. Mor.	1950	perennial vegetables, fruit trees, grapevine	1870
<b>State sector total</b>	<b>25232</b>		<b>4336</b>
Total accessions (100%)	42576		8571
<b>State sector (%)</b>	<b>59.3%</b>		<b>50.6%</b>

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**Table 12.** Survey of plant genetic resources collections in the private sector.

Institution	Total no. of accessions in collections	Crop	No. of vegetatively propagated accessions
Agric. Res. Institute Ltd., Kromeriz	4886	spring barley, oats, rye	–
AGRITEC Ltd., Sumperk	3884	grain legumes, fibre crops	–
Research Institute of Potatoes Ltd., Havlickuv Brod	1771	potatoes	1771
Res. Inst. for Fodder Crops, Troubsko	1807	fodder legumes, fodder plants	–
OSEVA PRO Ltd., Grassland Research Inst., Zubri	1747	grasses	235
OSEVA PRO Ltd., Research Inst. for Oilseed Crops, Opava	1020	oilseed crops	–
SEMPRA a.s., Research. Inst. for Fruit Trees Growing and Breeding, Holovousy	1969	fruit trees	1969
Hop Institute Ltd., Zatec	260	hop	260
<b>Private sector total</b>	<b>17344</b>		<b>4235</b>
Total accessions (100 %)	42576		8571
<b>Private sector (%)</b>	<b>40.7%</b>		<b>49.4%</b>

As Tables 11 and 12 show, nearly 41% of seed-propagated crops and 49% of vegetatively propagated crops are held by private institutions. This situation does not provide sufficient security, in the case of long-term conservation of crop collections, because of the lack of legal instruments which should guarantee ownership, availability and access to PGR.

The existence of field collections could especially be threatened by the privatization of orchards and lands with experimental fields. The National Programme has obtained visible results during its relatively short existence: rescue of field collections of fruit trees at the Research Institute for Fruit Trees Growing and Breeding in Holovousy, East Bohemia, and of vegetatively propagated collections of vegetables in Olomouc, which is at present part of the department of the Genebank, Prague.

### Conclusions

The establishment of the National Programme on PGR Conservation and Utilization has reached the goals planned for its first stage. Further support of PGR selections having a long-term guarantee to avoid losses of valuable germplasm is necessary. The Ministry of Agriculture should provide the long-term guarantee for covering expenses on conservation and utilization of plant genetic resources of all institutions involved in the National Programme.

All institutions should accept long-term responsibility to maintain and utilize collections, to make collections available for users with respect to international regulations.

It is necessary to guarantee clear and long-term legal security of lands for field collections and *in situ* conservation.

All seed-propagated collections have to be transferred to genebank storage as soon as possible and the genebank should guarantee their availability and maintenance. Collections of vegetatively propagated species (institutions holding these collections) should obtain a genebank status.

Legal acts on genetic resources and biodiversity protection should be adopted in the near future to guarantee state interest in plant genetic resources, maintenance, availability and utilization.

**Literature**

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## National coordination of wheat genetic resources activities in France

### **Annick Le Blanc**

French Coordinator for Cereals, GEVES, Domaine du Magneraud, Surgères, France

### Introduction

France has major genetic resources owing to the range of its soil and climate and a long tradition in breeding agricultural and horticultural species. The BRG (Board of Genetic Resources) was established in 1983 to deal with questions raised by maintaining genetic resources. During the past 10 years, the BRG made the scientific community and government departments aware of the need to conserve and maintain this wealth.

Genetic resources are mainly conserved by public or private institutes who use them in breeding programmes. The pragmatic side of this situation inevitably leads to a loss of material due to the concentration of readily utilizable resources in the short term. Moreover, part of these collections, made up of non-strategic resources, is widely duplicated. The National collection, as well as any concern for the immediate use of stored material, must ensure that the national heritage is preserved and must maintain a genetic and varied stock to meet the future needs of agriculture.

One of the priorities of the BRG is to trigger specific programmes in training, research, collecting or conservation, to bring together the various existing national initiatives, to rationalize the collections and thus create a national cooperative programme. The BRG is currently working on the elaboration of a national charter for the conservation of genetic resources in France. The example of the cereal network illustrates this cooperation.

For several years, this network has linked private and public partners. The participants are curators (presently essentially breeders) and a coordination unit (one coordinator). The network is controlled by a steering committee and the roles and work are defined in a charter with internal regulations. This network is detailed below.

### Who conserves cereal genetic resources in France?

INRA (National Institute for Agronomic Research) holds very large collections: about 8000 genotypes of bread wheat (about 5700 without duplicates), 1000 of durum wheat, 3500 of barley, 600 of oat, 25 of rye and 500 of *Triticale*. Five INRA laboratories are involved in the programme: Clermont-Ferrand, Dijon, Montpellier, Rennes and Versailles-Mons.

- GEVES (Variety and seed study and control group) holds a reference collection for all varieties ever registered in the French Catalogue, even after they have been removed.
- Private breeders also support collections in relation to their breeding programmes. These collections are quite important and are often not open to exchanges. The breeders have, however, participated in the national inventory and their contribution to the national wheat and barley collections is significant.

- Other partners could be included in the programme, for example, agricultural schools, botanical gardens and museums, with respect to their possibilities in terms of conservation, multiplication and facilities.

### **Description of the small grain cereal network**

The main idea behind this network is to preserve and maintain a certain genetic diversity in a collection that is managed in a cooperative and rational way by the group of people concerned with this work, i.e. curators, researchers, breeders, teachers. The different steps are listed below:

- identification of partners;
- inventory of genetic resources available in existing collections;
- creation of a coordination unit;
- identification of the tasks to be accomplished (conservation, multiplication, evaluation);
- drawing up of a charter and internal regulations;
- setting up a management and evaluation network for genetic resources, with the sharing of roles and responsibilities;
- definition of the network's collection;
- creation of a database
- definition of a national collection compatible with the basic principle of free access (UPOV<sup>2</sup> Convention, International Undertaking on Plant Genetic Resources).

From a practical point of view, the running of the network hinges on certain important points:

- annual meeting of the steering committee;
- introduction of new material in test nurseries;
- pre-evaluation of material prior to evaluation in the network;
- evaluation, in individual nurseries managed by the partners, of about 60 genotypes that are candidates for the network's collection;
- synthesis of evaluation data;
- shortlist of new accessions for the network's collection.

#### ***The participants***

The cooperative network includes:

- a coordination unit,
- curators: public institutes or private firms, and
- a steering committee responsible for running the network.

#### ***The coordination unit***

This has been run since 1991 by a GEVES graduate engineer. Funds from the Ministry of Agriculture, BRG and ONIC (National interprofessional cereal office) covering the coordinator's salary, travelling expenses and a small budget for administrative costs, occasional labour, etc. are managed by GEVES. The coordination unit is located in a GEVES unit. Its principal function is to manage and give its partners access to a collection of small grain cereal genetic resources.

#### **Roles of the coordination unit:**

- organize and manage evaluation and conservation of the network's collection;
- organize the sharing of the network's collection among the partners;

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<sup>2</sup> UPOV = International union for protection of new varieties and plants.

- introduce new material to be pre-screened by INRA;
- manage the safety-duplication of the network's collection;
- centralize requests for seed samples from the network's collection and organize or distribute corresponding material;
- manage the database;
- edit and publish catalogues;
- carry out research on variability management methodology and diversity valuation;
- represent the network at a European and international level.

#### ***The curators***

The curators are INRA plant breeding laboratories, private breeding firms, GEVES and, as a general rule, any organization, public or private, accepted by the steering committee and adhering to the present charter.

#### **Roles of the curators:**

- participate in the programme's planning and the constitution of the network's collection;
- collect and screen new accessions;
- conserve and regenerate part of the network's collection, according to the responsibilities established in agreement with the coordination unit;
- distribute seed samples in relation to the coordination unit;
- evaluate material according to the guidelines of the evaluation networks.

#### ***The steering committee***

The steering committee is composed as follows (number of representatives in parentheses):

- The Ministry of Agriculture (1)
- The coordinator
- GEVES (1)
- BRG (1)
- ONIC (1)
- INRA - Department of Plant breeding (1)
- SPSS (Selected seed producers association) (1)
- GNIS (National interprofessional seed group)(1)
- CTPS - Secretariat of small seed cereal section (1)
- Private breeders (6)
- Public breeders (6)
- and some occasional experts.

#### **Roles of the steering committee:**

- settle the general policy of the network;
- establish internal regulations with the methods of management (introduction, withdrawal, conservation, maintenance) and access to genetic resources;
- make proposals concerning the coordination unit programmes, the organization of the network and its legal evolution;
- follow-up with partners and coordinate the unit's activities;
- examine opening up of the network to new French and foreign partners;

- find the means necessary to run the network;
- ratify the annual report prepared by the coordinator.

The steering committee meets at least once a year, at the beginning of December. The meetings are chaired by the representative of the Ministry of Agriculture, and conducted by the coordinator.

### Network and National Collections

The difference between these two collections rests on the question of responsibility to their respective partners.

In the case of the **network's collection**, partners are only French breeders or curators (public and private), who have decided to combine their efforts while managing cooperatively their own sources of diversity for breeding. The notion of exchangeability could therefore be quite different from the one defined at an international level.

The **national collection** will be that part of the network's collection which is compatible with the basic principle of free access developed by the international authorities. As a general rule, it will concern genetic resources which belong effectively to France (cultivars, breeding lines, old varieties, landraces). Some other foreign material, with the authorization of countries concerned, will be included along with collected material which could be missing from other countries and resources whose safe conservation could be doubtful.

The programme participants agreed that the network's collection would not be a list of all the partner collections placed end to end. Criteria have been defined to choose genotypes which are to be conserved as a priority in the network. Each introduction in the network's collection is a spontaneous act: the reason why a genetic resource becomes a new accession on the network's list must be noted when entering the description of this new accession in the database. It is a way of specifying the interest of new material at the moment it is introduced into the collection.

This information refers to the list of criteria defined by the network as follows:

- French cultivars when they are removed from the French catalogue. The registered cultivars (French official list) are also available but under the responsibility of the respective breeders;
- French landraces or local populations;
- French or foreign genitors, especially those which gave, by breeding in their descendants, registered varieties;
- plant material from prospecting in diversification zones;
- plant material well known for the presence of identified genes or specific characteristics (controls);
- plant material not very well known or described but acknowledged as a genetic resource and whose supply or collection remains difficult;
- accessions with unusual characters;
- translocation genotypes;
- foreign landraces or populations if supply remains difficult;
- botanical varieties (including monosomic series, addition or substitution lines).

***The test nurseries***

The participation of the private sector in such an organization is possible only if the firms concerned take a direct interest as part of their breeding programmes.

The management of a network's collection therefore covers two aspects:

- conservation of the national heritage and genetic resources not directly usable in breeding programmes;
- introduction and characterization of new genetic resources usable as genitors by breeders.

**Conservation of the national heritage and genetic resources  
not directly usable in breeding programmes**

Most of the work is carried out by the public sector. Some evaluation or further descriptions could be realized in the framework of regeneration, particular research, mapping or identification of gene programmes, genetic variability studies and diverse characterization programmes.

This material, which is generally considered not to be adapted to the current cultivation conditions, is however acknowledged to be a potential reservoir of genes, in addition to the cultural aspect.

**Introduction and characterization of new genetic resources  
usable as genitors by breeders**

Every year, public or private breeders introduce a number of genotypes for tests which come from exchanges with foreign institutes, other breeders or international nurseries in the framework of collaboration programmes. Evaluations are generally carried out to decide if this new material will be used as genitors or not.

As INRA participates in several of these exchange networks, the French cereal network has mandated screening, at its own nurseries and collections, of the material which could be introduced to the network for further characterization and evaluation, and possible use as genitors. Private breeders also have the possibility of introducing material from their own collections and nurseries into this evaluation network, but everybody understands the difficulty they find in preserving the confidentiality of their breeding programmes, and at the same time cooperating with the network. Therefore, their contribution in providing new genotypes to the network remains limited.

Every year the INRA coordination unit draws up a list of about 50 to 100 genotypes, including controls, to be observed in the partners' nurseries in reference to INRA the abovementioned pre-screening. The partners are provided with a primary description joined to the seed samples (about 150 grains per sample, to be sown in 2 or 3 lines or in seed holes). This description includes some passport data, the evaluations carried out in the framework of the pre-screening and the principal attributes or characteristics of the material (resistance to disease to be confirmed, interest in technology, genetic diversification, behaviour concerning abiotic, botanical or morphological traits).

Most of these genotypes represent adapted material, directly usable by the partners in their respective breeding programmes. However, a small part of the proposed genotypes may not be well adapted, but are interesting for the presence of a particular gene or character, or for being different. The Wheat and Barley Working Groups are concerned with these evaluations and about 30 partners participate.

A minimum of two reliable observations, excluding heading date and plant height, is requested from the partners. The coordination unit returns a synthesis of all these observations, giving the original scores and some statistical data, such as mean, minimum, maximum and standard deviation.

After 1-2 years of evaluation, the partners decide which genotypes are to be introduced to the network's collection and who will be responsible for conserving and regenerating the new accessions. Corresponding data are then loaded in the database.

### **Conclusion**

The principal objectives of this cooperative work are the following:

- the collection remains in touch with the users and their concerns;
- partners have a new source of diversification for their breeding programmes at their disposal;
- some of the best breeding lines from INRA are rapidly made available to the partners;
- the introduction of new material in crossbreeding is stimulated;
- the sharing of responsibilities means that the partners share the work, resulting in an economical onset for the national conservation programme.

## Appendix I. List of Participants

Mr Wolfgang Kainz  
 Bundesamt für Agrarbiologie  
 Wieningerstrasse 8  
 4020 Linz  
**Austria**  
 Tel: +43-732 81 261/260  
 Fax: +43-732 385 482  
 Email: genbank@agrobio.gv.at

Mr Zdravko Matinic-Jercic  
 Dept. for Plant Breeding, Genetics  
 and Biometrics  
 Faculty of Agriculture  
 Svetosimunska 25  
 10000 Zagreb  
**Croatia**  
 Tel: +385-1 23 35 777  
 Fax: +385-1 21 53 00

Mr Constantinos Josephides  
 Agricultural Research Institute (ARI)  
 PO Box 2016  
 1516 Nicosia  
**Cyprus**  
 Tel: +357-2 30 5101  
 Fax: +357-2 31 6770

Ms Iva Faberová  
 Genebank Department RICP  
 Research Inst. for Crop Production  
 Drnovska 507  
 161 06 Praha 6 - Ruzyne  
**Czech Republic**  
 Tel: +42-2 360 851  
 Fax: +42-2 365 228  
 Email: Faberová@genbank.vurv.cz

Ms Annick Le Blanc  
 Collection Nationale Céréales à Paille  
 Unité Expérimentale du Magneraud  
 GEVES  
 Saint-Pierre d'Amilly - BP 52  
 17700 Surgères  
**France**  
 Tel: +33-5 46683093  
 Fax: +33-5 46683024  
 Email: joelle@calvanet.calvacom.fr

Mr Hansjörg Walther  
 Institut für Resistengenetik  
 BAZ  
 Graf-Seinsheim Str. 23  
 85461 Grünbach  
**Germany**  
 Tel: +49-8122 975714  
 Fax: +49-8122 975797

Mr Demetrius Gogas  
 Cereal Institute  
 NAGREF  
 570 01 Thermi-Thessaloniki  
**Greece**  
 Tel: +31-471544/110  
 Fax: +31-471209

Mr Lajos Horváth  
 Institute for Agrobotany  
 Külsö mező 15  
 2766 Tapiószele  
**Hungary**  
 Tel: +36-53 380070  
 Fax: +36-53 380072  
 Email: hollyl@mars.iif.hu

Mr Gerard Lohan  
 Dept. of Agriculture, Food and  
 Forestry  
 Backweston, Leixleip  
 Co. Kildare  
**Ireland**  
 Tel: +353-1 6280608  
 Fax: +353-1 6280634

Mr Shahal Abbo  
 Dept. of Field Crops, Vegetable and  
 Genetics  
 Faculty of Agriculture  
 Hebrew University of Jerusalem  
 PO Box 12  
 76100 Rehovot  
**Israel**  
 Tel: +972-8 948 1943  
 Fax: +972-8 946 8265

Mr Pietro Perrino  
Istituto del Germoplasma  
Consiglio Nazionale delle Ricerche  
Via G. Amendola 165/A  
70126 Bari

**Italy**

Tel: +39-80 558 36 08  
Fax: +39-80 558 75 66  
Email: germpp044@area.ba.cnr.it

Ms Algé Leistrumaitė  
Lithuanian Institute of Agriculture  
Dotnuva-Akademija  
5051 Kedainiai district

**Lithuania**

Tel: +370-57 37398  
Fax: +370-57 56996

Mr Loek J.M. van Soest  
Centre for Genetic Resources, The  
Netherlands (CGN, CPRO-DLO)  
PO Box 16  
6700 AA Wageningen

**The Netherlands**

Tel: +31 317 477011  
Fax: +31 317 418094  
Email: cgn@cpro.agro.nl

Mr Jon Arne Dieseth  
Department of Crop Sciences  
PO Box 5022  
1432 Ås

**Norway**

Tel: +47-64 94 78 00  
Fax: +47-64 94 78 02

Mr Wieslaw Podyma  
Plant Breeding and Acclimatization  
Institute (IHAR)  
05 870 Blonie  
Radzikow near Warsaw

**Poland**

Tel: +48-22 7252611  
Fax: +48-22 7254714  
Email: w.podyma@ihar.edu.pl

Mr Benvindo Maçãs  
Estação Nacional Melhoramento  
Plantas  
Apdo. 6  
7351 Elvas Codex

**Portugal**

Tel: +351-68 622 849  
Fax: +351-68 629 295

Mr Marcel Avramiuc (*unable to attend*)

Suceava Genebank  
Bulevardul 1 Decembrie 1918 nr.17  
5800 Suceava

**Romania**

Tel: +40-30 227087  
Fax: +40-30 227087

Mr Anatoly F. Merezhko  
N.I. Vavilov Research Institute  
of Plant Industry (VIR)  
Bolshaya Morskaya Street 42-44  
190000 St Petersburg

**Russia**

Tel: +7-812 314 4848  
Fax: +7-812 311 8762  
Email: vir@glas.apc.org

Ms Viera Tisová  
Research Institute of Plant  
Production  
Bratislavská cesta 122  
92168 Piestany

**Slovakia**

Tel: +42-838 722330/311  
Fax: +42-838 726306/723769

Ms Magdalena Ruíz Valcárcel  
Centro de Recursos Fitogenéticos  
Apdo. 1045  
28800 Alcala de Henares, Madrid

**Spain**

Tel: +34-1 881 92 61/86  
Fax: +34-1 881 92 87

Mr Jens Weibull  
**Nordic Gene Bank**  
PO Box 41  
23053 Alnarp  
Sweden

Tel: +46-40 461 790  
 Fax: +46-40 462 188

Mr Gert Kleijer  
 Station fédérale de recherches en  
 production végétale de Changins  
 Route de Duillier - BP 254  
 1260 Nyon

**Switzerland**

Tel: +41-22 363 4722  
 Fax: +41-22 361 5469

Mr Mesut Kanbertay  
 Aegean Agricultural Research Inst.  
 (AARI)  
 PO Box 9, Menemen  
 35661 Izmir

**Turkey**

Tel: +90-232 8461331 pbx  
 Fax: +90-232 8461107

Mr Mike J. Ambrose  
 Department of Applied Genetics  
 John Innes Institute  
 Norwich Research Park, Colney Lane  
 Norwich NR4 7UH

**United Kingdom**

Tel: +44-1603 452571  
 Fax: +44-1603 456844  
 Email: michael.ambrose@bbsrc.ac.uk

Mr Srbislav Dencic  
 Institute of Field and Vegetable  
 Crops  
 Maksima Gorkog 30  
 21000 Novi Sad

**F.R. Yugoslavia**

Tel: +381-21 614 933  
 Fax: +381-21 621 212

**ASSINSEL**

Mr Leon Broers  
 Lochow-Petkus France EURL  
 RN 154  
 28150 Allounes  
 France  
 Tel: +33-2 37 99 31 09  
 Fax: +33-2 37 99 33 80

**BRG**

Ms Marianne Lefort  
 Mr Michel Chauvet  
 Bureau des Ressources Génétiques  
 (BRG)  
 57 rue Cuvier  
 75231 Paris cedex 05  
 France  
 Tel: +33-1 44088310  
 Fax: +33-1 45357015

**INRA**

Mr Jean Koenig  
 Station d'Amélioration des Plantes  
 GEVES - INRA  
 Domaine de Crouelle  
 63039 Clermont-Ferrand cedex 2  
 France  
 Tel: +33-4 73624327  
 Fax: +33-4 73624453  
 Email: koenig@clermont.inra.fr

**IPGRI**

Mr Thomas Gass  
 IPGRI Regional Office for Europe  
 Via delle Sette Chiese 142  
 00145 Rome  
 Italy  
 Tel: +39-6-51 89 22 21  
 Fax: +39-6-575 03 09  
 Email: t.gass@cgnet.com

## Appendix II. Survey of existing genetic resources collections and databases

### Wheat, Barley, Oat, Rye and Triticale

(Fill in one page per crop and per country)

COUNTRY ..... CROP .....

PRINCIPAL INVESTIGATOR ( or representative)

Name .....  
 Institute/Organization .....  
 Address .....  
 Zip code .....  
 Phone number .....  
 Fax number .....  
 Email .....

(\* If national collection is divided in several collections in the country, number of collections implied in this survey..... , and localizations of these collections .....

**Considering one collection (composed of above-mentioned (\*) collections, as the case may be).**

COLLECTION TYPE: Research / Breeding / Genebank / Data only (**delete as appropriate**)

COLLECTION PURPOSE: .....

TOTAL NUMBER OF ACCESSIONS .....

COLLECTION CONTENTS - Populations or local varieties .....  
 Varieties .....  
 Research material .....  
 Wild relatives .....  
 Not defined .....

COLLECTION STORAGE METHODS.....  
 .....  
 .....

GENETIC RESOURCES DATA / COMPUTER ( for exchanges with central crop data base) YES / NO (**delete as appropriate**)

--> IF YES, TYPE OF SOFTWARE - Database .....  
 Spreadsheet .....  
 Text processing file .....

HARDWARE .....  
 DATA ACCESSIBILITY .....  
 DISTRIBUTION TYPE .....