Joint PGR Secure/ECPGR workshop

Conservation strategies for European crop wild relative and landrace diversity

7–9 September 2011, Palanga, Lithuania

Report

Compiled by S. Kell, V. Negri, R. Torricelli, N. Maxted, L. Maggioni and H. Fielder

Hosted by the Nature Research Centre, Lithuania

Contents

List of acronyms

AARI	Aegean Agricultural Research Institute
AEGRO	An Integrated European *In Situ* Management Work plan: Implementing Genetic Reserves and On-Farm Concepts
AFLP	Amplified fragment length polymorphism
AMOVA	Analysis of molecular variance
ARS	Agricultural Research Service
ARSIAL	Regional Agency for Development and Innovation of Agriculture, Lazio
BNYVV	Beet necrotic yellow vein virus
BSBI	Botanical Society of the British Isles
CBD	Convention on Biological Diversity
CCDB	Central Crop Database
CGRFA	Commission on Genetic Resources for Food and Agriculture
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPC	Swiss Commission for the Conservation of Cultivated Plants
CWR	Crop wild relative(s)
CWRIS	Crop Wild Relative Information System
CWRIS-PLIS	CWRIS Population Level Information System
CWRML	CWR Markup Language
CWRSG	Crop Wild Relative Specialist Group
DAFF	Department of Agriculture, Fisheries and Food
Defra	Department for Environment, Food and Rural Affairs
EAFRD	European Agricultural Fund for Rural Development
ECPGR	European Cooperative Programme for Plant Genetic Resources
EC	European Commission
ECCDB	European Central Crop Database
ESPC	European Strategy for Plant Conservation
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FP	Framework Programme
GCP	Generation Challenge Programme
GEF	Global Environment Facility
GIS	Geographical information system
GP	Gene Pool
GPA	FAO Global Plan of Action for the Conservation and Sustainable Utilization of PGRFA
GPS	Global positioning system
GR	Genetic resource(s)
GRIN	Germplasm Resources Information Network
GSPC	Global Strategy for Plant Conservation
IPA	Important Plant Area
IPGRI	International Plant Genetic Resources Institute
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
LR	Landrace(s)
MAPROW	Medicinal and Aromatic Plant Resources of the World
MCPD	Multi-crop Passport Descriptors

MTT	Maa-ja Elintarviketalouden Tutkimuskeskus (Agrifood Research Finland)
NBDC	National Biodiversity Data Centre
NC	National Coordinator
NFP	National Focal Point
NGO	Non-governmental organization
NI	National Inventory
NIFP	National Inventory Focal Point
NRC	Nature Research Centre, Lithuania
PA	Protected area
PDO	Protected Designation of Origin
PGR	Plant genetic resource(s)
PGRFA	Plant genetic resources for food and agriculture
RCAT	Research Centre for Agrobiodiversity at Tápiószele
SIS	Species Information Service
SNP	Single nucleotide polymorphisms
SOLIBAM	Strategies for Organic and Low-input Integrated Breeding and Management
SSC	Species Survival Commission
SSR	Simple sequence repeat
SWOT	Strengths, weaknesses, opportunities and threats
TG	Taxon Group
TIP	Trait Information Portal
UK	United Kingdom
UNEP	United Nations Environment Programme
UPGMA	Unweighted pair group method with arithmetic mean
UPOV	International Union for the Protection of New Varieties of Plants
WG	Working Group
WP	Work Package

Executive summary

The joint PGR Secure/European Cooperative Programme for Plant Genetic Resources (ECPGR) workshop, 'Conservation strategies for European crop wild relative and landrace diversity', was convened in Palanga, Lithuania from 7–9 September 2011 to discuss and agree a strategic approach to European and national crop wild relative (CWR) and landrace (LR) conservation. The ultimate aim is to ensure the systematic conservation of European plant genetic resources for food and agriculture (PGRFA) which are important for food security and the European economy. The workshop addressed five primary topics: 1) production of National Inventories (NIs), 2) taxon prioritization, diversity and gap analysis, and threat assessment, 3) data collection, management and exchange, 4) linking conservation to use, 5) development and implementation of national CWR and LR conservation strategies by the ECPGR Network members. The workshop comprised a series of presentations and discussion sessions on the state of the art of CWR and LR conservation in Europe and available approaches and methods. Participants shared knowledge on current national activities, discussed the practicalities of developing national CWR and LR conservation strategies, and agreed on the way forward. The workshop was structured around three plenary sessions (introductory, interim and final reporting) and three working group sessions (CWR conservation, LR conservation, and information management). It was attended by 101 participants from 38 European countries and one from the United States of America. Participants included members of the ECPGR *In Situ* and On-farm Conservation Network (Wild Species Conservation in Genetic Reserves and On-farm Conservation Working Groups) and Documentation and Information Network, as well as Consortium and External Advisory Board Members of the EU Framework 7 project, PGR Secure. The workshop was convened in the context of the EC Framework 7 PGR Secure project and was organized and facilitated by the University of Birmingham, United Kingdom (UK), University of Perugia, Italy, Nature Research Centre Lithuania (NRC), and ECPGR. It was hosted by the NRC.

Acknowledgements

The workshop was made possible with funding from the EU Seventh Framework Programme, the ECPGR and with generous in-kind support from the Nature Research Centre, Lithuania.

PGR Secure is a collaborative project funded under the EU Seventh Framework Programme, THEME KBBE.2010.1.1-03, 'Characterization of biodiversity resources for wild crop relatives to improve crops by breeding', Grant agreement no. 266394.

Front cover image

Workshop participants; photo courtesy of Pavol Hauptvogel.

1.0 INTRODUCTION

1.1 Workshop context

The goal of agrobiodiversity conservation, unlike other forms of conservation, is not only the conservation of species and intra-specific genetic diversity related to agriculture, but also to promote its sustainable use in facilitating agricultural production (Frankel and Bennett, 1970). Although significant progress has been made in the conservation and management of PGRFA globally and in Europe, there remain two critical areas where progress has been limited: (a) the use of conserved agrobiodiversity by breeders and (b) the systematic conservation of crop wild relative (CWR) and landrace (LR) diversity (Hawkes *et al*., 2000). Specifically for breeders and CWR / LR diversity conservationists, the *status quo* is no longer an option as human-induced climate change is threatening the maintenance of the very diversity breeders require to mitigate the adverse impact of climate change. Conventionally, breeders have used their own lines and stocks to generate novel crop varieties, but these materials are relatively genetically uniform and there is now increased recognition that CWR and LR offer the breadth of genetic diversity required by breeders to meet the novel challenges of climate change and rapidly changing consumer demands.

The EC-funded project, PGR Secure (full title: 'Novel characterization of crop wild relative and landrace resources as a basis for improved crop breeding' – www.pgrsecure.org) was initiated by the European Cooperative Programme for Plant Genetic Resources (ECPGR) *In Situ* and On-Farm Conservation Network to research novel characterization techniques and conservation strategies for European CWR and LR diversity, and further, to enhance crop improvement by breeders as a means of underpinning European food security in the face of climate change. To achieve these goals PGR Secure has four research themes:

1. Investigation of novel characterization techniques, including: (1a) Genomics, phenotyping and metabolomics, (1b) Transcriptomics, (1c) Focused Identification of Germplasm Strategy.

2. CWR and LR conservation, including: (2a) Europe-wide CWR inventory, (2b) Exemplar national CWR inventories, (2c) European CWR strategy, (2d) Europe-wide LR inventory, (2e) Exemplar national LR inventories, (2f) European LR strategy.

3. Facilitating breeders' CWR and LR use, including: (3a) Identifying breeders' needs, (3b) Meeting breeders' needs, (3c) Integration of conservation and user communities, (3d) Pre-breeding—channelling potential interesting germplasm into commercial breeding programmes.

4. Informatics development, including: (4a) CWR and LR inventory information web availability, (4b) Novel characterization information web availability, (4c) Inter-information system operability.

The research requires the integration and collaboration of European policy, conservation and breeding sectors and the products will be disseminated Europe-wide to all appropriate stakeholders. The project involves 42 European countries, as well as both large and smaller European plant breeding companies and is coordinated by the University of Birmingham in the UK.

1.2 Workshop objectives

One of the goals of PGR Secure is to assist PGR National Programmes to generate and implement conservation strategies for national CWR and LR diversity. This workshop was convened to discuss and agree a strategic approach to European and national CWR and LR conservation that will result in systematic conservation of these important resources. To achieve this goal, the following subjects were covered:

- Revision / modification of already existing national CWR inventories (e.g., previously generated by the FP5 funded PGR Forum project)
- Creation of new national CWR and LR inventories where necessary
- Baseline threat assessment of CWR / LR extinction / genetic erosion
- CWR / LR diversity prioritization and *in situ* and *ex situ* gap analysis
- Creation / collation of desirable additional national data sets (e.g., distribution, threat status, use potential)
- Data quality and data standards
- Use of national CWR and LR inventories
- Traditional and novel characterization of CWR / LR diversity
- Development and implementation of national CWR / LR conservation strategies by the ECPGR Network members.

With focus on National Focal Points, the objectives of the workshop were:

- To provide training and guidance on the creation and updating of the national CWR and LR inventories.
- To make progress on the mechanisms to upload CWR and LR data onto EURISCO.

1.3 Report content

This report provides summaries of the presentations given at the workshop and of the discussion sessions. Key issues and outcomes of the discussions are highlighted. The presentation summaries in the plenary and CWR sessions were contributed by the presenters and the working group reports and discussion summaries were collated by S. Kell and H. Fielder. In the LR sessions, the presentation summaries, working group reports and discussion summaries were prepared by V. Negri and R. Torricelli. The content of the CWR and LR sessions was circulated to the presenters for comments. The presentation summaries in the information management sessions were summarized by L. Maggioni and the working group reports and discussion summaries were collated by S. Kell and H. Fielder. The content of the presentation summaries provided by the contributors has not been altered by the report compilers, apart from some minor editing. All presentations given at the workshop are available for consultation at: www.pgrsecure.org/palanga_presentations.

2.0 PLENARY SESSION 1

2.1 Welcome and opening of the workshop

Ehsan Dulloo, session Chair and Nigel Maxted, Chair of the ECPGR *In Situ* and On-Farm Conservation Network and PGR Secure project coordinator welcomed the participants to the workshop. Shelagh Kell provided an overview of the workshop objectives and work plan, as well as noting apologies from participants unable to attend.

2.2 Workshop context and overview

2.2.1 PGR Secure: project context and overview

Presented by Nigel Maxted

The presentation covered the PGR Secure policy background, 'horizon scanning' for medium and longer term priorities by the ECPGR *In Situ* and On-farm Conservation Network, the PGR Forum (www.pgrforum.org) and AEGRO ('An Integrated European *In Situ* Management Work plan: Implementing Genetic Reserves and On-Farm Concepts' – http://aegro.jki.bund.de/aegro/) projects, plus an overview of the PGR Secure project. The need for concerted international action on CWR and LR conservation (and use) is spelt out in the FAO Global Plan of Action for the Conservation and Sustainable Utilization of PGRFA (GPA) (FAO, 1996), Global Strategy for Plant Conservation (GSPC) (CBD, 2000, 2010a), International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (FAO, 2001), Draft Global Strategy for CWR Conservation and Use (Heywood *et al.*, 2007, 2008), European Strategy for Plant Conservation (ESPC) (Planta Europa, 2008) and CBD Strategic Plan for Biodiversity 2011–2020 (CBD, 2010b). The results of the 'horizon scanning' for medium and longer term priorities identified by members of AEGRO partners / ECPGR *In Situ* and On-farm Conservation Network members were as follows.

Short-term priorities

- Systematic CWR genetic reserves (national and European);
- Integrate *in situ* CWR conservation into on-farm initiatives;
- Genetic gap analysis to aid national CWR action plans;
- Legislative protection for CWR species and genetic diversity;
- Promotion of conservationist/breeder links for CWR and for LR;
- Production of national LR inventories;
- Generation and implementation of national LR conservation strategies.

Long-term priorities

- Establishment of a European network of CWR genetic reserves (via Natura 2000 network?);
- Systematic IUCN Red Listing of European CWR species / genetic diversity threat assessment;
- Promotion of more participatory management and monitoring models;

- Focus national CWR inventories and prioritization to address breeders' demands;
- Improved European and national legislation to promote LR on-farm conservation;
- Research unique value of crop diversity held in European home gardens;
- Establish European on-farm inventory of LR, former breeders' varieties and farm-saved seeds;
- Develop participatory LR management and monitoring models;
- Promote biodiversity friendly agriculture systems.

The aims and products of the FP5 project, PGR Forum (www.pgrforum.org)—a European forum to debate methodologies associated with the conservation of CWR, with a focus on *in situ* conservation—were reviewed, as were those of the EC AGRIGENRES project AEGRO (http://aegro.jki.bund.de/aegro). Products of the latter project included gene pool *in* / *ex situ* conservation strategies for *Avena*, *Beta* and *Brassica*, CWRIS-PLIS (Population Level Information System) to combine and harmonize data and facilitate querying, and the production of an efficient strategy to establish LR conservation areas in EU member states. The AEGRO project culminated in the joint AEGRO / ECPGR *In Situ* and On-farm Conservation Network symposium, 'Towards the establishment of genetic reserves for crop wild relatives and landraces in Europe', which was held at the University of Madeira, Funchal, 13–16 September 2010. The proceedings have been published by CABI (see Maxted *et al*., 2012).

Finally, the FP7 PGR Secure project, which involves 11 partners and commenced in March 2011 for 3.5 years, was introduced. The aim of the project is to research novel characterization techniques and conservation strategies for European CWR and LR diversity, and further to enhance crop improvement by breeders. The research approach is: 1. Novel characterization techniques, including: (1a) Genomics, phenotyping and metabolomics, (1b) Transcriptomics, (1c) Focused Identification of Germplasm Strategy; 2. CWR and LR conservation, including: (2a) Europe-wide CWR inventory, (2b) Exemplar national CWR inventories, (2c) European CWR strategy, (2d) Europe-wide LR inventory, (2e) Exemplar national LR inventories, (2f) European LR strategy; 3. Facilitating breeders' CWR and LR use, including: (3a) Identifying breeders' needs, (3b) Meeting breeders' needs, (3c) Integration of conservation and user communities, (3d) Pre-breeding – channelling potential interesting germplasm into commercial breeding programmes; and 4. Informatics development, including: (4a) CWR and LR inventory information web availability, (4b) Novel characterization information web availability, (4c) Inter-information system operability. The project was initiated by the ECPGR *In Situ* and On-Farm Conservation Network and will involve 42 European countries, as well as both large and smaller European plant breeding companies.

2.2.2 Developing a European CWR conservation strategy

Presented by Shelagh Kell

In this presentation, CWR were defined, the numbers of CWR reviewed and a European strategy for their conservation outlined.

Definition of a CWR

A CWR can be defined as "a wild plant taxon that has an indirect use derived from its relatively close genetic relationship to a crop; this relationship is defined in terms of the CWR belonging to gene pools 1 or 2, or taxon groups 1 to 4 of the crop" (Maxted *et al*., 2006). This definition essentially means that broadly speaking, all taxa within the same genus as a crop—or within closely related genera in the case of some crop gene pools (e.g., *Aegilops* in the wheat gene pool)—can be considered as CWR. Crops can include food, fodder and forage, medicinal plants and condiments, ornamental and forestry species, and industrial crops (e.g., oils and fibres).

Numbers of CWR

Maxted and Kell (2009) estimated that there are >58,000 CWR globally, while in Europe, >15,000 species are native and >8000 are endemic (Kell *et al*., 2008). In Lithuania alone (where this workshop is hosted), there are >1000 native CWR species. These figures illustrate the point that if we consider a wide range of crop types and a broad definition of a CWR, we are dealing with a very large number of species. How is it possible to conserve them?

A systematic approach to conserving Europe's CWR diversity

Measures need to be put in place for the systematic conservation of priority CWR *in situ* (within and outside protected areas (PAs)) and *ex situ* (in gene banks). We can achieve these using two broad approaches:

- Floristic – conservation of the CWR flora of a defined geographical region (usually a country)
- Monographic – conservation of a defined taxon or taxonomic group (e.g., a species or a crop gene pool)

Both approaches conclude with CWR diversity being actively conserved *in situ* in genetic reserves and *ex situ* in gene banks.

A combination of both approaches is needed to systematically conserve Europe's CWR diversity. Using the floristic approach, we need to develop and implement national CWR conservation strategies and taking the monographic approach, we need to develop and implement a regional strategy for high priority crop gene pools. By doing so, we will ensure that the highest priority CWR across the region are actively conserved.

National CWR conservation strategies

Taking a floristic approach, the national CWR conservation strategy begins with the production of the national CWR inventory (or checklist[1]) (data extracted from the CWR Catalogue for Europe and the Mediterranean can be used as the basis[2]). Priority (target) taxa are then selected from the checklist on the basis of a range of criteria, but most importantly, the two criteria: 1) utilization potential (economic importance of the crop and degree of relatedness of the CWR to the crop), 2) threat status. Diversity and gap analysis is then carried out for the target taxa to identify conservation priorities, a conservation management plan is drawn up, and this is translated into complementary (*in situ* and *ex situ*) conservation action. In a national CWR conservation strategy, the objective is to maximize the conservation of the taxonomic and genetic diversity of the country's CWR flora. Diversity and gap analysis leads to the identification of complementary priority conservation actions, genetic reserves are established within existing national PAs (or new reserves established if necessary), and germplasm is collected for conservation in *ex situ* collections. National CWR conservation strategies have been developed in a number of European countries, including the UK, Ireland, Portugal, Switzerland and Germany. Within the context of PGR Secure, they are being developed in Finland, Spain and Italy and the draft UK strategy is being developed further and incorporated into national plant genetic resources (PGR) conservation planning.

Priority gene pool conservation strategy

The first step in the development of a priority gene pool conservation strategy is to select the priority crops. Priorities are likely to be food crops (which are important for nutrition and food security), crops of high economic value, and crops with multiple use values. In Europe, priority crop gene pools have been identified on the basis of the first two criteria. There are 185 genera containing human food crops encompassing 5995 species native to Europe. Out of these taxa, there are 19 priority crop genera containing highly economically important crops in Europe, within which there are 279 species native to the region. In addition, there are a further 19 crop genera listed in Annex I of the ITPGRFA containing 207 species native to Europe. Combining these two crop genus sources results in 23 priority crops or crop groups, comprising 486 CWR species native to Europe.

Having identified the priority crop gene pools, conservation strategies for the individual gene pools can be developed following five basic steps:

1. Delineate gene pool taxa (list taxa in the gene pool and those in the target area);
2. Select target taxa on the basis of utilization potential (degree of relatedness to the crop/known utilization potential) and relative threat status;
3. Undertake diversity analysis (geographic information system (GIS) analysis, genetic diversity analysis, complementarity analysis);
4. Select target sites (using gap analysis, climate change analysis and on the basis of site suitability);

[1] Following discussions during the workshop, it was decided that the term 'checklist' is more suitable than 'inventory' in this context.

[2] National CWR checklists extracted from the CWR Catalogue for Europe and the Mediterranean are included in the memory sticks issued to all workshop participants.

5. Identify complementary *ex situ* conservation needs;

6. Develop strategy document and lobby for conservation action.

In a priority gene pool conservation strategy, the objective is to maximize the conservation of the genetic diversity of the gene pool. Diversity and gap analysis leads to identification of complementary priority conservation actions, genetic reserves are established within existing PAs (or new reserves established if necessary), and germplasm is collected for conservation in *ex situ* collections. In Europe, gene pool conservation strategies have been developed for the oat, beet and brassica gene pools. Further priority gene pool conservation strategies will be developed in the context of the PGR Secure project.

European CWR conservation strategy: general considerations

- Aim to conserve maximum genetic diversity within and between populations of target taxa – choose sites that are most likely to represent this diversity based on results of the diversity analysis.

- Widespread taxa should not be ignored; for example, *B. vulgaris* subsp. *maritima* is widespread but has traits linked to specific locations.

- Select sites within existing PAs where possible – however, a balance will have to be met between ecogeographic suitability of sites and feasibility.

- Establish multi-taxon reserves where possible.

- Prioritize the selected sites on the basis of conservation of maximum genetic and/or taxonomic diversity.

- Other factors to consider include land use, potential development pressures, level and quality of site management, legal status, potential conflict with existing site management aims and climate change.

From planning to practice

We have the knowledge to develop conservation strategy plans for priority CWR taxa. However, the practicalities of translating plans into practice are less straightforward. One product of the EC-funded AEGRO project (http://aegro.jki.bund.de/aegro/) was the publication of draft quality standards for the conservation of CWR taxa in genetic reserves that include criteria for the establishment of genetic reserves and management considerations to optimize genetic reserve efficacy (see Iriondo *et al*., 2012). The quality standards are a tool for practitioners involved in the design of CWR *in situ* conservation strategies, but also for protected area (PA) managers interested in the *in situ* conservation of CWR. They may be implemented in the last stage of the process of selecting the locations of a network of genetic reserves (national, regional and global approaches) when multiple alternatives exist according to primary selection criteria (such as genetic diversity complementarity in single-species gene pool approaches or species richness in multi-species gene pool approaches). As the establishment of genetic reserves involves the implementation of active management including demographic and genetic monitoring of the populations, the generation of a set of quality standards for genetic reserve conservation of CWR aims to ensure that conservation efforts are carried out following the most logical and efficient procedures that positively contribute to achieving the objectives. The conservation resources invested in the establishment of the genetic reserves are then

more likely to have long-term sustainability. The adoption of standards of good practices relies on the hypothesis that the projects or programmes that are executed this way achieve more rigour in the process of decision-making, and more efficiency in the use of resources and in pursuing the objective of conservation (CMP, 2007; O'Neill, 2007).

The quality standards are a step in the right direction; however, there are a number of other issues that need to be addressed when putting the CWR conservation strategy into practice, including:

- How to conserve CWR populations outside of PAs?
- Raising awareness of the importance of CWR and lobbying for action.
- Assigning responsibility for CWR conservation – CWR often fall between the remit of environmental and agricultural agencies and thus are ignored in conservation planning.
- Resources for monitoring and managing CWR populations.
- Coordinating the national and regional strategies.

Conclusions

- We have a working definition of a CWR and we know that there are many CWR species so we need to prioritize conservation action.
- A combined floristic and monographic approach is needed to conserve priority European CWR taxa.
- Data analysis techniques are available to identify priority CWR populations.
- We need to lobby for action to establish CWR genetic reserves.
- Increased efforts are needed to collect and conserve germplasm *ex situ.*

2.2.3 Developing a European LR conservation strategy

Presented by Valeria Negri

It was initially noted that PGR Secure and ECPGR On-farm Working Group aims are overlapping on the topic, a sketch of current on-farm conservation was given and the issues to be considered in drawing a European conservation strategy for LR were reviewed. Then delegates were informed on the specific issues that will be tackled by the PGR Secure project; namely the compilation of Europe-wide and national LR inventories, the drafting of exemplar national conservation strategies (for Finland, Italy and United Kingdom), of a priority (e.g., *Avena, Beta, Brassica* and *Medicago* spp.) European gene pool conservation strategy, and in the end of a systematic European LR conservation strategy. The latter should identify the management interventions that improve the *in situ* (on-farm) and *ex situ* (in gene banks) conservation of LR diversity. She concluded that all these aims could only be fulfilled involving all of the European plant genetic resource community and then the delegates were to be considered as collaborators in PGR Secure.

It was noted by several delegates that PGR Secure is not providing funds to compile NIs of LR. V. Negri answered that this was a problem that could not be answered by the PGR Secure in full, due to budgetary limitations; however PGR Secure was at least able to invite the national delegates to this

workshop with the aim to provide them with the basic tools to carry out the job in their own country. On the other hand, the international frame of agreements and of legally binding documents put the responsibility of conserving genetic resource for the benefit of the present and future generations with each single state. It is then each single state task to activate the needed resources for National Inventory (NI) projects and/or set appropriate lobbying strategies to elicit dedicated funding from the European Union and international bodies.

Later on, after having recalled that the general aim of the workshop is to provide background information and training in national LR inventory and LR conservation strategy development, V. Negri presented the specific topics to be covered and discussed in the group 2 session:

- What LR are and on-farm conservation
- Building up of national LR inventories:
  - Available tools and information
  - Data to be collected and how
  - Making data available
- Characterization of LR diversity
- Baseline assessment of LR extinction / genetic erosion threat
- Use of the national LR inventory
- LR safeguard and use
  - LR markets
  - Linking local LR
    - to local community use and
    - to breeders use
- Production of national LR conservation strategies
- National implementation of agreed workshop targets by national delegates.

2.2.4 PGR Secure helpdesk

Nigel Maxted noted that although funding is not available in the PGR Secure project for all European countries to develop CWR and LR conservation strategy plans, PGR Secure will provide a helpdesk facility which can be consulted online or help can be sought via the Project Manager through direct email/phone contact. The helpdesk is available via the project website at www.pgrsecure.org. To help guide the construction of the CWR conservation strategy planning helpdesk, a questionnaire was included on the memory sticks provided to each participant (also available online at www.pgrsecure.bham.ac.uk/sites/default/files/helpdesk_requirements_questionnaire.doc).
Participants in the CWR conservation session were asked to complete the questionnaire and return it either during or soon after the workshop.

2.2.5 European *in situ* information management – vision and options

Presented by Theo van Hintum on behalf of Siegfried Harrer

Introduction

Knowledge about where PGRFA are stored *ex situ* or where they can be found in their natural environment (*in situ*/on-farm) is one of the major preconditions for the use of PGRFA. The importance of proper documentation is also reflected by the international legal framework in which PGRFA conservation operates. There are several international agreements (e.g., the Convention on Biological Diversity and the ITPGRFA) as well as European legislations and regulations affecting conservation and use of PGRFA.

Any national or regional information system for PGRFA managed *in situ*/on-farm will have to take into account the aforementioned international policy framework, especially with regard to its scope and to the quantity and quality of the data. Therefore, a close collaboration between countries seems necessary to ensure a coherent development of any such vision for a coherent European *in situ* information management.

The pan-European platform for collaboration on PGRFA is the ECPGR. ECPGR aims at facilitating the long-term conservation and the increased utilization of plant genetic resources on a cooperative basis in Europe. ECPGR operates through broadly focused networks dealing with groups of crops or general themes related to plant genetic resources, such as the '*In situ* and On-farm Conservation Network' and the 'Documentation and Information Network'. The main information infrastructural element of the ECPGR is the EURISCO web-based catalogue (http://eurisco.ecpgr.org/), currently with a clear focus on PGRFA managed *ex situ*. However, the need to also include both *in situ* CWR populations and on-farm managed LR in the activities is recognized widely.

Current state of European* ex situ *documentation

At present, the web-based catalogue EURISCO provides information about nearly 1.1 million accessions of crop diversity conserved *ex situ* in 42 European countries. Since its launch in 2003, EURISCO has emerged as the most prominent element in the European *ex situ* information landscape. It can only play that role thanks to the well-developed PGRFA documentation systems at the institutional and national levels and their strictly organized interaction. One of the main elements for the success of EURISCO is its transparent approach with clear responsibilities at the national and European level and standards for data exchange (EURISCO Descriptor List, based on the FAO/IPGRI Multi-crop Passport Descriptors – MCPD). The organizations in a country maintaining PGRFA provide the National Focal Point (NFP[3]) with their data using these standards for data exchange. The individual data sets form the NIs, which are then sent through the NFP to EURISCO. Such a bottom-up approach allows for a sufficient control of the content and quality of the data at the respective levels: while the data provider at the institutional level will have full control and responsibility for the quality of their data, the NFP will have the responsibility to compile in the NI only data on accessions being part of the national PGRFA system. Only these data will then be transferred by the NFP to EURISCO.

[3] Since the workshop, ECPGR has re-designated National Focal Points (NFPs) as National Inventory Focal Points (NIFPs).

Recent activities in the* in situ*/on-farm domain

European countries have already nominated through their National ECPGR Coordinators 32 *in situ* and 34 on-farm NFPs. They have the responsibility to compile *in situ*/on-farm data for the respective NI, although in most of the cases activities have not yet started. The compilation of NIs includes especially the decision on which LR and which *in situ* occurrences of PGRFA in a specific country shall be included as well as the competence to officially report this kind of information to others (e.g., to European documentation systems such as EURISCO).

In 2007 a draft minimum descriptor list for the documentation of on-farm conservation and management activities was developed and discussed by the ECPGR On-farm Conservation and Management Task Force. The purpose of these descriptors is to gather information on LR that is being collected from farmers' fields and to build up a knowledge base. There are 38 descriptors specially developed to describe the LR as well as the management system (e.g., cropping system, harvest methods, seed processing and storage) and socio-cultural, historical as well as traditional uses.

In the EU-funded PGR Forum project (European Crop Wild Relative Diversity Assessment and Conservation Forum, 2002–2005) (www.pgrforum.org), partners from 21 countries developed a methodological concept for the management of CWR data—the Crop Wild Relative Information System (CWRIS – www.pgrforum.org/cwris.htm)—with particular emphasis on site and population data. Within the AEGRO project (2007–2011) (http://aegro.jki.bund.de/aegro/) CWRIS was further extended by four independent modules for *Avena, Beta, Brassica* and *Prunus*, collectively called 'Population Level Information System – PLIS', allowing the search for occurrences of a specific species. On the global level a project on '*In situ* conservation of CWR' jointly funded by the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF) resulted in the establishment of a few non-European CWR NIs, based on descriptors developed specially for CWR.

The vision and how to achieve it

Taking into account the experience made during the establishment of EURISCO, as well as the recent achievements in the *in situ*/on-farm domain, it should be feasible to use EURISCO and its approach for *in situ* and on-farm data as well (see Figure 1). Some prerequisites have been met already: the ECPGR *In situ* and On-farm Conservation Network has the knowledge on the specific needs for documentation in this domain, while the ECPGR Documentation and Information Network provides experience in documentation issues and the link to the national/institutional level in each country through the network of NFPs.

Some data standards for exchange of *in situ*/on-farm data are already available, but there is a strong need for further development, harmonization and acceptance by the community. As mentioned above, a few regional information systems are already available but they lack comprehensive *in situ*/on-farm data at occurrence level, with the exception of a few countries. The EURISCO system seems to be suitable to be adapted/expanded for *in situ*/on-farm occurrence level data. It is therefore recommended:

- To develop and agree on one standard for exchange of *in situ* and on-farm data. A draft could be developed by ECPGR (both networks) involving other relevant institutions; final agreement should be sought among ECPGR, Bioversity and FAO;

- To develop NIs for *in situ*/on-farm by organizing the required support for NFPs to create such NIs; compiling data and creating incentives for data suppliers; creating the interface for data exchange from NIs to EURISCO, according to agreed standards;
- To provide capacity building and training (through ECPGR and its networks).

Once the above requirements are met, it is also recommended:

- To expand the data structure of EURISCO for inclusion of *in situ*/on-farm data into EURISCO;
- To develop a data transfer mechanism from NIs to EURISCO (jointly by Bioversity on behalf of ECPGR and the network of the NFPs).

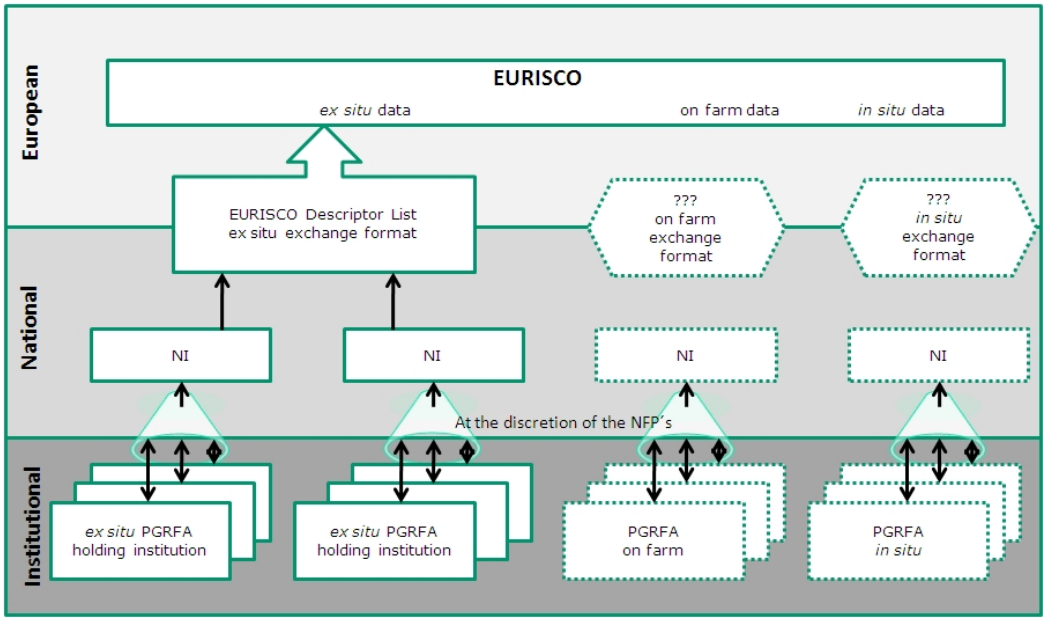

Figure 1. Vision of a future European documentation landscape for *ex situ*, *in situ* and on-farm PGRFA information

2.2.6 Development of a European information system for CWR and LR conservation and use data and implementation of the Trait Information Portal

Presented by Sónia Dias

The presentation gave an overview of the objectives of PGR Secure Work Package (WP) 2, 'Informatics', outlining the purpose, objectives, sources of information, activities undertaken and way forward with ontologies and schema concepts for the Trait Information Portal (TIP) development.

With the objective in mind to produce a web-based CWR and LR TIP, a user's survey has been carried out and the results presented. These form a baseline understanding of what users are looking for, in terms of data and content, informing us what are the questions users would like to have answers for. Another important feature of the survey was to assess the services that the TIP should include: download data, data quality checking tools, mapping and analysis tools and facility for uploading data.
For the purpose of the TIP the way forward is to make use of ontologies using in the project a 'Triontology' (i.e., CWR, LR and crop-trait ontologies). The goal is to develop a controlled vocabulary (ontology) that describes the crops, themes, traits, anatomical and morphological structures and growth and developmental stages, etc; to establish a semantic framework for meaningful cross-species

queries across crops, inventories and traits (genotype and phenotype datasets); and describe crops, CWR and LR structures and entities and the relationships among them.

For this, the curation tool (and also an annotation tool) developed by the Generation Challenge Programme (GCP), Bioversity team, would be a well developed and mature tool to be up take by the project and for the TIP. The demo demonstrated the worthiness in using these tools to start with. Based on the already existing resources (curation tool, annotation tool, CWR descriptors, LR descriptors, CWR ontology, Trait ontology, *ex situ* platform, etc), the PGR Secure crop ontologies groups for *Avena, Brassica, Beta* and *Medicago*, CWR, LR needs to be established and links made to the trait ontology. Based on the above what was proposed is a simple schema for the TIP: based on a mongo, goggle database; an upload system with customized driven template options; use the annotation and curation tool for the ontologies; create data views for the search at the different ontologies, linking with external sources of information and web-enable these for users.

The proposed concept it includes three different entry points, allowing for users to choose their door to the information (Trait, CWR or LR information), while keeping the capacity to link or tap into existing online sources of information such as GENESYS, EURISCO, European Central Crop Database (ECCDBs), etc.

This concept has been thought to allow a system that firstly serves the data provider, so it can efficiently serve the users.

To achieve all the above, the following questions will have to be addressed for planning the long term (especially after the project end) sustainability of the tool: 1) Who will be hosting the TIP? 2) How do you see the links? Are they just redirecting the users to other sources or are the links providing direct access to further information? 3) Is the proposed concept what you looking for? 4) What features besides the ones indicated would be needed (take into account the data types provided)? 5) Which data types should be downloadable and in which formats? 6) What data sources are missing? 7) What kind of access to analytical tools is needed?

It was also sought from the project WP (with whom dependencies exist) an understanding on: Data types to be used? Features envisaged? Meaning and relation of the links? Hosting of the TIP? TIP general concept endorsed; Ontology groups established (circulation of a registration form) and Feedback and guidance on the TIP to the development team (Bioversity International).

2.2.7 Understanding user community needs

Presented by Gert Poulsen

The CWR and LR stored in the gene bank collections are not utilized optimally. The object of PGR Secure WP5 is to investigate the reasons for this. Most germplasm used for developing new varieties comes from existing commercial varieties, though there are also long lists of good stories about use of CWR for introducing traits.

The overall goal of this WP is to promote the access and use of CWR and LR in Europe by two approaches:

1. To analyse the relationships between the four CWR/LR stakeholders in three regions of Europe (northern, central and southern) via a questionnaire–based strengths, weaknesses, opportunities and threats (SWOT) analysis and identify the actions needed.

2. To promote and facilitate the flow of pre-breeding material and accession information gained in this project to the stakeholders concerned.

The first approach is planned to develop through:

a) Establish a network of country key persons;

b) Establish lists of four main stakeholder groups (conservationists, breeders, agro-NGOs, scientists);

c) Interviews with representative stakeholders;

d) Web-based questionnaire to reach more stakeholders;

e) Preliminary SWOT analysis as input to regional and European workshops;

f) Writing final SWOT on regional and European level;

g) Facilitate development of new partnerships through networking.

The analysis will identify constraints for the use of CWR and LR, and who decides on the use of germplasm in breeding programs. Based on the results routes for increased use of CWR and LR will be proposed.

The Second approach aims at promoting the flow of pre-breeding material.

The task applies two independent routes to transfer germplasm into commercial breeding. The first fundamental pre-breeding route applies material created in WP1 where CWR *Brassica* germplasm with resistance to cabbage whitefly and cabbage aphid are transferred to breeders. Later, molecular markers linked to resistances will be transferred to the breeders.

The second applied pre-breeding route, screens *Avena* and *Beta* international crop data bases for agronomical interesting traits (*Beta*: resistance to BNYVV, *Rhizoctonia*, etc.; *Avena*: resistance to *Fusarium*, cold tolerance, etc.). The identified accessions will be available for the users.

The participants of WP5 are Chris Kik (coordinator) from Centre for Genetic Resources, the Netherlands, Lothar Frese and Gisela Neuhaus from Julius Kühn Institute, Germany and Gert Poulsen from The Nordic Genetic Resource Centre, Sweden

2.2.8 Using the FAO Agrobiodiversity Toolkit

Presented by Joana Magos Brehm

The FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) commissioned the preparation of a Toolkit for National Strategy Development of PGRFA that will aid countries to formulate National Strategies for the conservation of CWR and LR. A brief overview of this toolkit, that is currently being developed, was given in this presentation including its characteristics, structure, and its potential users. A request for reviewing and providing additional materials was also made to all the workshop participants. To facilitate this, a questionnaire was provided to the participants on the workshop memory sticks (also available online at www.pgrsecure.bham.ac.uk/sites/default/files/toolkit_questionnaire.doc). The draft Toolkit is available to download from http://pgrsecure.org/palanga_workshop (MS Word and pdf versions).

2.2.9 Plenary session 1: discussion summary

Crop wild relative issues

- **Data availability and quality** – Access to information on the locations of CWR populations is sometimes lacking. For example, in Denmark, conservationists are still working on gathering these data; therefore, it may be necessary to delay undertaking the diversity analysis and develop a national CWR conservation strategy until such datasets are available.

- **Overlap between floristic and monographic approaches** – The monographic approach to CWR conservation strategy planning can apply at global, regional and national level. Therefore, a national CWR conservation strategy might involve both a general floristic approach as well as a monographic approach to undertake more detailed studies on particular high priority crop gene pools. However, this depends on the richness of the national CWR flora—many European countries do not contain a large number of species in a single crop gene pool; therefore, a regional approach to crop gene pool conservation planning is advisable.

- **The number of priority CWR species per country cannot be prescribed** – Due to differences in CWR species richness between European countries, the number and percentage of national priority species cannot be prescribed and will vary from one country to another.

- **A reduced list of target taxa may be needed to attract conservation funding** – The list of priority CWR species identified in the national CWR conservation strategy plan may need to be reduced to a minimal number when applying for funding to enact conservation. Therefore, a second level of prioritization may be needed.

- **Diversity analysis of all priority species may not be feasible** – If resources are not available to undertake diversity for all priority CWR species, how do we decide which ones to select for the analysis? The choice depends on the available time and resources—species can be selected to act as examples for future studies.

- **Flagship CWR of Europe** – The idea of identifying a number of flagship European CWR species was mooted. The European Red List of Vascular Plants (http://ec.europa.eu/environment/nature/conservation/species/redlist/) which includes a 591 CWR species could be used as the basis for selection.

- **Bridging the gap between the agricultural and environmental conservation communities** – It is widely acknowledged that CWR are neglected in conservation planning as they are neither seen as the responsibility of the agricultural conservation community (whose focus tends to be on crop plants), nor the environmental conservation community (whose focus is on PA and rare or threatened species conservation). This issue resonates in several European countries. For example, in Sweden, it was reported that efforts have been made to bridge this gap for several years. The Environmental Protection Agency in Sweden has been approached to try to get them on board by emphasizing the importance of CWR for crop breeding; however, breeding is not the focus of the nature conservation community so this justification is not attractive to them. Likewise in England, the government agency responsible for nature conservation (Natural England) has been lobbied for several years to include CWR in national conservation planning. A CWR conservation strategy plan was produced by the University of Birmingham some years ago and Natural England were approached in the hope that they would take steps to implement the strategy, but at that time PGRFA were not considered a priority. A dialogue has continued over the years and this recently

culminated in the publication of a report by Natural England in collaboration with the University of Birmingham (see Hopkins and Maxted, 2010) which reviews PGRFA resources in the UK, their use in crop breeding, measures in place to conserve them and what needs to be done to secure CWR genetic diversity in the future. Thus the 'gap' has at least partially been bridged in the UK and this was achieved by involving the relevant agency as a stakeholder in the work. The responsible person at Natural England is now co-supervisor of a PhD linked to PGR Secure to develop a CWR conservation strategy for England and through contacts with the relevant bodies in Scotland, Wales and Northern Ireland, it is intended that the strategy will be extended to those countries.

This issue is also pertinent in Finland; however, contact has been made by MTT (Agrifood Research Finland) with the Environment Agency and their response was positive. It was also noted that in some countries, including Germany, there are conflicts of interest between ministries and it was suggested that perhaps the PGRFA community needs to consider what resources it can bring to the nature conservation community.

It was also noted that in the UK, PAs are funded by the government but as there are limited funds, PA managers need to be able to promote the site to attract additional funding. One way of doing this is to highlight the role of the PA in food security through the conservation of wild PGRFA. Further, as components of natural/semi-natural habitats, CWR provide important ecosystem services; therefore, highlighting this additional value of CWR provides further justification for their conservation in PAs.

Landrace issues

- **Gaining support for landrace conservation** – LR are in critical need of conservation attention as they are dwindling rapidly. A considerable amount of work has already been achieved across Europe. In the UK, some work has been carried out and funding is currently being sought to continue with a more comprehensive LR conservation strategy. It was also noted that in the UK, the main actors in LR conservation have been lobbying the government for eight years to prepare a LR NI. The importance of getting involved in discussions at policy level was highlighted, as well as the critical need for 'buy-in' to National Programmes at a very early stage. In this context, it was noted that farmers' material is specifically mentioned in the Nagoya Protocol (see http://www.cbd.int/abs/about/).

- ***Ex situ* landrace conservation** – LR cannot be effectively conserved only *ex situ* as only a snapshot of genetic diversity is conserved—it is the continued maintenance of LR populations *in situ* (on-farm and in garden) that is important to conserve adaptive traits. However, backup in *ex situ* collections is important in case of crop loss as the material can be repatriated to the farmer. It was noted that local seed systems are likely to fail some farmers due to the impacts of climate change and that they will therefore increasingly rely on sourcing material from gene banks. The 'Seeds for Needs' project (http://www.bioversityinternational.org/announcements/seeds_for_needs.html) was highlighted in this context. In this project, researchers are using data from germplasm collections and GIS to identify accessions which are already likely to be adapted to future growing conditions areas with similar environmental profiles. The pre-selected varieties are then tested by farmers, drawing on their own experience, indigenous knowledge and adaptation strategies. The pre-selected varieties are then matched with places where they are likely to continue to produce good yields under predicted future conditions. After testing, the best performing and most adaptable varieties are distributed to farming communities for multiplication with the help of local agribusinesses.

- **Threats to landraces** – The main threat to LR in Europe is the aging maintainer community. Also, changes of land use (e.g., from agriculture to industrial development) and LR replacement by modern cultivars. However, there are different threats in different countries.

Trait Information Portal

- **Scope of the TIP** – CWR, LR and traits, but the final scope still needs to be clearly defined by the users. It was suggested that the name 'TIP' may be misleading. It was explained that the concept came from the needs of breeders to find out where they can obtain specific traits. However, the intention is to create a flexible system.

- **Linkages with other information systems** – How is the TIP different to what is being done in GENESYS (www.genesys-pgr.org/)? We do not want to duplicate what is being done in other projects; therefore we need to collaborate. It was noted that the TIP will be developed in tandem with GENESYS by Bioversity but that the TIP will include *in situ* and on-farm data, whereas GENESYS is only for *ex situ* data.

- **Ontologies** – Ontologies are under development. The workshop participants were invited to collaborate in their development. A form was passed around for participants to put their name down to be included in discussions.

- **PGR Secure WP5 breeders' survey** – It would be beneficial to look at how we can use the breeders' surveys being carried out by WP5 to inform the conceptualization of the TIP. The results may provide useful additional information to inform the development of the TIP.

Cross-cutting issues

- The importance of targeting the research community as well as breeders was highlighted because while it is generally acknowledged that CWR and LR are important for crop improvement, they are on the whole more difficult to use in breeding programmes than other types of material because of the difficulty of specific trait transfer and linkage drag.

- The need to convince politicians that CWR and LR conservation is of strategic importance—both nationally and internationally—was highlighted. Continuous and steady funding is a major limiting factor.

- The FP7 collaborative project, SOLIBAM (Strategies for Organic and Low-input Integrated Breeding and Management – www.solibam.eu/) was highlighted and it was suggested that a link between PGR Secure and SOLIBAM could be beneficial.

3.0 WORKING GROUP 1: CWR CONSERVATION

3.1 Developing a European CWR conservation strategy

3.1.1 Aim and objectives of the working group 1 session/participant introductions

Nigel Maxted introduced the session, the overall aim of which was to discuss and agree a strategic approach to European and national CWR conservation that will result in their systematic conservation. The specific objectives of the session were to:

- Provide an overview of national CWR strategy planning;
- Review the process of creating CWR NIs, including revision/modification of the NIs generated by the FP5 funded PGR Forum project[4];
- Propose and discuss options for CWR prioritization;
- Provide guidance in undertaking *in situ* and *ex situ* gap analysis, including an introduction to ecogeographic data analysis and options and tools for genetic diversity analysis;
- Give an overview of progress in systematic threat assessment of European CWR and discuss issues arising;
- Review the current state of the art in CWR conservation data management and discuss future needs and development of existing standards;
- Discuss the implementation of national CWR conservation strategies by members of the ECPGR *In Situ* and On-Farm Conservation Network.

All participants in the working group gave brief introductions, outlining their expertise and professional roles, highlighting projects of relevance to the session and indicating how much progress has been made in CWR conservation in their respective countries.

3.1.2 National CWR conservation strategy planning

Presented by Nigel Maxted

Crop wild relatives were introduced and the need for their active conservation was stressed. CWR are taxa directly associated with food security and economic stability. They include the wild progenitors of crops and possess many beneficial traits that can be bred into crops to address changing environmental and market demands. These species are being eroded yet they have been widely neglected by national agencies because agricultural agencies generally have no responsibility for conservation and ecological conservation agencies tend to focus their efforts on habitat or rare and threatened taxa conservation. If each country is to achieve the CBD 2010 target for conservation and use of CWR taxa, there is a need for a complex interdisciplinary approach that outlines what diversity is present, what threatens that diversity and how it might be best conserved for use by future generations. These issues were discussed in relation to UK CWR conservation. Several key topics were

[4] The national CWR inventories extracted from the CWR Catalogue for Europe and the Mediterranean (Kell *et al*., 2005) were sent to the National Coordinators at the end of the PGR Forum project (www.pgrforum.org). These data stes were also provided to all workshop participants on the workshop memory sticks.

addressed: (1) creation of a CWR NI, (2) analysis of the CWR NI content, (3) national patterns of CWR distribution, (4) threat status of CWR diversity, (5) assessment of current conservation actions, (6) identification of priority sites for CWR conservation, and (7) creation of CWR conservation action plans. These steps were used to formulate an effective national conservation strategy for UK CWR diversity. The approach attempts to balance scientific expediency with practical issues based on the UK and other national experience.

3.2 CWR inventories: the backbone for conservation and use

3.2.1 The CWR Catalogue for Europe and the Mediterranean

Presented by Shelagh Kell

In this presentation, the process of creating the CWR Catalogue for Europe and the Mediterranean (CWR Catalogue) (Kell *et al*., 2005) was reviewed, examples of the use of the Catalogue were presented and plans to modify and update the Catalogue were outlined.

The CWR Catalogue was created in the context of the EU-funded PGR Forum project (www.pgrforum.org) in response to the need for baseline data on CWR in Europe. It was created using a systematic approach that can accommodate changes in nomenclature and status and can be applied at both regional and national level in any region. Euro+Med PlantBase (Version January 2006) (www.emplantbase.org) forms its taxonomic core. Euro+Med PlantBase is an online database and information system for the vascular plants of Europe and the Mediterranean region containing names and distribution data (occurrence in countries or sub-national units) from Flora Europaea, the MedChecklist, the Flora of Macaronesia dataset and published Floras from the Euro-Mediterranean region. Specialists from over 50 countries and territories within the region have contributed to the revision of the taxonomic status of all taxa contained in the database. For each taxon, Euro+Med PlantBase records geographical unit of occurrence, status (native, introduced, cultivated, status unknown), and whether record of distribution is known to be complete. Geographic occurrence records are coded P – Present, S – Assumed present, D – Doubt about presence, A – Absent, E – Extinct, F – Recorded as present in error. The data were filtered to select only taxon occurrence records coded P, S or D.

The genus names in the filtered Euro+Med PlantBase data were then matched with a list of crop genus names collated from Mansfeld's World Database of Agricultural and Horticultural Crops (http://mansfeld.ipk-gatersleben.de; Hanelt and IPK Gaterslaben, 2001), Schultze-Motel (1966) ('Enumeration of cultivated forest plant species'), Community Plant Variety Office list of licensed plant varieties in Europe (Kwakkenbos, 2003, pers. comm.) (for ornamentals), and Medicinal and Aromatic Plant Resources of the World (MAPROW) (Shippmann, 2004, pers. comm.). The taxa within the matching genera were then extracted to form the CWR Catalogue. The matching process took account of the different accepted taxonomic classifications of the data sources to ensure that all potential CWR were included.

This process resulted in the inclusion of more than 80% of the flora of the region, which includes both crops and CWR and native and introduced species. Further analysis revealed that around 90% of the taxa are native to the region and 58% are endemic, and that 49% of genera containing crops worldwide are found in the Euro-Mediterranean region. An analysis of the number of major and minor food CWR was also undertaken, as well as an examination of the number of CWR included in the EU Habitats Directive, Important Plant Areas, botanic garden living collections and the IUCN Red List of Threatened

Species (see Kell *et al*., 2008). The CWR Catalogue is available online via the Crop Wild Relative Information System (CWRIS – www.pgrforum.org/cwris/cwris.asp).

The creation of the CWR Catalogue was an important landmark in the conservation of European CWR diversity. By producing the first comprehensive inventory of European CWR, we have been able to publicize the breadth of taxonomic CWR diversity in the region. The CWR Catalogue has also been used to form the basis of CWR NIs, and has the potential to be used to inform conservation planning and integration of CWR with existing conservation initiatives, to provide the backbone for access to conservation and use data, including demographic, genetic and genomic information and to promote use of conserved European CWR diversity by plant breeders, scientists and other user communities.

A revision of the CWR Catalogue will be undertaken during the PGR Secure project. The revised Euro+Med PlantBase data will be used to form the taxonomic core, a modified list of crop genus names will be utilized, records of extinct occurrences will be included (these were previously filtered out), and some refinement to the matching process taking into account synonymy will be implemented.

3.2.2 Creating the national CWR inventory of Ireland

Presented by Heli Fitzgerald

This presentation was to introduce the project that was done in 2005 as a thesis (Regional Red List Assessment and Biodiversity Action Plans for Crop Wild Relatives in Ireland**)** in the University of Birmingham by Heli Fitzgerald.

The aims were to assess regional Red List Categories for Irish CWR using the current IUCN Criteria (IUCN, 2001); to propose priority areas for CWR *in situ* and *ex situ* conservation through gap analysis and to develop biodiversity action plans for Critically Endangered Irish CWR.

First a CWR inventory list for Ireland was created. This included 1207 CWR taxa. Secondly, high-level ecogeographic database for these taxa was compiled. The CWR list was prioritized to 217 taxa by removing: aliens and neophytes, taxa with no data on their distribution and taxa with no distribution in Ireland, critical or apomictic groups, hybrids, common taxa and stable taxa. National Red List assessments were undertaken. It was found that 19 taxa were Critically Endangered, 22 Endangered, 37 Vulnerable, 7 Extinct, 49 Near Threatened and 81 Data Deficient.

The *ex situ* and *in situ* conservation gap analysis was undertaken to determine gaps in the conservation of CWR in Ireland and to give suggestions for the future conservation priorities.

The *ex situ* gap analysis was done by looking at the existing *ex situ* collections in the gene banks and botanic gardens. Twenty-eight CWR species were found to be already in the Irish Threatened Plant Seedbank collections and 34 CWR species already in living collections in Ireland. However, 172 rare CWR taxa were not conserved *ex situ*. Seven of these were already classified Extinct, 13 Critically Endangered, 11 Endangered, 25 Vulnerable and 43 Near Threatened. Recommendations and targets for future collecting were given.

The *in situ* gap analysis was undertaken by using raw distribution data to create overlapping map of all the 220 priority species. Areas were selected by complementarity analysis and iterative selection methods and compared against PA maps to find out whether they overlap. Five most species rich areas were selected that were located in existing conservation areas. Recommendations for the establishment of genetic reserves in these areas were given. Finally, species action plans for the Critically Endangered CWR taxa were prepared.

3.2.3 Group discussion on generating CWR NIs/CWR conservation strategy planning

CWR National Inventories

- **Development of the CWR NI in Portugal** – It was suggested to merge the data extracted from the CWR Catalogue for Europe and the Mediterranean and the inventory developed by Dr. Joana Magos Brehm with the current national Flora. However, Dr. Magos Brehm pointed out that the CWR Catalogue data had already been harmonized with the national Flora when she created the NI.

- **The inclusion of introduced species in CWR NIs** – The issue of whether to include introduced species in a CWR NI was raised. It was suggested that introduced species should not be included in the CWR Catalogue. However, it was also noted that introduced species may contain genes of interest; for example, there is interest in an introduced species of *Medicago* in North America in alfalfa breeding. The date of introduction of the species may be a consideration in national CWR conservation strategy planning. A recently introduced species may not be considered a priority for conservation, while a species introduced a few hundred years ago may warrant inclusion. It also depends on the conservation status of the species outside of the country. It was therefore suggested that it is better to start with an inclusive approach and have the option to filter the inventory rather than taking a narrow approach and missing potentially useful species.

- **The inclusion of forestry species in CWR NIs** – In Spain, it is not considered necessary to include forestry species in the CWR NI because they are already protected by specific national forestry laws and are the object of particular national and regional biodiversity conservation actions. However, the situation in Sweden is different—forestry species are important native resources but the forestry department does not have the information needed to identify wild populations; therefore, the inclusion of forestry data in the CWR NI will be important.

Genetic diversity studies

- **Genetic diversity of *Trifolium repens* in Britain** – In the presentation by Nigel Maxted on national CWR strategy planning, he showed a slide illustrating that in a study of the genetic diversity of *Trifolium repens* in Britain, it was found that there is more genetic diversity within the wild population on the Scottish island of St. Kilda (in an area of c. 10 ha) than there is within and between wild and LR populations throughout the rest of Britain. The question was asked, how is the genetic diversity on the Scottish island of St. Kilda explained? It is thought to be due to the fact that there has been introgression between cultivated and wild populations of *T. repens* on mainland Britain, making the populations more homogeneous, but introgression has not occurred on the island of St. Kilda.

- **Choice of molecular variation to study** – A whole genome approach to genetic diversity studies may not be relevant when studying adaptive traits—genetic diversity in neutral traits is not always an indicator of adaptive traits.

- **Ecogeographic information as an indicator of genetic diversity** – If a species occurs in a wide range of habitats it is likely to contain a wide range of genetic adaptation. However, in cases where the habitats in which a species occurs are similar but the geographic distance between populations is larger, it is likely that greater genetic diversity exists between populations. This holds true as a general assumption but is not always the case, as is shown in the genetic diversity of *Lens culinaris*

subsp. *orientalis* (see Ferguson *et al*., 1998). It is therefore always advisable to undertake genetic diversity analysis if possible; if not, ecogeography is the best proxy for patterns of genetic diversity.

Cross-cutting issues

- **Transboundary CWR conservation strategy planning** – It is important to take into account the transboundary distribution of a species. Joint strategies and coordinated implementation is needed for neighbouring countries. It was noted that in Switzerland, the higher the percentage of the global distribution of a species occurring in the country, the more responsibility the national authorities have to conserve it.

- **Project in the Czech Republic to investigate the diversity of threatened CWR** – The initial focus was on threatened grasses, legumes and vegetables. Monitoring programmes were initiated and germplasm collection carried out. One of the results was to recommend the introduction of new species as cultivated plants.

- **CWR prioritization criteria** – It would be useful to define the responsibility of countries with regard to selection of priority CWR in an international context. Also, it was suggested that management needs could be included as a criterion for prioritization[5].

3.3 CWR prioritization

3.3.1 Options for CWR prioritization

Presented by Shelagh Kell

Crop wild relatives are species closely related to crops (including crop progenitors) and are defined by their potential ability to contribute beneficial traits to crops such as pest or disease resistance, yield improvement, or stability (Maxted *et al.*, 2006). Because of the large number of species adapted to a wide range of habitats, they contain an extremely broad range of genetic diversity and are therefore likely to become increasingly important as gene donors for crop improvement in the face of climate change. CWR are increasingly threatened with extinction, yet in the past they have received relatively little systematic conservation attention (Maxted *et al*., 2008a).

Recent research indicates that the gross global number of crop and CWR species accounts for around 21% of the world's 283,846 known flowering plant species (Maxted and Kell, 2009). In Europe and the Mediterranean, more than 25,000 CWR species are known to exist and 17,495 of these occur in Europe alone (Kell *et al*., 2008). The sheer number of CWR species demands careful planning in terms of conservation. Limited financial resources and capacity means that conservationists have to prioritize species so that those in most urgent need of conservation are given immediate attention. Prioritization is therefore a fundamental step in efficient PGR conservation (Maxted *et al*., 1997) and is important to inform planners, resource managers and local people of the importance of biodiversity to national development objectives (Magos Brehm *et al*., 2010).

There are numerous systems and methods for species prioritization and many different criteria have been used to prioritize species (e.g., see Maxted *et al*., 1997). However, the prioritization of CWR is

[5] Compiler's note: assessing management needs (i.e., *in situ* and *ex situ* management) is part of the process of gap analysis which is an essential step in the development of a national CWR conservation strategy.

only relatively recent (e.g., Mitteau and Souzipet, 2000; Flor *et al*., 2006; Barazani *et al*., 2008; Ford-Lloyd *et al*., 2008; Maxted and Kell, 2009; Magos Brehm *et al*., 2010) and a systematic approach that can be applied globally, regionally and nationally has not previously been proposed.

In this presentation, the authors presented a systematic approach to the prioritization of CWR, noting the following key points:

- There are three main criteria that are likely to be most useful for prioritization of CWR: priority crops, utilization potential and relative level of threat. A combination of all three criteria is usually used.

- The selection of priority crops will vary according to scale of prioritization (i.e., global, regional, national or local) and may even vary according to the implementing agency. However, the highest priority crops are likely to be food crops (important for nutrition and food security), crops of economic value and crops with multiple use values.

- Utilization potential can be assigned to CWR taxa by applying the Gene Pool concept (Harlan and de Wet, 1971) or in the absence of genetic data, the Taxon Group concept (Maxted *et al*., 2006). In general, the closest wild relatives in GP1B and GP2 or TG1B and TG2 are given priority. However, tertiary wild relatives that are already known as gene donors or have shown promise for crop improvement should also be assigned high priority.

- Relative level of threat can be assigned to taxa based on the IUCN Red List of Threatened Species (www.iucnredlist.org/), the European Red List of Vascular Plants (Bilz *et al*., 2011) and/or national Red Lists. In the absence of Red List assessments, endemism and relative distribution can be used as an indicator of relative threat. Inferences from known threats to/loss of habitats/land use types can also be applied, as well as local expert knowledge.

- CWR prioritization can be carried out at different geographical (i.e., global, regional, national, sub-national) and taxonomic (e.g., crop genus) scales and can be simple to complex, depending on scale, time, resources and conservation goals. The methods used vary depending on a number of factors—the number of taxa, the resources available for their conservation, the differing needs of the target area and the priorities/interests of the implementing body.

- Recent studies have shown how CWR can be prioritized globally (Maxted and Kell, 2009), regionally (Ford-Lloyd *et al*., 2008; Kell *et al*., 2012a) and nationally (e.g., Maxted *et al*., 2007; Magos Brehm *et al*., 2010).

3.3.2 CWR prioritization at national level

Presented by Joana Magos Brehm

The establishment of priorities among taxa is a crucial step in any conservation strategy given the limited financial resources available. In this talk, examples of national prioritization methodologies of CWR were provided for the UK and Portugal as well as the main lessons learnt from them.

The UK prioritization scheme was based on two main criteria: economic value and threatened status. For a total of 2300 UK plant taxa, about 81% are CWR (1863 taxa) (Maxted *et al.*, 2007). Those crops listed in the UK government's Department for Environment, Food and Rural Affairs (Defra) home production statistics, as well as those included in the Seed Traders National Annual Return (forage/fodder crops), the EU Common Catalogue of Agricultural and Horticultural crops, genera in the International Convention for the Protection of New Varieties of Plants (UPOV Convention), and ornamental species with more than 100 nursery suppliers (in 2004) were prioritized over the total breadth of the UK CWR. In addition, 80 threatened CWR were also prioritized (from Cheffings *et al.*, 2005). A total of 250 taxa (including species and subspecies) were considered to be the UK CWR priorities. For these priority taxa, an ecogeographic survey, a gap analysis and a threat assessment were carried out and *in situ* and *ex situ* conservation recommendations were made. A complementary analysis was carried out and 17 key sites covering 152 species (67% of the 226 priority species) were identified (Maxted *et al.*, 2007).

The Portuguese prioritization scheme was based on eight criteria (native status, economic value, national and global distribution, *in situ* and *ex situ* conservation status, threatened status, legislation) and using four different methods. The 50 top taxa of each method were extracted, and those occurring as top taxa in four or more of these methods were the priorities. Twenty taxa were identified as the Portuguese CWR priorities. This method allowed reducing the subjectivity inherent to each single method. A matrix of overlapping percentage between methods and between the final list of priority CWR (by combining the different methods) and the result obtained with each method was performed and the main advantages and disadvantages of each method used were listed (Magos Brehm *et al.*, 2010). An ecogeographic survey, a gap analysis, a genetic analysis (for few of the target taxa), and distribution modelling study (climate change) were carried out for the 20 priorities and *in situ* and *ex situ* conservation recommendations were made. Sixty-eight percent of priority species could be conserved in three existing Portuguese conservation areas (Magos Brehm, 2009).

The main lessons learnt from these two case studies were:

- The criteria used in setting conservation priorities tend to differ with the user, country, etc.
- A single criterion or the use of different methods greatly affects the results.
- Relatively low level of similarity between individual results and the final list obtained by combining all methods (high degree of subjectivity associated with the use of a single method).
- Need to reduce subjectivity in order to obtain reliable results: combination of methods.
- Whatever the criteria and the method used, priorities must be viewed as a working hypotheses based on the best available information.

3.3.3 Progress in prioritizing CWR in Spain

Presented by M. Luisa Rubio Teso

In this presentation an overview of the progress made in Spain regarding the prioritization of CWR was discussed. During the presentation, some considerations made before the start of the prioritization were described taking as reference other countries' experiences and available literature, but always bearing in mind the idiosyncrasy of Spain. The reasons and changes undertaken on this primary scheme to generate the national list of CWR prioritized for conservation in Spain were stated. A two-step diagram to be followed to achieve the prioritization of CWR in Spain was presented and a brief outline of each step taken was given according to the criteria selected. These two steps were 1) the generation of a prioritized crop genera list and 2) the prioritization of the CWR associated to the prioritized crops. The selected criteria (presence in Annex 1 of the ITPGRFA, native status and registered varieties) were also discussed taking into account the Spanish peculiarities. Part of the preliminary lists of the initial 194 crop related genera to be prioritized were shown as well as the filters and information considered. A first list of 27 genera classified into four categories (food, fodder and forage, ornamental and 'other uses'), as starting point to prioritize was shown and discussed. The next steps foreseen to generate a final list of CWR to be conserved and object of specific preservation actions were also explained.

3.3.4 Group discussion on CWR prioritization

The main issues highlighted/discussed were:

- In the context of a project led by the Global Crop Diversity Trust, 160 priority crops in 92 genera have been identified. For these crops, searches for established GP concepts have been carried out and the TG concept applied when GP concepts were not available. The resultant database of Global Priority CWR Taxa is available at www.cwrdiversity.org/home/. The GP concept has rarely been applied except to major crops.

- The issue of whether to take account of the global economic importance of crops rather than just the national economic importance was discussed. Due to interdependence between countries, it was generally agreed that the global (or at least European) economic importance should be taken into account when assigning conservation priorities. This is particularly relevant in those countries that have a heavy reliance on CWR from other parts of the region or the world. It was noted that in Spain prioritization would be on the basis of national priorities in order to attract donor support for conservation.

- We need to be careful about using too many prioritization criteria because the possible overlap between them may cause excessive weighting of certain criteria.

- It was suggested that plant breeders/breeding researchers should be involved in the selection of prioritization criteria. It was noted that in Norway, forage breeders are interested in material from the national flora but on the whole breeders are not interested. PGR Secure WP5 addresses breeders' needs and barriers to the use of CWR in breeding programmes. Through this WP, we will be able to discover what breeders see as priorities at European level.

- The tertiary gene pool should not be ignored, especially if traits from species in the tertiary gene pool have been transferred to crops or have shown potential for crop improvement.

3.4 CWR diversity and gap analysis

3.4.1 *In situ* and *ex situ* gap analysis: overview

Presented by Nigel Maxted

Gap analysis is a well-established conservation technique that identifies areas in which selected elements of biodiversity are represented and through comparison with existing *in situ* PA networks identifies habitats or ecosystems that need additional protection. The talk demonstrated that gap analysis may be extended to encompass both *in situ* and *ex situ* genetic diversity conservation strategies. The methodology for gap analysis is reviewed, it involves the following steps: (1) circumscription of target taxon and target area; (2) assessment of natural diversity through a review of intrinsic taxonomic, genetic and ecogeographical diversity combined with threat assessment; (3) assessment of current complementary *in situ* and *ex situ* conservation strategies; and (4) reformulation of the conservation strategy through analysis of the differences between the pattern of natural, intrinsic diversity and the elements of that diversity already effectively represented by existing *in situ* and *ex situ* conservation actions. The methodology was illustrated using the example of the conservation of African *Vigna* species (cowpea *Vigna unguiculata* (L.) Walp. and its wild relatives). The extended methodology for gap analysis is shown to be robust and indicates that its scope as an effective conservation tool may be expanded to fully address the need for a more comprehensive and complementary conservation strategy that encompasses both *in situ* and *ex situ* applications. The methodology has rapidly been taken up by the international community and secondary examples of its application were provided.

3.4.2 Ecogeographic data analysis: an introduction

Presented by José M. Iriondo

The purpose of this presentation was to introduce the concept, rationale, methodologies and applications of ecogeographical data analysis. The idea behind the use of ecogeographical data is the assumption that genetic diversity of adaptive value is modelled by selective pressures originated by environmental biotic and abiotic factors. Thus, ecogeographical data that synthesizes these factors can act as a proxy of the genetic diversity of adaptive value that we are interested in conserving. The sources of ecogeographical data and some approaches to the synthesis of these data were presented and described in some detail. There are many possible applications of ecogeographical data analysis in CWR conservation. In this talk, some examples about the ecogeographical characterization of CWR populations and seed accessions, the assessment of ecogeographical representativeness of CWR collections, the use of ecogeographical data in the selection of genetic reserves for the *in situ* conservation of CWR, and the use of the Focused Identification of Germplasm Strategy (FIGS) were presented and discussed.

3.4.3 Tools for CWR genetic diversity analysis

Presented by Helena Korpelainen

Genetic variation is necessary for adaptation to changing environmental conditions. Abundant variation creates genetic flexibility and is thus usually advantageous. However, genetic diversity may be lost through natural disasters, or farmers may engage in activities that promote genetic erosion of CWR, such as extending grazing lands into wild habitats, or there may be increasing demand of land for alternative use to meet the general needs of modern society, often including clearing of virgin land

where wild species occur. Such actions tend to destroy wild species and place wild germplasm in jeopardy.

When analyzing genetic diversity of plants, morphological traits are used for basic characterization and they allow the interpretation of relationships between the genotype and environmental conditions. However, in-depth analyses of genetic diversity require the use of molecular tools, which allow direct investigations of variation at the DNA level, thereby excluding all environmental influences. In addition, such methods can be employed at any growth stage. Molecular methods, including primarily molecular marker techniques and DNA sequencing, will provide information of the amount and distribution of genetic diversity and of relatedness between populations and individuals, and give estimates of gene flow and past demographic changes. Data analysis is an important part of any genetic diversity study. For that purpose, many kinds of software are available.

Molecular markers represent detectable sequences of DNA or protein whose inheritance can be monitored. To be useful, molecular markers must be polymorphic, reproducible, and fast and reasonably inexpensive to detect. Common molecular marker types are microsatellites (simple sequence repeats, SSRs), single nucleotide polymorphisms (SNPs), and amplified fragment length polymorphisms (AFLP). These markers usually represent neutral genetic variation. However, it may be of interest to discover polymorphisms that affect the performance of plants (e.g., stress tolerance, disease resistance). For that purpose, gene-specific markers can be developed based on known genes of interest. It is increasingly affordable to produce large amounts of sequence information, and screen and detect molecular variation of genes at a genome-wide level.

3.4.4 Genetic diversity analysis of CWR in Portugal

Presented by Joana Magos Brehm

A species-targeted conservation strategy should, whenever possible, include information on the genetic diversity of the target taxa so the chances of conserving potentially useful genes are maximized. In this communication the main results obtained in a study on neutral genetic diversity (using AFLPs) of few Portuguese priority CWR, in particular of *Dianthus cintranus* Boiss. & Reut. subsp. *barbatus* R. Fern. & Franco, throughout its distribution area, were shown. Twenty plants per population in a total of five populations were sampled and two selective *Mes*I and *Eco*RI primer pairs were used. Descriptive statistics (including allele frequencies, percentage polymorphic loci/population, genetic diversity, number of private alleles), population structure and differentiation analysis (Wright's F_{ST}, 1951; dendrograms – agglomerative hierarchical clustering using UPGMA, Principal Coordinate Analysis, AMOVA, and Bayesian clustering method), and a Mantel test to test for isolation by distance were carried out. The results confirmed this taxon as an outbreeder with genetically homogenous populations and moderate values of genetic diversity, low but significant levels of genetic differentiation, and most genetic variation within populations.

In addition, genetic (genetic diversity, number of polymorphic alleles, number of common and localized alleles (modified from Marshall and Brown, 1975), inter-population genetic distance), demographic (population size) and threat data (number of threats) were used in order to prioritize populations for conservation. One population located in Condeixa-a-Nova was prioritized for both *in situ* and *ex situ* conservation (Magos Brehm *et al.*, 2012).

Given the potential interest of CWR use, it would be more useful to assess adaptive diversity rather than neutral diversity. However, given the time and financial constraints, a neutral diversity study was carried out. The differences between neutral and adaptive diversity were finally raised. Neutral

diversity is related to migration, mutation, and genetic drift—it has no direct effect on species fitness and it is not affected by natural selection—whereas adaptive diversity is related to evolution and reflects the species potential ability to adapt to changing environments.

3.4.5 Threat assessment of European CWR

Presented by Shelagh Kell

In this presentation, an introduction to the European Red List project was given, the process of selecting a sample of European CWR to assess as part of this project was outlined, the Red Listing process was summarized, some key results of the project were presented and knowledge gained and lessons learnt were reviewed.

The European Red List is an IUCN initiative, funded by the European Union. The objective of the project was to carry out threat assessment of around 6000 species to produce the first European Red List. The list includes mammals, reptiles, amphibians, freshwater fishes, butterflies, dragonflies and damselflies, molluscs, beetles and selected vascular plants. Three plant groups were selected for inclusion—CWR, aquatic plants and policy species (i.e., species listed in the Annexes of the Habitats Directive, Bern Convention, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the EU Wildlife Trade Regulation). The IUCN Species Survival Commission (SSC) Crop Wild Relative Specialist Group (CWRSG) was given the task of carrying out Red List assessments of 500–600 CWR species as part of this initiative. The intention of the project was to carry out regional Red List assessments of a representative sample of CWR; therefore, national endemicity was not a criterion for selection. Further, national endemic species can be submitted directly for publication in the IUCN Red List of Threatened Species. In order to maximize impact in raising awareness about the importance of European CWR and their conservation status, a clear process of taxon selection was needed. Using data from the CWR Catalogue of Europe and the Mediterranean (Kell *et al*., 2005), GRIN Taxonomy for Plants (USDA, ARS, National Genetic Resources Programme, 2009) and Mansfeld's World Database of Agricultural and Horticultural Crops (Hanelt and IPK Gaterslaben, 2001; IPK Gaterslaben, 2003), the species were selected as follows:

1. CWR species native to Europe (i.e., any species introduced before AD 1500) – 19,537 species
2. CWR of human and animal food crops – 7,324 species, 955 of which are CWR of both human and animal food crops
3. CWR of crops important to Europe in terms of production quantity and/or economic value – 279 species (106 species are also CWR of forage and/or fodder crops)
4. CWR of food crops listed in Annex I of the ITPGRFA – 207 species
5. Forage species listed in Annex I of the ITPGRFA – 52 species
6. In addition, all *Medicago* species native to Europe were included on the basis of data availability.

A total of 591 CWR species were assessed.

The assessment process involves a) the collation and documentation of data of the following types: taxonomic, distribution, population, habitats and ecology, use and trade, threats, conservation actions, b) evaluation of the taxon against the IUCN Red List Criteria c), selection of the threat category, d)

justification of the assessment using explanatory text, e) expert review and evaluation of the assessment. Assessments are documented online using IUCN's Species Information Service (SIS).

Out of the 591 CWR species for which regional assessments were carried out, 19 were assessed as Not Applicable, either due to their marginal occurrence in Europe or because they were introduced after AD 1500. The status of the remaining species was assessed at two regional levels: geographical Europe (572 species) and the EU 27 (521 species). At the European level, at least 11.5% (66) of the species are considered as threatened, with at least 3.3% (19) of them being Critically Endangered (CR), 4.4% (22) Endangered (EN) and 3.8% (25) Vulnerable (VU). A further 4.5% (26) of the species are classified as Near Threatened (NT). Within the EU 27, at least 10.5% (55) of the CWR species assessed are threatened, of which at least 3.5% (18) are CR, 3.3% (17) EN and 3.8% (20) VU—in addition, 4.0% (21) of the species are considered as NT. One species (*Allium jubatum* J. F. Macbr.) is Regionally Extinct (RE) within Europe and the EU. Of the remaining species, 54.7% were assessed as Least Concern (LC) and 29% as Data Deficient (DD).

It should be noted that the percentages of threatened CWR mentioned above represent minimum estimates. If we consider only those species that are surviving and for which we have enough data to assess the risk of extinction (excluding DD, EX and RE species), we might receive a more realistic value, assuming that the percentage of threat among DD species is similar to the overall percentage of threatened species within this group. In this case, 16.3% of the assessed CWR are threatened at European level and 14.4% at the EU 27 level.

Other results presented were:

- The number of CR, EN, VU or NT species per crop genus: 25 out of 58 genera included contain threatened or NT species.
- Major threats to CWR: intensive livestock farming was highlighted as the most significant threatening factor.
- Population trends: for 48.2% of the species assessed, the population trends are unknown; for the remaining species, 10.9% have a decreasing population trend, 38.7% are thought to be stable and a small percentage (2.3%) are thought to be increasing.
- The European countries containing five or more regionally and globally threatened or NT species: Spain, Portugal, Ukraine, Greece, Italy, Cyprus, France and European Russia.
- The number of globally and regionally threatened or NT species in 14 crop gene pools: crop gene pools containing a high percentage of threatened species include cultivated beets, asparagus, oat, the brassica complex, wheat and lettuce.
- The habitat types recorded for ten or more species.
- Conservation actions needed for 483 species: the main actions needed are *ex situ* conservation (for 446 of the species assessed), site/area management (for 188 species) site/area protection (for 98 species) and invasive species control (19 species).

Positive outcomes of the project were highlighted, including:

- An increased awareness of the importance of CWR amongst the 'nature' conservation community;

- Raising the conservation profile of highly threatened CWR;
- Collation of a significant quantity of data useful for conservation planning and to provide a baseline for future assessments, as well as highlighting species for which more data are needed;
- European experts working on CWR brought together and provided with Red List training.

On the other hand, the project highlighted some issues of concern, such as:

- The need for careful interpretation of the meaning of a Least Concern assessment: the assessments are carried out at species level—the IUCN Red List Criteria do not take into account intra-specific genetic diversity;
- Problems of data quality and consistency;
- Taxon and national experts have insufficient time to contribute to Red Listing;
- Application of the Criteria can be a bit 'hit and miss', depending on quality of data and opinion of assessors;
- Most assessments based on criterion B (geographic range), highlighting a lack of population level data;
- Some of the IUCN data documentation standards are inadequate for documenting information on CWR;
- Many species known to occur within existing PAs; however, most are not monitored or actively managed;
- Germplasm from European populations is reported by EURISCO for 279 (48%) of species assessed; however, most are represented by very few accessions, are reported by only one gene bank, and have been collected from only a small part of the species' range.

Opportunities for taking European CWR Red Listing forward were highlighted:

- The CWRSG could coordinate collation of global assessments of national endemic CWR species for submission to the IUCN Red List of Threatened Species;
- The European Red List may be developed further in the future, providing an opportunity to add more CWR species to the list;
- The usefulness of IUCN Red Listing to CWR (and all wild plant species) should be improved by considering intra-specific genetic diversity in the Criteria.

The IUCN Red List of Vascular Plants is now published (see Bilz *et al*., 2011) and further analysis can be found in Kell *et al*. (2012b). The assessments are published online at: http://ec.europa.eu/environment/nature/conservation/species/redlist/index_en.htm and for 188 of the species that are endemic to Europe, assessments are published in the IUCN Red List of Threatened Species (www.iucnredlist.org/).

3.4.6 Group discussion on CWR diversity and gap analysis

Gap analysis

- **The question was asked whether CWR conservation gap analysis has been undertaken in any of countries represented at this workshop**. It was reported that in Turkey, material is being collected systematically by region and for species that have not previously been collected and conserved. They are also prioritizing species under threat and mainly collecting close wild relatives. The importance of taking into account the needs of breeders and researchers was emphasized. It was noted that sampling takes into account the many different micro-climates within the same zones in Turkey and that transitional and migration zones are very important.

Red List assessments

- **Data Deficient species** – More than 29% of the CWR species assessed as part of the IUCN Red List of Vascular Plants project were evaluated as Data Deficient; however, some are DD because data could not be obtained from the country experts. It was agreed that gathering data for these DD species should be seen as a priority for the European CWR conservation community.

- **National Red List assessments** –The need to carry out national Red List assessments of CWR was highlighted and it was suggested that the European Red List could be used to raise awareness at national level.

Development of criteria for threat assessment taking into account infra-specific genetic diversity

Development of the criteria – It was noted that the concepts for taking this forward have not yet been developed. It was suggested that it might be possible to add a sixth criterion to the existing IUCN Red List Criteria; however, it was stressed that it is not expected that IUCN will change the existing Criteria but that we will develop a parallel system. The importance of working with IUCN was emphasized and the need to convince IUCN of the importance of genetic diversity in the measurement of extinction risk was highlighted. It was noted that a new layer to assess the threat of genetic erosion is important. It was also noted that Stefano Padulosi (Bioversity International) is investigating the development of a threat assessment system for cultivated plants. The development of the criteria for threat assessment taking in account genetic diversity could be taken forward by PGR Secure—a subgroup could be set up, including any participants at this workshop who are interested in collaborating. It was also noted in this context that paying attention to intraspecific taxonomic diversity is important. For example, the genus *Poa* has a wide distribution and has little attention paid to it in terms of conservation, but with its taxonomic structure there may well be important areas and taxa in need of conservation action.

3.4.7 CWR working group feedback preparation

The working group 1 rapporteur presented a summary of the session so far. Participants discussed the points highlighted in the summary and came to an agreement on the details of the interim reporting session.

3.5 CWR conservation data management

3.5.1 CWRIS: the PGR Forum information management model

Presented by Shelagh Kell

The Crop Wild Relative Information System (CWRIS) is a model for the management of data associated with CWR conservation and an online information system providing access to taxon information (see PGR Forum, 2005; Kell *et al*., 2008).

CWRIS was initiated by and developed in the context of the EC FP5 project, PGR Forum (www.pgrforum.org). Its development involved an iterative process of review and refinement through a series of workshops, project working groups and a user testing panel. The information management model was tested with case studies in an online data entry module. The online system was published in 2005 (see PGR Forum, 2005) and at a later date, CWRML (CWR Markup Language) was published (see Moore *et al*., 2008).

The data management model is object based and hierarchical, starting with the root 1 level descriptors, 'taxon', 'population' and 'site'. The level 2 descriptors are nested into the level 1 descriptors and provide a set of descriptors relevant to 'taxon', 'population' and 'site'. Likewise, within each level 2 descriptor is a set of level 3 descriptors, providing a more detailed set of descriptors. The descriptors provide the structure within which existing data can be accessed, mapped on to the data model, or communicated, and in which novel data can be collated. They are considered the minimum set of descriptors required for the effective management of data associated with CWR conservation.

Each level 3 descriptor is assigned data standards to enforce consistency in data recording, storage and retrieval. Existing data standards were utilized in the model where possible and appropriate (e.g., EUNIS Habitat Types and the IUCN Habitats Authority file); however, there were a number of data types for which new data standards were required, or existing ones adapted (e.g., novel standards were proposed for breeding system, pollination mechanism and plant habit). In a few cases, where no suitable standard exists, or enforcing a limited choice of attributes is not appropriate, the model allows for the inclusion of free text elements.

The data management model was tested and refined with a number of case studies using an online data entry module (the case studies are available via CWRIS online – http://www.pgrforum.org/cwris/cwris.asp). A referencing system ensures that all objects are linked to resources. Different reference classes are available and any data item can be linked to any number of references.

CWRML (Moore *et al*., 2008) forms the basis of syntax for formatting data on CWR for exchange and dissemination.

3.5.2 Bioversity *in situ* CWR descriptors

Presented by Imke Thormann

The presentation outlined the UNEP/GEF CWR project during which the CWR descriptors were developed and the information management challenges that had required the descriptor development. The approach to the descriptor development and the results were described.

The CWR descriptors were developed within the framework of the global project '*In situ* conservation of crop wild relatives through enhanced information management and field application', which was supported by UNEP/GEF, co-financed by BMZ, Germany and implemented by Bioversity International from April 2004 to December 2010. The project's partner countries were Armenia, Bolivia, Madagascar, Sri Lanka and Uzbekistan. The following organizations participated in the project: Botanic Gardens Conservation International (BGCI), the German Federal Office for Agriculture and Food (BLE), Food and Agriculture Organization of the United Nations (FAO), International Union for Conservation of Nature (IUCN) and UNEP World Conservation Monitoring Centre (UNEP-WCMC).

The challenge was to develop CWR information management systems and capacity while there were very few CWR information activities to build upon and information were very scattered and difficult to access. No global resources dedicated to CWR existed yet. In the partner countries there was only one targeted information activity, the development of a CWR atlas in Bolivia. Data were found to be dispersed within and among institutions in the countries. Little data were digitized, in particular location data, and data formats were different in institutes within one country. National settings regarding in-country collaboration, IT infrastructure and capacities differed considerably among the five countries.

Among other activities, this situation required to develop CWR descriptors for data types and fields that were necessary to capture all relevant information about CWR at a national level, in order to provide a basis for data management work in the countries.

Units that need to be described were identified. These can be divided into two main groups: 'population', 'accession' and 'specimen' as main units to be described and 'taxon', 'site', 'contact', and 'resources' as standalone categories and components used by the other units, representing additional entry points into the CWR data. For each of these seven entities detailed descriptor lists were developed as well as a core set of descriptors for data exchange.

Among the sources taken into consideration during the development were the ABCD schema (Access to Biological Collection Data), the MCPD, the PGR Forum draft descriptor list and TDWG standards. A series of revisions among the national and international project partners, including the technical advisory group to the project (composed of external experts) took place in order to finalize the descriptor lists. Also inputs from outside the project community were received from PGR Forum members, Bioversity scientists and ECPGR members.

National CWR information systems that were developed in the five countries were all based on the detailed descriptor lists. The seven detailed descriptor lists are available as hierarchical structured lists in PDF and as Word documents and the core descriptor list is available as a Word document and have been shared with the PGR Secure project partners and ECPGR members present at the conference.

3.5.3 Group discussion on CWR conservation data management and minimum data types

The main issues highlighted/discussed were:

- **Ontologies** – The need for ontologies and agreement on concepts was emphasized. It was expressed that the use of the term 'data standards' is not appropriate. It was noted that there is already an advanced CWR ontology available and that we need to agree on which data types we are going to use.

- **Choice of information systems and descriptors** – It was expressed that the information management systems presented are too complex for the management of CWR NIs. It was emphasized that CWRIS is a model for the management of CWR conservation data, not just for the management of CWR NI data. This highlighted the issue that different people may differently interpret what constitutes a NI.

- **Links between *in situ* and *ex situ* data** – It was noted that the link between *in situ* and *ex situ* data is an occurrence. However, it was also pointed out that an occurrence does not imply active management—a population must be actively managed to be classified as being conserved *in situ*.

- **The CWR Portal** – It was noted that the CWR Portal (www.cropwildrelatives.org/) can be used to upload CWR NIs.

- **Access to research information** – It was suggested that a useful resource would be access to information on what research has been carried out by different countries on CWR taxa.

3.6 Development and implementation of national CWR conservation strategies by the ECPGR network members

3.6.1 Taking forward the national CWR conservation strategies: procedures and responsibilities

The PGR Secure Project Coordinator noted that while the project does not have funding for all countries to develop national CWR conservation strategies, we can provide technical support via the project helpdesk. He emphasized that it was the responsibility of the PGR National Programmes to find the resources for the development of the national CWR conservation strategies but that the funding required to carry out the background research and planning is not significant. He then opened the floor for discussion on how the countries represented at this workshop see the development of the CWR conservation strategies going forward.

3.6.2 Group discussion on development and implementation of the national CWR conservation strategies

Justifying the development of national CWR conservation strategies

- The publication of the Global Strategy for CWR Conservation and Use would be useful. The draft Strategy was endorsed by participants at the First International Conference on CWR Conservation and Use in September 2005. There was some interest from FAO and the CBD Secretariat in taking it forward but this has not been achieved to date.

- There are various policy instruments that oblige signatory nations to conserve national PGRFA and it was agreed that a list of these would be provided in the PGR Secure helpdesk to help countries provide justification for CWR conservation when applying for resources.

- In Norway, the National Coordinator needs to convince the Ministry of the importance of the task. It would be useful to frame it in a European concept—lobbying for funding will have more impact on governments if we can demonstrate that all other countries in Europe are contributing to a European strategy.

- Applying monetary values to CWR could be used to justify their conservation. There are some examples that can be used (e.g., global use value of CWR by breeders 115 billion USD (Pimental *et al*., 1997)).

- **Letter to National Coordinators** – It was suggested that a letter from the ECPGR Secretariat, PGR Secure Project Coordinator (and Chair of the ECPGR *In Situ* and On-Farm Conservation Network), supported by the European Commission could be sent to PGR National Coordinators emphasizing that the development of national CWR conservation strategies is a priority. It was suggested that this letter should be from the ECPGR Steering Committee in order to convince key players at a high level. It was noted that most members of ECPGR Steering Committee are NCs so this is a better route; however, would this lead to an expectation by NCs to receive funding from ECPGR? The idea of the letter was generally supported. It was noted that NCs can use it if they wish— they have the responsibility to pass on decisions to a higher level.

Budgetary restrictions

- In the Czech Republic, it is a bad time for starting new projects due to budgetary cuts.

- Countries could make use of students to undertake the research as part of their theses.

- The GEF is offering funding for the implementation of Nagoya Protocol which could be potential source for some countries.

- Small countries have a serious problem in obtaining money from the government. Macedonia has a large number of species but the government has no plan for funding their conservation. Biodiversity in the Balkans is very important but *ex situ* collecting only started in recent years and *in situ* conservation is more expensive.

The PGR Secure Project Coordinator noted that *in situ* conservation does not necessarily have to be expensive but the issue of getting funding in small countries is important. He also noted that the project is only asking countries to develop national strategies, not actually implement them.

Other issues

- **Conserving CWR in existing protected areas** – the Natura 2000 Network in Central Europe is dense—we should find CWR populations within the existing network before expanding to conservation outside of Pas.

- **Choice of species to conserve** – It was noted that it would be beneficial to link with the list of priority crop gene pools identified in the Global Crop Trust project (see www.cwrdiversity.org/home/).

4.0 WORKING GROUP 2: LR CONSERVATION

4.1 Developing a European LR conservation strategy

4.1.1 Aim and objectives of the working group 2 session/participant introductions

After the participant introduction, V. Negri recalled that the general aim of the workshop is to provide background information and training in LR NI and LR *in situ* conservation strategy development, and presented the specific topics to be covered and discussed in the group 2 session:

- What are LR, what is *in situ* (on-farm in garden) conservation and how a conservation activity can be realised?
- Building up of LR NIs:
  - Inventory methodology and practice: how to collected LR historical, cultivation and use data,
  - Already available tools and information,
  - Type of data to be collected and data collection procedures,
  - Making data available to the project.
- Gap analysis to ensure that limited resources are used efficiently and effectively:
  - meaning and
  - practices (how to systematically compare conservation requirements and activities, both *in situ* and *ex situ*, to find out what else should be done).
- Characterization of LR diversity:
  - purposes and
  - recommended procedures.
- Baseline assessment of LR extinction / genetic erosion threat:
  - standardized, objective means of assessing threat in cultivated LR presently developed which helps in identifying conservation priorities and actions.
- Use of the LR NI to identify the areas where to set conservation activities with priority.
- LR safeguard and use: farmer/grower prerequisites for continued management of LR *in situ* (on-farm and in home gardens):
  - what motivates LR maintainers in Europe?
  - how do farmers choose which LR to maintain?
  - how do farmers choose which seed to save?
  - how dynamic in terms of genetic diversity are European on-farm systems?
  - what is the role of local (farmer, farmer co-operatives, NGOs), national (governmental agencies, breeders, farmer bodies)?
  - LR markets

- Linking local LR
    - to local community use and
    - to breeders use.

- Production of national LR conservation strategies.
- National implementation of agreed workshop targets by national delegates.

4.2 Landrace inventories: the backbone for conservation and use

4.2.1 LR definitions, LR use and *in situ* (on-farm) conservation

Presented by Valeria Negri

A training presentation was given which considered the nature of LR, (their definitions and genetic structure), their importance and possible ways to *in situ* (on-farm/in garden) conservation. She initially noted that there are many definition of what a LR is (e.g., Anderson and Cutler, 1942; Harlan, 1975; Brush, 1992, 1995; Papa, 1996, 1999; Zeven, 1998; Asfaw, 2000; Friis-Hansen and Sthapit, 2000; Negri, 2003, 2005; Camacho Villa *et al*., 2005; Saxena and Singh, 2006; Lorenzetti and Negri, 2009; Negri *et al.*, 2009).

Italy is presently working to inventory its own heritage of LR under the definition that was given in the frame of the EU funded project AEGRO (http://aegro.jki.bund.de/aegro/): *"A variable population, which is identifiable and usually has a local name. It lacks 'formal' crop improvement, is characterized by a specific adaptation to the environmental conditions of the area of cultivation and is associated with the traditional uses, knowledge, habits, dialects, and celebrations of the people who developed and continue to grow it"* (see Lorenzetti and Negri, 2009). The definition was also adopted in recently produced manual aimed to help the Italian Regions to inventory LR (Marino, 2010).

This because this definition emphasizes the aspects of a long standing, unbroken and active management of LR in a specific human context and underlines that a LR belongs to the people who developed it and feel to be its owner. In this sense it answers the need for recognizing (and remunerating) the farmers' rights that have been so often highlighted in International binding documents.

This is important in the Italian context where many typical, often niche, products come from LR as can be important for other countries with the same situation. Since from their sale on the local market farmers obtain a fair remuneration of their work, (work that allows agriculture to survive in difficult environments with obvious benefit for the protection and wealth of the environment), it is commonly understood and agreed that these resources should be maintained in their hands.

However, there are LR that are autochthonous in one region and are being introduced into another region and/or have been reintroduced in the origin area from gene bank specimens. These will become locally adapted with time, but cannot be considered as LR following the above mentioned definition, because they do not belong to the people who developed them.

The purposes of the PGR Secure could be better fulfilled if only autochthonous LR still living on the farms will be listed in NIs, however since responsibility of maintaining Genetic Resources (GR) stays with each State and no one other subject, PGR Secure cannot be prescriptive on what material should be recorded as 'LR'. To fulfil its purposes, PGR Secure only ask delegates to record (among the other

traits) the initial provenance of materials reintroduced from gene bank and the period of time they have been cultivated on a certain farm.

LR use in a) local farmer communities, b) breeding and participatory plant breeding and c) research were then briefly reviewed (the points were to be extensively treated by other contributions the day after). V. Negri especially stressed how LR cultivation generates local incomes, the possibility of creating new products and the protection of environment with reference to the emmer wheat cultivation in Italy.

Finally, V. Negri considered how the genetic makeup of LR suggests to operate for their *in situ* safeguard and the possible interactive role of farmers, as main actors in *in situ* conservation, and of (national or regional) authorities, with whom lies the responsibility of GR conservation.

A lively discussion followed that was started by S. Bulinska-Radomska (Plant Breeding and Acclimatization Institute, Poland) on the meaning of the term 'landrace'. She initially noted that if Poland was to record LR under the Negri's definition very few of them will eventually be recorded. In addition, without an agreed definition at international level it would be difficult to draft a European strategy for LR conservation. V. Negri answered that many years ago Zeven already noted how difficult was to define LR, adding that to give a definition was probably impossible. She added that to find further consensus would have been probably difficult in the PGR Secure lifetime. For this reason it will be proposed in the next day session on generating Nis to record if a certain LR was reintroduced and the time the LR has been cultivated on the farm. This would allow on one side each State to have a reference picture (at least) and on the other side PGR Secure to choose among data in order to draft a European strategy. Finally, it is each State responsibility to find out which genetic resource is to be recorded on-farm and preserved. PGR Secure can only suggest, not dictate what should be recorded.

4.2.2 Generating LR National Inventories

Presented by Valeria Negri and Renzo Torricelli

R. Torricelli and V. Negri (University of Perugia, Italy) then presented the goals of inventorying LR, where LR can be searched and LR gap analysis. It was initially noted that LR are still present also across Europe, however, complete inventories for each single European country are still lacking. This lack of information severely hampers the possibility of conserving and using effectively these GR. To create NIs is the needed informative base for any conservation action which is presently strongly needed and asked by many legally binding international agreements.

LR can be searched in public, private and non-governmental organization (NGO) *ex situ* collections (gene banks and living collections) and on the farms still cultivating them (*in situ*) by a door to door search where farmer are interviewed and LR material is collected for safety backup in gene banks. Searching in bibliographic records (often grey literature or accounting record) may be of help in carrying out the search job.

Finally, the comparisons of information obtained by different sources (gap analysis) helps to identify areas that (Maxted *et al.,* 2008b):

- need to be explored (areas where no information exist about LR exist);
- where it is needed to carry out LR collection for *ex situ* safeguard (areas where LR exist on-farm but LR were never collected for *ex situ* conservation);

- where it is feasible to reintroduce the LR whether farmers need or ask for this sort of materials (areas where LR do not exist anymore on-farm, but from where LR were collected and conserved *ex situ*); and finally

- do not need any further action than on-farm conservation monitoring (areas where LR still exist on-farm and were collected for *ex situ* conservation).

4.2.3 LR National Inventories: available tools, information and current situation

Presented by Merja Veteläinen

M. Veteläinen (MTT Agrifood Research Finland), after recalling goals of the inventorying action, presented the available tools, information sources and the current situation of inventory actions in Europe.

Available tools presently include *ex situ* information systems such as local/regional gene bank, EURISCO and CCDBs and on-farm (*in situ*) information available from earlier inventories, literature, Internet, NGOs and other grower organizations, farmer interviews and the On-farm/In garden contact database (http://www.sharingingformation.eu/).

She noted that to carry out inventories attention should be paid to the collection of guidelines, forms and descriptor lists, to give LR grower information on subsidy systems, to consider *ex situ* back-up possibilities and conservation networks and to have a post-inventory follow-up plan. All this in order to build up a well designed, integrated *ex situ* / *in situ* conservation system.

In inventory implementation it is initially needed to reach and contact the LR growers, which cannot be an easy task; to the purpose spreading of information about importance and need of inventorying actions through the press and media, agriculture extension services, local authorities, information material sent by post to farmers can be useful. Then it is needed to collect data at farm level interviewing farmers by using with questionnaires and tape records, to a minimum of descriptors for the documentation of on-farm conservation and management activities. Interviewing farmers it is useful also to collect seed samples for *ex situ* back up safeguard in gene banks. Later it is appropriate to verify the origin of collected material; this can be done by looking up at historical documents, carrying out characterization experiments (which can also take advantage of the use of molecular markers). Finally it is also needed to give a feedback to growers.

The currents state of inventorying activities in Europe can be gathered by the overview available in Bioversity International Technical bulletin no. 15 and upcoming AEGRO/ECPGR publication. These documents show that methods and tools used in inventorying LR are highly variable.

A discussion on how inventories need to be adjusted to the local and cultural conditions followed. It was noted that contacting farmers can be a very sensitive matter and sometimes monetary contributions are needed.

M. Veteläinen agreed that all these issues have to be taken into consideration.

4.3 Generating LR National Inventories: data collection and availability

4.3.1 Data to be collected about LR present on-farm, type and availability

Presented by Merja Veteläinen and Valeria Negri

M. Veteläinen (MTT Agrifood Research, Finland) and V. Negri (University of Perugia, Italy) suggested a list of basic data to be recorded when inventorying LR on the farms and stimulated a discussion on the topic. About data to be recorded it was first noted that there are two levels to be considered: the national needs and the PGR Secure needs. As for the latter a minimum set data would be needed to be recorded:

1. genus
2. species
3. authority
4. LR local name
5. latitude
6. longitude
7. altitude

and answers to questions:

8. 'How long the landrace has been cultivated in the farm?' (years)
9. 'LR reintroduced from gene banks/other farmers?' (yes/no). If reintroduced from gene bank: reference of the gene bank should be given. If reintroduced from other farmers if from a neighbouring, same district or different district/country farm should be specified.
10. 'Any seed exchange with other local farmers?' (yes/no)

The format to be used should be the EURISCO in order to facilitate a EURISCO extension to include on-farm data in the future.

It would of course useful to record also other data (see the minimum descriptor list already worked out by the ECPGR On-farm Working Group (WG) downloadable from: http://www.ecpgr.cgiar.org/networks/in_situ_and_on_farm/on_farm_wg.html), but the data listed above are the minimum which would allow the PGR Secure project to achieve its aims (deliverables D4.1, D4.2, D4.3, D4.4, D4.5). All crops should be inventoried, but focus should be on those belonging to the *Avena, Beta, Brassica* and *Medicago* genera.

The abovementioned data will allow at national level the mapping of inventoried LR which is needed for conservation planning (i.e., to know where to set *ex situ* and *in situ* conservation actions, for risk assessment and to monitor conservation across years).

It was mentioned that the University of Perugia could take care of setting a system where to upload each NI data.

It was then asked the national delegates, if they agreed about the minimum data to be recorded and their format and if they agreed in making the asked data available to the PGR Secure project. Finally a discussion was opened about data to be recorded in inventorying LR at national level.

J. Weibull (Swedish University of Agricultural Sciences) noted that that was certain the minimum data set to be recorded in inventorying LR.

Other data that were considered useful in making official inventories at national level were then mentioned by delegates belonging to the ECPGR Documentation group:

11. Inventorying date
12. NI number
13. Institute code
14. Country
15. District
16. Municipality
17. Main use of product obtained from LR (e.g., baking, brewing, etc.)
18. Total area cultivated under the inventoried LR (ha)
19. LR name synonyms known by the farmer (to be listed)
20. Farmer motivations for growing LR
21. Special traits the farmer observe in the LR
22. Sample for *ex situ* safety duplication collected? (yes/no, if yes Institute code to be specified)
23. Is the LR under threat? (yes/no)
24. Is any monitoring foreseen? (yes/no)
25. Farmer permission of making public the data recorded about the LR and the farm obtained (yes/no)

It was also noted that data format needed to be further discussed. V. Negri then agreed to prepare a new list including all the agreed traits to be presented the day after during the joint session. (The list was presented in the following day joint session).

After discussion the national delegates agreed that they were available in making data available to the PGR Secure project, whether they would be able to get funds for inventorying LR on-farm in the future.

4.3.2 Interviewing landrace farmers: how to get information? Examples from Finland

Presented by Maarit Heinonen

M. Heinonen (MTT Agrifood Research Finland) gave a training presentation on how to get information from farmers based on experience maturated in Finland within a project started in 2006. She noted initially that knowledge on LR is typically scattered, non-organized, rarely written down and locally based. Since the generation is vanishing to whom LR have been part of the everyday life, it is badly needed to locate / find the LR (with local knowledge) and place it (with GIS method) and to gather the diverse (biological, cultural, historical, local) knowledge.

Possible channels to find /contact LR farmers include direct contacts to LR farmers (registers of different organizations, registered conservation varieties in the official list of plant varieties; seed savers organizations and other, contact lists of the earlier inventories and studies, email lists of NGOs and eventually social media and the web) and indirect contacts to LR farmers (local informants such as rural advisors and other local authorities, museums, local associations working in local heritage, plant breeders and other scientists and experts).

A national call for LR in Finland was announced by the PGR National Programme in the early 2006 asking for information about cereals, flax, pea, and hemp and making clear that interest focused on LR in cultivation and old commercial varieties bred in Finland that were not yet stored *ex situ* at the gene bank. The importance of making inventories to the purpose of safeguarding PGR was strongly stressed and assistance in reporting the existence of LR and old cultivars still on the farm to the Finnish National Programme for PGR elicited relying on the need to save a common heritage. A poster and a leaflet were used to the purpose which were distributed Finland wide through the above mentioned channels.

Based on the answers received LR data were collected by interviewing some LR owners. A face-to-face contact was established which allowed to ask several questions and to carry on many observations to the entire farmer family, understand motivation to continue on-farm conservation and collect seed samples. It was noted during the interviews that the best knowledge of a certain LR stays with the eldest and the females of the family. Collecting of LR data should be done by questionnaire to be filled in by the interviewer. However, also a questionnaire available in websites and mailed questionnaire (paper format) to be filled in by LR owner could be used.

A feedback to this research work was provided to a wide audience by preparing LR brochures (presenting LR examples), website of the PGR National Programme; including LR information and circulating articles in magazines and newspapers.

4.3.3 Historical data as background information

Presented by Maarit Heinonen

Following the previous speech, M. Heinonen, taking as an example an old apple tree LR (called 'Huvitus'), gave an outlook on how possibly historical data can be used to evaluate what LR groups can be still in cultivation, to locate the LR, to evaluate the LR origin.

On this old cultivar, besides interviews of local informants, there are several information sources old scientific literature: pomological, plant breeders publications (studies on LR as breeding material) other old literature (about the site, recipes books etc.) and achieve documents, old photos and maps and statistics

Through this information it was possible to locate the presumed original place of the LR, a garden where a very old tree of Huvitus was still alive, information that was then confirmed by comparison of DNA fingerprinting of several specimens of the same LR taken from other gardens.

This sort of information can also be used to demonstrating LR, in museum gardens and to promote the use of LR based products and services.

4.4 LR characterization and threat assessment

4.4.1 LR characterization for identity assessment

Presented by Renzo Torricelli

R. Torricelli (University of Perugia, Italy) gave a training speech on how to characterize LR for identity assessment. He initially reminded that LR continue to disappear and are an important source of useful genes for breeding work, the base for new populations adapted to environmental changes and the base for local profitable economies. In Italy there are still many LR of different crops present on-farm and in home gardens (over 1,300 LR were inventoried in Central Italy only). They are maintained because of better quality than commercial varieties, better performance (yield/persistence) under harsh pedo-climatic conditions and traditional reasons such as particular traits appreciated by the farmer's family and ritual or religious use (Negri, 2003).

In Italy some LR are protected by national and regional laws (and other supportive measures). Within this (also legislative) context morpho-phenological characterization is needed to:

- Plan actions to safeguard individual LR;
- Assess the identity and distinctiveness of a certain LR (i.e., if it is not a true LR it will not be protected);
- Enhance the value of product obtained from LR;
- Implement any actions to market the seed of conservation varieties (2008/62/EC, 2009/145/EC and 2010/60/EU Commission Directives);

Guidelines (see Marino, 2010) for the assessment of identity and distinctiveness of a certain LR from other LR and commercial varieties have been recently worked out which foresee the use of:

- field trials;
- with replicated and randomized designs;
- spaced plants;
- keeping distinct seed lots from different farmers;
- control materials (pure lines or F1 hybrids for autogamous or cross-pollinating species, respectively, including those recommended in the area);
- statistical tools.

Following he presented characterization examples of an outbreeder (the 'Black celery of Trevi', *Apium graveolens* L.) and an inbreeder ('Fagiolina del Lago Trasimeno', *Vigna unguiculata* (L.) Walp.) LR crop (Polegri and Negri, 2010; Torricelli *et al.*, submitted).

These studies showed a clear morphological and genetic identity of both LR that make them distinguishable from other LR and cultivars. Distinctiveness was used to promote their use on the territory. Characterization for identity assessment is also used to allow a LR entering into a protection scheme such as that implemented by the Lazio Region in Italy (see 4.4.2).

Z. Bulinska Radomska (Plant Breeding and Acclimatization Institute, Radzików, Poland) asked if a clear morphological and genetic identity is found in all LR or are there some exceptions in Italy.

R. Torricelli answered that in some cases (e.g., emmer and lentil in central Italy) exceptions are observed. Not 'true' LR (Negri's *sensu*) are mainly found in open field crops (in crops where there is a market linked to the typical product), while LR of vegetable crops found in gardens are generally true LR.

4.4.2 LR threat assessment (the Lazio Region example)

Presented by Renzo Torricelli

R. Torricelli (University of Perugia, Italy) explained how threat assessment is implemented in Italy to protect LR within the Italian legislative frame.

He explained that Italy was the first country in Europe to protect genetic resources (GR) (and LR in particular) with several regional and national laws passed from 1997 onwards.

These laws are now being harmonized with the recent European legislation which allows seed commercialization of 'conservation varieties' (e.g., LR, ecotypes and old varieties): 2008/62/EC, 2009/145/EC and 2010/60/EU Commission Directives. Italian Regions are the institutions in charge of protecting local GR, while the Ministry of Agriculture has only a coordination role. In this role the Ministry of Agriculture promoted the publication of a handbook for *ex situ* and *in situ* (on-farm) conservation of GR (Marino, 2010). Where they exist, Regional laws are implemented through the European Agricultural Fund for Rural Development (EAFRD, EC 1698/2005 1974/2006 Regulations).

The Italian Regional legislative frames promote the agrobiodiversity *in situ*/on-farm conservation with the goals to reduce the "genetic erosion threat" of local (i.e., autochthonous) GR, to develop an economic interest for food products from local GR and to enhance information on local GR.

The text of the Lazio Regional Law n. 15 (March 1st 2000) 'Protection of autochthonous genetic resources of agricultural interest' (Costanza *et al.,* 2012) in particular refers explicitly to the ITPGRFA and makes it clear that*: autochthonous plant and animal genetic resources, including wild plants, such as species, races, varieties, populations, cultivars, ecotypes, and clones for which there is an economic, scientific, environmental, or cultural interest, threatened by genetic erosion are protected.*

The Law foresees that its implementation is carried out by the Regional Agency for Development and Innovation of Agriculture, Lazio (ARSIAL). ARSIAL carries out and continuously updates a regional LR inventory (see www.arsial.it/portalearsial/RegistroVolontarioRegionale/Default.htm), record relevant information on history, cultivation area, threat, use, morpho-physiological characteristics and distinctiveness of each LR and, on the basis of the information gathered, relying on a scientific

commission opinion, eventually allow a LR to enter the protection scheme (Figure 2) (see also Costanza *et al.*, 2012; Negri, in press).

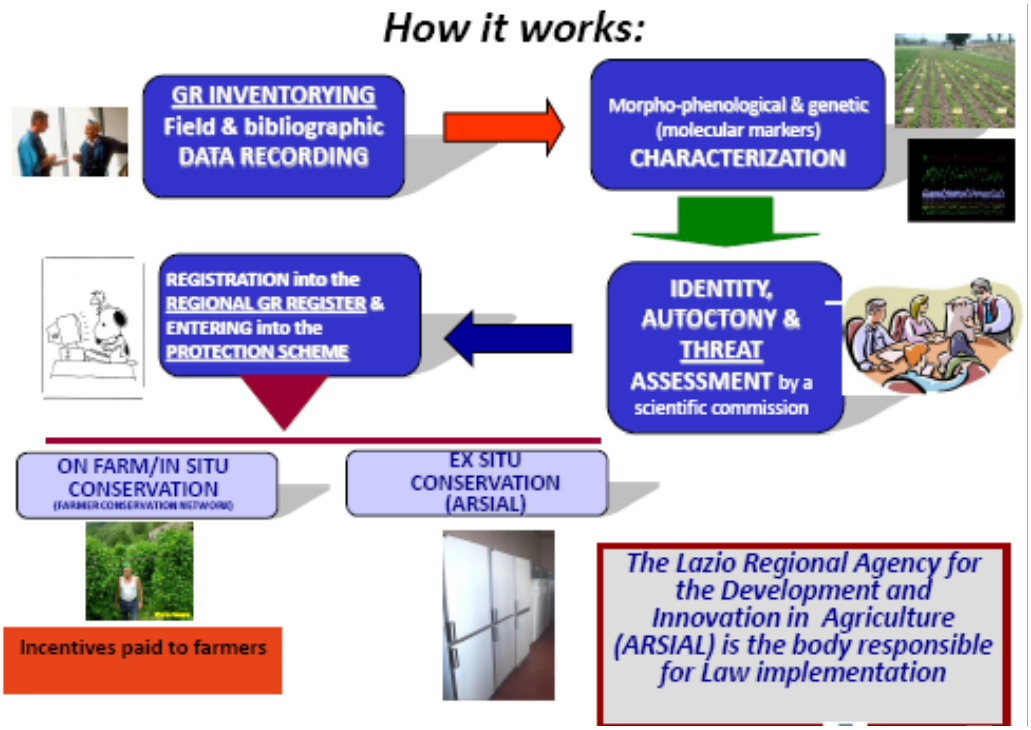

Figure 2. Operation of the Lazio Region scheme

In particular, for the threat assessment of a plant LR, the following the indicators are used:

1. existence of the product on the market;
2. presence of a LR in the catalogues of seed company or nurseries;
3. numbers of farmers still cultivating the LR;
4. cultivated areas of the LR in comparison with the total regional areas for those crops;
5. trend of new cultivation areas dedicated to that specific LR.

Each indicator is then associated to different conditions so to attribute a risk score (1 = low; 2 = medium; 3 = high) and the higher the level of threat the higher is the possibility of funding on-farm conservation activities through subsidies (Porfiri *et al*., 2009).

After a LR is assessed as under threat, it enters a protection scheme which directly involves farmers for on-farm (*in situ*) conservation. Farmers receive subsidies to carry on the on-farm conservation work.

Torricelli concluded that the experience gained in several years shows that a Regional law appears to be a good instrument to preserve agricultural biodiversity and promote the use of LR. An informative brochure in English that was prepared by the ARSIAL was distributed to the participants.

4.5 Linking LR conservation to use

4.5.1 Adding value to landraces with cultural information

Presented by Maarit Heinonen

M. Heinonen gave a speech on how to increase the conservation value of LR by using cultural information, in fact absolute value (biodiversity value) is not enough to keep LR in cultivation (it is a too abstract concept for the lay persons who in the end preserve LR on-farm). Biodiversity value needs to be transformed to more concrete value which has an exchangeable value on market.

There are several possibilities to add this sort of value to LR and LR conservation: to point out their diverse use values (good cultivation properties, the niche products that can be obtained from them, the authenticity they bring to the historic sites, manor gardens, museum gardens when cultivated there, the cultural and social values they have as personal, family, local and national heritage)

When people are aware of the origin of a LR, they take care of the LR.

So it is very much important to collect cultural information. In this respect aged (retired) farmers are probably the most useful sources because they are able to recollect the rich indigenous knowledge on LR cultivation and use. However some young farmers have strong personal connection to and commitment (emotions) to LR cultivated in the family for several generations and then can also be a useful source of information.

M. Heinonen mentioned that the consumer attitude towards LR products can be greatly improved by recording information on LR based products and gave some example were given: potato LR 'Lapin Puikula'; wool wrap made of an indigenous Finnish sheep ('Kainuun harmas') dyed with dryer's woad (*Isatis tinctoria* L.) and a tourist farm with LR breeds (animals and plants). In particular, the cultural information gained about the potato LR, 'Puikula' helped in awarding the 'Protected Designation of Origin' (PDO) by the EC. Consumers are willing to pay an extra on the top of the product when there is a demonstrable link to local cultural and biological heritage maintenance. This can help in on-farm (*in situ*) conservation of LR.

4.5.2 Maize bread from LR

Presented by Pedro Mendez Moreira

M.P. Mendes Moreira (Escola Superior Agrária de Coimbra, Portugal), also on behalf of the co-author C. Vaz Patto Universidade Nova de Lisboa), gave a presentation on how conservation can be linked to local use taking as an example the use of maize LR in making a traditional bread. The story of maize cultivation in Portugal is similar to that of other countries: after introduction from America, LR developed that were adapted to local pedo-climatic conditions and entered in local use to produce bread, but with the introduction of 'modern systems' of cultivation and 'modern' (hybrid) varieties they became neglected materials. However flower that can be obtained from 'modern' varieties has not the same organoleptic qualities than that obtainable from LR and a need to rescue the old LR was felt. Meanwhile accessions were progressively collected and stored *ex situ*, the rescue of the old materials was pursued following several different, but concurring strategies: i) conventional breeding programs in LR aimed at obtaining hybrid and open pollinated varieties giving high quality products and showing good agronomic performances, ii) participatory plant breeding programs aimed at improving LR for those characters that farmers claimed to be the most important and iii) on-farm

conservation projects. Conventional breeding programs and participatory breeding programs resulted in a success among farmers and contributed to the safeguard of genetic diversity of maize in Portugal.

4.5.3 Emmer products from LR

Presented by Renzo Torricelli

R. Torricelli (University of Perugia, Italy) illustrated how and where emmer wheat LR are maintained in Italy. He explained that the crop is well suited to the marginal conditions of hilly and mountainous areas of the country, generally cultivated under an environmental friendly (mostly organic) management systems and that LR are maintained because of these positive traits and of traditional use. Some LR of emmer (e.g., 'Farro della Garfagnana' and 'Farro di Monteleone di Spoleto') have quality marks awarded by the European Union (Protected Geographical Indication and Protected Designation of Origin, respectively) and this increases the added value of emmer products and protects both consumers and producers.

Presently farmers make good profits from the crop which is sold at a good price on the market (the emmer business is about 2 millions of euro in Italy). This contributes to maintaining people in the country and then to the conservation of the local environments. Notably the maintenance of the crop has stimulated many innovations at the level of harvest processing and product development. New equipments and new products were invented by the farmers. This demonstrates that conservation on-farm is not just the maintenance of old uses and traditions, but that it may also be innovation.

M. Dimitrijevic (Faculty of Agriculture, University of Novi Sad, Serbia) asked about the motivations that encourage farmers to grow emmer instead of improved varieties of wheat.

R. Torricelli answered that emmer is grown because of organoleptic qualities, good profit and traditional use. Because of harsh conditions, the improved varieties of wheat give poor results in those mountain areas.

4.5.4 Landrace diversity of cereals for organic and low input agriculture

Presented by Rudolf Vögel

R. Vögel (Brandenburg State Office of Environment, Health and Consumer Protection, Germany) offered interesting information on a reintroduction project of cereals carried out in the German biosphere reserve Schorfheide-Chorin and through a farmer network. LR were extinct early in the area, so gene banks were asked for LR and old cultivars.

About 400 were tested and a choice for reintroduction was made on the base of the traits farmers considered most valuable across years (1995–2010). Presently 30 LR and old cultivars are successfully managed by the farmers in and outside the biosphere reserve and are source of income, others are considered of potential interest and a small percentage of interest for demonstration gardens. In wheat, although grain yield of the reintroduced materials is relatively lower, straw yield is higher than that of modern cultivars under low input conditions. As for rye, the old cultivar 'Norddeutscher Champgnerroggen' is the most suitable to the Brandenburg environmental and management conditions. It shows early ripening, enormous height, competitive yield (equal to modern varieties under low input) and high baking value traits that make it highly valued locally. Barley LR are superior for brewery traits and the taste of beer they make.

The experience maturated show that LR and old cultivars have a role to play in low input agriculture not only for the competitive yield under low input conditions and good quality of the products, but also because they bring a special value to the protection of nature and elicit the local agro-touristic business. In addition the rescue activity carried out improved the availability of not uniform materials for farmer use, improved the general farmer knowledge and advise exchange level, elicited the repair of disrupted product handling (farmer-mill-baker, farmer-malt factory-brewery) otherwise lost. In other words it had a positive effect also on the cultural and social level of the farmers involved.

4.5.5 Linking LR diversity to conventional and participatory breeding

Presented by Michael Ambrose

M. Ambrose (John Innes Centre, Norwich, UK) examined the points of difference between conventional and participatory breeding, the role of gene banks as facilitators in making available materials and information to the potential users and stakeholders of genetic resources and some case study.

He noted that while conventional breeding is mostly aimed at improving specific traits, obtaining cultivars with uniformity, stability and high production level and mostly uses already obtained cultivars as the base for further improvements, participatory plant breeding mostly asks for local or regional provenances as a basic material for the breeding work. These show local adaptation and often specific features which are valuable to the farmers.

Gene banks act as facilitators in providing germplasm and related information through a range of mechanisms that work on the short, medium or long period. Especially ancillary information and characterization data are critical for uptake of a certain accession to breed from it. In some cases a gene banks can also carry out pre-breeding or germplasm enhancement to satisfy the needs of a breeding programme. Some examples of characterization and evaluation studies which gave interesting information for breeding work were presented which focused on pea.

Finally M. Ambrose presented the work carried out at the John Inns Institute on heritage wheats which, beside characterization and evaluation work, includes maintaining demonstration fields for farmers interested in reintroducing them.

He concluded that to create LR NIs is just the first part in the pathway of conserving LR and old cultivars in agriculture. There is the need to use them widely to preserve diversity on-farm. Gene banks have an important role to play as facilitators of the process.

4.6 Development and implementation of national LR conservation strategies by the ECPGR network members

4.6.1 Use of National Inventories for defining the most appropriate conservation areas MAAs

Presented by Valeria Negri

V. Negri made available to delegates a strategy to identify areas that are rich in biodiversity where to locate safeguard actions with priority through a holistic approach (Negri *et al*., 2012).

Once LR are inventoried and georeferenced, the country area is (artificially) subdivided in squares (as superimposing a grid to the country). In each subdivision, the LR density, diversity in terms of species and evenness, diversity of agricultural systems (taking advantage of the CORINE land use map) and

presence of PA data can be worked out. Each square is then ranked on the basis of the maximum level of the above mentioned characters. The top ranked areas are the richest in terms of agrobiodiversity and deserve special attention when setting conservation strategies. An example is reported that concerns central Italy.

The approach described can be easily applied to the whole of Europe because the CORINE land use map (which is available online for the entire European territory through the European Environment Agency website), as well as the main PA locations, are available for the entire area. However basic data on LR location are needed and must be recorded when inventorying LR.

4.6.2 Taking forward the national LR conservation strategies: procedures and responsibilities

Presented by Merja Veteläinen

The preparation of a conservation and use action plan was then reviewed by M. Veteläinen. She also addressed the responsibilities at national and/or European level. Each country is responsible for LR inventory, LR and farmer survey, *in situ* and ex situ conservation, sustainable use of plant genetic resources and integration of conservation plans into national and regional action policies. However, an integration of different activities and policies is needed at European level and projects like AEGIS and PGR Secure operate to facilitate this integration.

In developing of effective means for systematic *in situ* conservation of LR more efforts should be dedicated by each state member to raise awareness among conservationists on the importance of on-farm conservation. However the ECPGR On-farm Working Group has a role to play on the topic. At the national level appropriate management strategies should be developed, an enhancement of the farmer management of LR should be pursued and on-farm conservation and management of LR should be integrated in a system that promotes LR use.

At European level it is necessary to agree on protocols for assessing LR threat status (according to the model of the IUCN Red List Criteria) may be taking advantage of already existing example such as that reported here for the Lazio Region in Italy.

It is also necessary to develop methods to assess impacts of climate change on LR which is a task for the research at European level.

Immediate targets to be pursued and achieved are reported in Table 1.

Table 1. Taking forward LR conservation strategies: targets and responsibilities

Target	**Responsibility level**	
	National	European
Create national and European priority LR lists and identify priority sites for on-farm conservation	X	X ECPGR: Establishment of European on-farm conservation network
Establish a European mechanism/clearing house		X ECPGR: common LR descriptors
Establish protocols for LR information management and dissemination		X Inclusion of the LR suitable descriptors in EURISCO
Ensure public awareness, effective security and legislative protection for European LR	X	X EU level regulations require European level coordination
Promote sustainable use	X	X Develop novel approaches for characterization and evaluation of LR diversity

5.0 WORKING GROUP 3: CWR AND LR INFORMATION MANAGEMENT

In the absence of Siegfried Harrer, who was unable to attend, Theo van Hintum introduced the session, the overall aim of which was to outline the current status of *in situ* and on-farm NIs, as well as to discuss on data types, data standards and data availability.

5.1 Introduction

It was reminded that comprehensive documentation of PGRFA is key for the efficient conservation and use of these resources. This is also reflected by the international legal framework in which the PGRFA conservation operates such as the CBD, the ITPGRFA and the Second GPA, all containing provisions for comprehensive documentation of the national genetic resources (e.g., Article 17, 'Exchange of Information' of the CBD and Article 17, 'The Global Information System on PGRFA' of the ITPGRFA) bind contracting parties to develop and strengthen information systems on PGRFA globally.

On the European level there are also some regulations/directives with some relevance for PGRFA documentation such as:

- COUNCIL REGULATION (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) (Article 39 Agri-environment payments "….Support may be provided for the conservation of genetic resources in agriculture….").
- COMMISSION DIRECTIVE 2008/62/EC providing for certain derogations for acceptance of agricultural LR and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion and for marketing of seed and seed potatoes of those LR and varieties (…conservation varieties…).
- COMMISSION DIRECTIVE 2009/145/EC providing for certain derogations, for acceptance of vegetable LR and varieties which have been traditionally grown in particular localities and regions and are threatened by genetic erosion and of vegetable varieties with no intrinsic value for commercial crop production but developed for growing under particular conditions and for marketing of seed of those LR and varieties (…conservation and amateur varieties….)

Any national or regional information system for PGRFA conserved in gene banks or managed *in situ*/on-farm will have to take into account the aforementioned international policy framework especially with regard to its scope and to the quantity and quality of the data (i.e., only PGRFA regarded as forming part of the national PGRFA system have to be included).

5.2 Current status of the European PGRFA documentation landscape and the specific role of National Inventories

In Europe the ECPGR provides the relevant platform for collaboration on PGRFA. For documentation issues the main elements of ECPGR are the *In situ* and On-farm Conservation Network and the Documentation and Information Network and the EURISCO web-based catalogue. EURISCO provides information about over 1.1 million accessions of crop diversity conserved *ex situ* in 41 European countries. It is based on the well-developed PGRFA documentation systems at the institutional and national levels and its transparent approach with clear responsibilities at the national and European level. Core elements at national level are NIs. Stakeholders (gene banks, research institutes, farmers, NGOs) maintaining PGRFA provide the NFP for the NI with data using agreed standards for data exchange (EURISCO Descriptors). The NFP will then use these data to form the respective NI and upload these data to EURISCO. Following the example of EURISCO for the compilation of *ex situ* NI data, the ECPGR Steering Committee agreed in December 2010 that *in situ* and on-farm NIs should also

be compiled into EURISCO in the near future. The role of the NIs in the comprehensive documentation of national PGRFA *ex situ*, *in situ* and on-farm data should therefore be outlined. Documentation has to be done with sufficient control of the content and quality of the data at the respective levels. While the data provider at the institutional level should have full control and responsibility for the quality of their data, the NFP will have the responsibility to compile in the NI only data on accessions being part of the national PGRFA system. This is even more important since the NI is also defining the scope of any National Programme on PGRFA. A clearly defined scope will be crucial for any efficient implementation of measures not only as part of the National Programmes, but also regarding obligations arising from the international level (e.g., second GPA). In this regard, it will be more and more important that the documented PGRFA will also be compliant with the aforementioned European legislation in order to make sure that there is a common understanding on what are endangered PGRFA *in situ* and on-farm. This will not only be crucial to better harmonize the resources available at national and European level for the conservation and use of these resources, it will also be relevant for a transparent and consistent common European reporting procedure in the future (not only to EURISCO, but also in framework of the CBD and the ITPGRFA).

5.3 Country presentations

All the participants in the working group briefly introduced themselves. Presentations on the situation of the respective *in situ* and on-farm NIs are summarized below.

Albania

Belul Gixhari reported that there was no CWR inventory available in Albania, but three parts of an 'Albanian Flora' had been published. A national strategy to assess the threat status of CWR taxa and the conservation needs had not been developed yet. A number of laws are dealing with biodiversity, the environment, forest trees, medicinal plants and protected zones, but they are not specifically related to *in situ* CWR and on-farm LR. The preparation by the Albania Gene Bank of preliminary lists of *in situ* CWR and on-farm fruit tree LR was planned for 2011. The gene bank was set to organize explorations and collection missions during 2011 and to begin studies related to the assessment of CWR diversity, *in situ* CWR data management and evaluation of genetic reserves within existing PAs.

Armenia

Marina Hovhannisyan presented the status of NIs *in situ* and on-farm in Armenia. The flora of Armenia is extremely rich and includes species with large potential and practical value. There are more than 3500 species, of which 180 are endemic. More than 400 rare and disappeared species are included in the Red Book of Armenia. CWR also are very abundant. Recent achievements related to *in situ* conservation include the development and adoption of the Strategy on the Development of Natural Specially Protected Areas in Armenia and Action Plan (2003–2010), the development and approval by the government of the management plans for Sevan and Dilijan National Parks, the development of digital maps and the inventory of biodiversity for two national parks and the updated Armenian Red Data Book (2011). The UNEP/GEF-funded project '*In situ* conservation of crop wild relatives through enhanced information management and field application' in Armenia has been carried out in 2004–2009. The project developed a list of CWR species and of wild edible plants and established a management plan for the Erebuni State reserve. The Armenian CWR Information system (http://cwr.am/) was also developed, including species name, common name, synonyms, distribution maps, red list assessment, current population trend, threats, conservation actions and utilization information. On the other hand, on-farm management related activities are limited owing to lack of stakeholders' awareness concerning on-farm and no steps towards the creation of an on-farm

inventory are currently being undertaken. Needs and priorities for the future remain the establishment of a database for *in situ* wild relatives and of a database for LR and old traditional varieties of crops, including information on traditional knowledge. Information exchange, technology transfer and capacity building, management, conservation and use of plant genetic resources on-farm are also recommended.

Czech Republic

Iva Faberova presented the status of *in situ*/on-farm PGR documentation in the Czech Republic. *In situ* documentation of CWR and LR at the national level has not been developed yet. *Ex situ* conserved orthodox seeds CWR accessions are documented as a result of collecting missions. 1802 accessions were collected from border areas and these can be a starting point for *in situ* documentation. It should be noted that not all collected materials are included in the NI. Regarding LR, exceptional conservation types, such as local fruit trees have been reported as a result of various projects. Information is available from printed reports and articles, while no central database or standards exist. A starting point for a LR NI is the set of 617 *ex situ* documented LR of domestic origin. These are however usually not collected in the fields or local markets and therefore original geographic documentation is generally missing. Vegetatively propagated long-term plantations are more suitable for being recorded as conservation units. *In situ*/on-farm documentation and conservation present various challenges, when compared to the consolidated sustainability of *ex situ* conservation, documentation, characterization and evaluation, which are carried out by National Programme's partners. Documentation standards are not available, while conservation conditions are constantly changing and are implemented by actors that are beyond the control of the National Programme.

Hungary

Attila Simon reported on the status of NIs on *in situ*/on-farm PGRFA. At the moment, the NI includes only the accessions maintained and preserved by the Research Centre for Agrobiodiversity at Tápiószele (RCAT). A survey has been carried out by the RCAT in cooperation with the Ministry of Rural Development, aiming at inventorying all the existing collections and accessions conserved in Hungary. According to preliminary conclusions, more than 80,000 accessions of PGRFA (forest species excluded but microorganisms of agricultural importance included) are maintained in *ex situ* collections in Hungary. This survey has allowed pointing out that very valuable fruit collections containing old varieties and LR exist. NGOs, civil organizations, farmers and gardeners have an increasing role in the maintenance of LR. The collection, preservation and maintenance of CWR have been targeted only in a few cases. Although the LR and CWR are a very important part of the NI, they have not yet been documented in separated, well-structured and detailed specific inventories. Moreover, only a limited collection data set, corresponding to the MCPD is available at the moment, in spite of the fact that a lot of information related to the collected samples and their habitats is available in printed form, but not in a standardized form. Such information covers the description of the collecting mission, the description of the collection site and the description of the material (taxonomy, quantity, isolation, local names, usage and all kinds of cultural, traditional and nutritional information related to the samples). The GRIN-Global gene bank documentation system is expected to provide an effective tool for developing NIs on on-farm and *in situ* conserved germplasm, complemented with all information related to the abovementioned collected samples. The *ex situ* NI contains 992 unique accessions of CWR collected in Hungary, mainly grasses (697), cereals (141) and forage legumes (122). These data, when complemented with those of the collections of the LIFE+ Pannon Seed Bank project, will form a

comprehensive inventory of CWR. The *ex situ* NI also contains 9857 unique accessions of LR and ecotypes originated in Hungary (2881 food legumes, 2330 vegetables, 1538 cereals, 1018 industrial crops, 1001 grasses, 944 forage legumes and 145 others). Based on earlier experiences with a 'backyard multiplication system' that was established for isoclimatic regeneration of native LR, a new on-farm conservation network is now being established with the participation of civil organizations, local farmers' associations, farmers and gardeners. The new on-farm network will provide a relevant basis for the development of the NI of LR.

Ireland

Noel Collins presented the status of Ireland's *in situ* PGRFA NI. While there was a limited focus on CWR/LR before 2008, the production of the second National Report on the State of PGRFA in Ireland, highlighted knowledge gaps. During a National GR Forum held in late 2008, interested stakeholders resolved to help assist addressing CWR knowledge gaps. The Department of Agriculture, Fisheries and Food (DAFF) has then grant aided these two bodies to carry out targeted work in CWR via a National Genetic Resources Grant Aid Scheme. Funding has been prioritized in addressing CWR knowledge gaps in the last 3 years. In 2009 a CWR project was funded for the production of a priority list of CWR for Ireland by Genetic Heritage Ireland. The entire Irish flora was scanned for CWR, resulting in a list of 181 species. From this, a priority list of 30 species was produced, based on four criteria (Annex 1 ITPGRFA listing, conservation status, current economic value and economic potential). In 2010 a project was funded for the establishment of a National CWR Database by the recently established National Biodiversity Data Centre (NBDC). A different approach to the 2009 project was adopted in establishing a priority list as NBDC focuses on *in situ* conservation. A list of 102 CWR species based on Annex 1 of the ITPGRFA was created and a National Crop Wild Relative website was established, including information on CWR at national and international level (http://geneticresources.biodiversityireland.ie/crop-wild-relatives/). Individual species profiles have been created, containing information on their geographical distribution, which was extracted from the Botanical Society of the British Isles (BSBI) database. Additional data were specifically sourced for 55 of the 102 CWR species that are less widespread in Ireland (<100 ha). Information sources ranged from herbarium folders in botanic gardens to the Department of Environment's threatened species database. A separate web portal for these 55 species has been set up at http://maps.biodiversityireland.ie/. In 2011 a project was funded for recording of CWR from key under-recorded areas by NBDC. The Project had two principle aims: collecting new CWR records from five key under-recorded sites and formatting these data to the EURISCO template and adding these data to the aforementioned National CWR Database. In summary, the development of CWR NI is still at an early stage in Ireland. Further targeted recording is needed to improve knowledge of species distribution. A key knowledge gap is the absence of an up-to-date plant Red List, which will be useful to produce a definitive list of priority CWR species for *in situ* conservation.

Latvia

Anita Gaile specified that at the moment Latvia does not have an *in situ*/on-farm inventory. All CWR collections are maintained in *ex situ* collections.

Poland

Marcin Zaczynski referred that passport data of Polish endangered and protected CWR species were available online. He mentioned the conservation of a local LR/variety of Plum (*Prunus domestica*) in the Vistula valley, which is grown in old orchards and is used for a traditional jam production. A project on a model enclave of agricultural biodiversity at the Nidziańska Basin aimed at the protection of whole agro-ecosystem, *in situ* conservation of weeds and on-farm conservation of cereals and accompanying species, but the project was discontinued. Generally, on-farm conservation mostly consists in the maintenance of orchards with fruit trees and the related passport data are available online.

Romania

Neculai Cristea reported that digitized on-farm data for 5987 Romanian records are available. These data were gathered while collecting throughout Romania. Most samples have been recorded from sub-alpine or alpine areas, where old populations have been preserved and are still grown. Specific on-farm descriptors have been used, recording accession number of the collected samples, taxonomic information, type of user, including their social class and age, data on the level of distribution of the accessions, frequency of cultivation and agronomic practices. The reasons for choice of the variety, selection criteria, methodology of conservation and type of use are also recorded.

Spain

Lucia de la Rosa expressed the Spanish position regarding the creation of inventories for on-farm LR. The Gene bank Network's NI of the Spanish Programme for Conservation and Utilization of PGRFA includes passport data from all the collections in the Network. This database, established online and based on the IPGRI/FAO MCPD, includes the field 'type of material' whereby code number '300' identifies local varieties maintained in *ex situ* conditions. It was believed that the creation of a NI of LR held in on-farm conditions according to the criteria discussed in the meeting was unrealistic in Spain for the time being. The diversity of structures and agricultural systems in Spain is far too broad to be tackled in a short period of time. Hence, at present, the closest instrument to an inventory of on-farm LR would be the list of vegetable products covered by regulations establishing 'geographical indications of origin', such as 'Jerte' cherries or 'Vinalopó' grapes. Other Spanish products protected by such systems can be found at: www.marm.es/es/alimentacion/temas/calidad-agroalimentaria/calidad-diferenciada/dop/htm/cifrasydatos.aspx#para3.

In addition, in Spain, a number of regions (Comunidades Autónomas) such as Andalucia, Balearic Islands, Canary Islands, Catalonia, Galicia, Murcia, Basque Country and La Rioja, have established systems of agro-environmental grants, normally associated with organic agriculture and the cultivation of local LR, which could also serve as a base for the creation of an inventory of local varieties maintained in on-farm conditions.

Switzerland

Christoph Köhler presented the status of NIs on *in situ*/on-farm PGRFA in Switzerland. The Swiss CWR inventory has identified 2749 taxa, of which 1447 are considered most relevant as PGRFA and 143 were identified as a priority list. These priority species belong to aromatic and medicinal plants (47%), forages (28%), fruits and grape (11%), vegetables (6%), berries (4%) and agricultural crops (4%). A pilot project was carried out to inventory and conserve the *in situ* habitat (grassland and pasture) of ecotypes from forage crops and the region 'Northern Foothills of the Alps' has been inventoried. Another project aimed to find and describe wildcat pear in two regions of Switzerland was started in

2011. A database for *in situ* data of forages has been prepared to implement the Swiss concept for the *in situ* conservation of forages. This is based on and is integrated in the national *ex situ* inventory (www.bdn.ch). The concepts were developed by the national Working Group on forages of the CPC (Swiss Commission for the Conservation of Cultivated Plants). The input data derive from farmers' questionnaires, GPS, other site data and botanical surveys. For each site, two lists are stored in the database, a list of site data and a list of species occurring at the site (www.bdn.ch/search/map/?search_in=lst&list_type=speclist). A total of 109 descriptors were developed for the site data. Regarding LR, they are conserved *ex situ* and no projects exist for on-farm conservation. Many LR are cultivated/conserved on-farm and are sold in the market. Some LR are protected with the label 'AOC' (controlled designation of origin).

Turkey

Lerzan Aykas outlined the PGR National Programme of Turkey, which is coordinated at the national level by the Aegean Agricultural Research Institute (AARI). She reported on a national project on *in situ* conservation that was carried out between 1993 and 1998, focused on cereal and grain legume CWR, wild fruit and forest tree species, on-farm LR and endemic species under threat. As a result, genetic management zones for CWR were designated and inventories were prepared. A national plan for *in situ* conservation of plant genetic diversity was developed, as well as institutional capacity within and between relevant ministries. Regarding LR, ecogeographical surveys and inventories were carried out, as well as socio-economic surveys, agro-morphological studies, genetic analysis, distribution maps and definition of on-farm conservation sites. Regarding endemic species, a NI of Important Plant Areas (IPAs) was published in 2004. A UNEP/GEF Project was also subsequently implemented, aimed at Design, Testing and Evaluation of Best Practices for *in situ* conservation of economically important wild species. A comprehensive database system has been developed, providing a Plant Diversity Atlas. This is linked to other related databases and can manage spatial data through a GIS. Distribution of CWR is therefore available on maps, including their geographical variation of agro-morphological traits.

6.0 PLENARY SESSION 2

6.1 Working group reports and discussion

6.1.1 Working group 1: CWR conservation

The WG1 rapporteur summarized the main topics covered during the session and highlighted some key issues arising. Major strengths and weaknesses related to the development of CWR conservation strategies in Europe were identified.

Developing a European CWR conservation strategy

CWR conservation strategy approaches were reviewed:

- Individual PA, national, regional, global
- Inside/outside PAs
- Holistic approach

CWR Inventories: the backbone for conservation and use

- Different approaches to creation of a CWR NI were evaluated.
- The CWR Catalogue for Europe and the Mediterranean (v. 4.0) is under development. It will include revised data from Euro+Med PlantBase and some adjustments to the methodology will be implemented. The addition of a link between the CWR and the type of crop use will be a major improvement.
- Arguments in favour of being inclusive in the creation of a CWR NI (e.g., use of exotic species in plant breeding) should not be discarded. However, a very inclusive list may make it not significantly different from a national flora checklist.
- Problems derived from changes in nomenclature and existing synonymies need to be addressed.

CWR prioritization

- The main criteria for prioritization are: priority crops, potential use and relative level of threat.
- Once crops are prioritized, how much weight should be put into the criteria concerning potential use and relative threat?
  - Select taxa of potential use (GP1B and 2, and GP3 if they are known gene donors or have been identified as potential gene donors) that are threatened (restrictive approach)
  - Select taxa of potential use and rank them according to relative level of threat
  - Select taxa of potential use and threatened taxa (most inclusive approach)
- Take into account transboundary distribution when assessing threat factors. Coordination and collaboration between neighbouring countries is recommended.
- Simultaneous use of different variables that measure the same criteria may artificially inflate some criteria.

- Important to work together with the stakeholders (plant breeders, scientists, other end users) in the process of prioritization.
- It is important to view priorities as working hypotheses that can be constantly updated.
- Flagship CWR species could be used to promote CWR conservation in the different countries.
- It is important to pay attention to the infra-specific levels throughout the process of prioritization, as well as in *in situ* and *ex situ* gap analysis.

CWR diversity and gap analysis

- Process of *in situ* and *ex situ* gap analysis discussed, including applications of ecogeographical and genetic diversity analysis.
- The use of ecogeographical data and neutral variation genetic data were compared and discussed through the example of white clover, and that stirred a discussion on the pros and cons of these approaches.
- A recent initiative to undertake IUCN Red List assessments of a sample CWR of high priority crops provides a comprehensive account of the threat status of European CWR. There is an urgent need to obtain additional information for those classified as Data Deficient.
- The development of a methodology to assess genetic diversity loss and species threat using genetic criteria was discussed.

CWR conservation data management

- There is a need to provide an information management system for *in situ* CWR conservation that would be equivalent to the *ex situ* accession information system. The link between both is a taxon occurrence and there is a need to define what an *in situ* accession is.
- CWRIS and Bioversity CWR descriptors should be taken into account when deciding upon the establishment of an information system within EURISCO dedicated to *in situ* accessions of CWR.
- Additional thoughts and proposals are needed in relation to the development of the Trait Information Portal within PGR Secure.
- An information system that helps the user go from the initial draft national CWR checklist extracted from the CWR Catalogue for Europe and the Mediterranean to the final CWR NI or even the reduced list of priority CWR species would be desirable. This should accommodate the information used as filter or ranking criteria.

Development and implementation of national CWR conservation strategies by the ECPGR network members

- PGR Secure offers a helpdesk facility to assist all those countries interested in developing national strategies.
- Different possibilities for funding the development of national CWR conservation strategies were discussed. What is being sought at this stage is the design of the strategy, not its implementation.

- National CWR conservation strategies can be developed in a flexible way adapting to available funding.

Major strengths

- A conceptual framework for the establishment of a national CWR conservation strategy has been published.
- The PGR Secure helpdesk and an FAO Agrobiodiversity Toolkit are available to assist policy-makers and practitioners in the process of establishing a national CWR conservation strategy.
- The comprehensive CWR Catalogue for Europe and the Mediterranean has been filtered out for each country as a starting point for the creation of CWR NIs.
- Flexibility to create CWR NIs and national CWR conservation strategies adapted to each country's needs.
- Shared views on the relevance of crop importance, potential use and threat as the three main criteria for prioritization.
- List of gene pool concepts developed for priority genera available online (www.cwrdiversity.org/home/).
- Well-established methodology of *in situ* and *ex situ* gap analysis with scalable levels of complexity depending on the needs and available resources.

Major weaknesses

- The flexibility to create CWR NIs and national CWR conservation strategies adapted to each country's needs can be a major weakness when trying to standardize, build a common policy for Europe, or make comparisons between countries.
- Using the same prioritization criteria, the application of different methods of scoring can lead to different sets of prioritized species. Working on consensus species obtained from the use of different scoring methods is a possible solution, but the whole process is complex and may be difficult to implement in many countries.
- Need to clarify ideas on what is needed to have a CWR *in situ* accession information system equivalent and running in parallel to the existing *ex situ* component within EURISCO.
- Need to clarify ideas on what is sought in the establishment of the Trait Information Portal.

6.1.2 Working group 1: CWR conservation – discussion summary

CWR prioritization

- It was suggested that a list of global priority crops could be provided in the PGR Secure helpdesk. It was noted that a list is already available (see www.cwrdiversity.org/home/).

Funding

- In the UK, PGRFA conservationists have been lobbying for eight years for funding to develop a UK LR inventory. We need a list of policy drivers that will persuade governments to provide the money

needed. Guidance is needed to identify national obligations and how to take them forward. This could be provided as a component of the PGR Secure helpdesk.

- The suggestion to write a letter to NCs outlining achievements in this workshop and setting the context in terms of obligations under various policy instruments was discussed. It is the responsibility of NCs to approach the appropriate national authorities.
- The EU is a party to the ITPGRFA. Could be used as justification for funding.
- The PGR Secure EC Project Officer was asked whether funding might be available to support the PGR Secure final dissemination conference but we were informed that there is no funding available.
- ECPGR supports the development of national CWR conservation strategies via the networks. However, *ex situ* conservation is still the main focus of ECPGR. It was noted that perhaps the ECPGR Steering Committee has put aside *in situ* conservation as funding has been forthcoming in the context of projects such as PGR Secure. However, ECPGR can continue to lobby the EC for funding.
- The current economic situation is a limiting factor for governments—they are saving money on National Programmes. We need higher level pressure/support (e.g., a politician from the EC).
- How much money is needed? The cost to develop the national CWR conservation strategy in Spain (as a component of the PGR Secure project) is equivalent to 24 person months. In Finland, the cost is equivalent to eight person months. All that is needed in each country is a commitment to the time to undertake the work. The time needed depends on the number of priority species and complexity of the diversity analysis undertaken.
- Are there alternative approaches (e.g., start with European approach and cut it into pieces to inform national strategies?) A top down approach is not desirable. We need both a bottom up and top down approach combined. A transboundary approach (which means a European level approach) is needed but the national approach is also needed as countries have national obligations to conserve their PGRFA and it is at national level that resources will be mobilized (not European).
- A budget is only needed to contract one researcher. It would be beneficial to explore potential ties with a university. There are highly skilled students finishing their studies who may want to study for a Masters—the student pays fees to the university so there is little or no cost to the National Programme.
- It was suggested that approaching private companies for funding could be an option; for example, in Portugal there is a private company funding *ex situ* activities.

6.1.3 Working group 2: LR conservation

The WG2 rapporteur summarized the main topics covered during the session and highlighted some key issues arising. Major strengths and weaknesses related to the development of LR conservation strategies in Europe were identified.

LR Inventories: the backbone for conservation and use

- A training session on LR definitions, LR direct and indirect use in agriculture, LR genetic makeup and a possible structured activity of *in situ* (on-farm and in garden) LR conservation opened the session.

- Most of the LR still grown *in situ* are in need of urgent safeguard. It was stressed that farmers are the main actors in maintaining LR and that the role of the Public Authorities can only be that of promoting, organizing, coordinating, monitoring and giving technical and economic support to *in situ* conservation.

- The group discussed the meaning of the term 'landrace' of which there is a different understanding in different contexts. It was noted that very few LR that have been continuously cultivated by generations in the same area are present in some countries (e.g., Poland), as far as it can be presently estimated. It could be then worthwhile also to record old cultivars reintroduction activities or those activities that are aimed to develop new LR. This also in the light of the present EC legislation on conservation variety seed marketing (under the name of 'conservation variety' old cultivars, ecotypes, amateur materials etc are listed whose seed can be commercialized).

- Aims, prospect and importance for developing national and European inventories of LR were outlined. Delegates agreed that the inventory is the basic information needed to develop any action or strategy for LR safeguard at country and European level. However, they also expressed concern on financial resources that can be possibly dedicated to the inventory task in each country. It seems that very few countries have presently a coordinated plan and dedicated resources to create inventories. It was also stressed that no country has a complete inventory of LR at present.

- LR inventory methods were also reviewed with reference to *in situ* conservation activities. The needed steps to be taken (reaching and contacting the maintainers, collecting data and samples for *ex situ* safety backup, verification of origin and feed back to maintainers) were presented and available sources of information reviewed.

- Special attention was deserved to ways of approaching farmers. Examples of how to reach and gather information on LR were given with reference to those countries that have already initiated this work (Finland and Italy).

- Gap analysis aims and methodology were also presented.

- Finally, an ecosystem (holistic) approach to identify most suitable areas where to set conservation actions was made available to delegates.

Generating LR National Inventories: data collection and availability

- Data concerning LR that have to be recorded in order to build up national and European conservation strategies were reviewed and discussed.

- An agreement was found about a minimum set of descriptors that are needed for the PGR Secure aims (e.g., to draw a conservation strategy for the focus crops of the project), while other descriptors need to be added to this set to serve the purpose of a European inventory.

- Delegates agreed to make it available data to PGR Secure, whether financial national resources will allow their recording. The list of data to be recorded, as well as the data format, will be made available to national delegates by PGR Secure.

- To create a European LR inventory was considered to be of utmost importance and could be possibly realised within the frame of ECPGR in the future, taking as an example, and following the frame of, EURISCO (the web catalogue that receives data from the NIs, and provides access to all ex situ PGR information in Europe, http://eurisco.ecpgr.org/). The latter set of descriptors can be further worked out involving the ECPGR Documentation working group.

- PGR Secure will provide technical and scientific support for data recording through its helpdesk.

LR characterization and threat assessment

- LR morpho-physiological characterization is needed to verify origin and identity. Economic resources are needed for the public authorities in charge of planning and organizing safeguard actions and for farmers to continue cultivation. Resources are also needed to enhance the market value of product obtained from LR (for example by certifying their quality and their origin with marks like PDO), which enhances their possibility of surviving, and to market LR seed (as conservation variety seed as allowed by 2008/62/EC, 2009/145/EC and 2010/60/EU Commission Directives whether they are under threat in their Region of origin). It is then necessary to allocate the (usually limited) resources properly—only to those LR that are unique (distinguishable from other LR or cultivated materials in general) and have a clear origin, hence a detailed characterization is required. Sound characterization procedures and methods were reviewed with reference to real examples.

- How to assess threat by using standard procedures and reliable indicators was also presented making reference to the only scheme presently available (e.g., the Lazio Italian Region example).

Linking LR conservation to use

- The continued use and farmer management of LR was acknowledged as the only means of *in situ* conservation.

- What motivates LR maintainers in Europe was reviewed through examples coming from different European countries.

- The cultural, traditional, economic and niche values that maintainers attribute to their LR and LR products is the 'lever' to be used to enhance LR use and then allow their continued maintenance *in situ*.

- Rising interest in growing LR and dissemination of information related to LR maintained *in situ* must be pursued to favour LR *in situ* conservation.
- The reintroduction of LR on-farm to develop new farming systems/new material for breeding work as a mean to favour a wider *in situ* conservation was also mentioned.
- Linking LR diversity to conventional and participative breeding is also a mean to increase *in situ* conservation of useful genetic diversity.

Development and implementation of national LR conservation strategies by the ECPGR network members

- Each country is responsible for LR inventory, LR and farmer survey, *in situ* and *ex situ* conservation, sustainable use of plant genetic resources and integration of conservation plans into national and regional action policies.
- Considered the high diversity of crops and of environmental, cultural and socioeconomic situations present in Europe, the different needs of each single country (some countries need to preserve the remnant LR, others to reintroduce LR from gene banks), and that each single country is responsible for the conservation of its own genetic resource, flexibility in drawing conservation strategies must be allowed.
- However, an integration of different activities and policies is needed at European level and projects like AEGIS and PGR Secure operate to facilitate this integration.

Major strengths

- It was agreed that the inventory is the basic information needed to develop conservation strategies.
- It was agreed that to build up NIs is an urgent matter.
- It was agreed the minimum set of data that is to be recorded in building up inventories.
- The PGR Secure helpdesk is available to assist policy-makers and practitioners in the process of establishing a national LR conservation strategy.
- Flexibility to create LR NIs and national LR conservation strategies adapted to each country's needs was also considered as a strength point.
- Already developed methods to compile LR inventories, characterize LR, evaluate the risk of extinction/genetic erosion LR are running and promote LR use were presented in a wide panorama of cases so to be possibly applied in different situations and useful in different countries.

Major weaknesses

- Lack of financial support for building up each European country LR inventory was outlined as a major weakness.
- The flexibility to create LR NIs and national LR conservation strategies adapted to each country's needs can also be a major weakness when trying to standardize, build a common policy for Europe, or make comparisons between countries.

6.1.4 Working group 2: LR conservation – discussion summary

Landrace National Inventories

- It was noted that the countries are keen to undertake LR inventories but that funding the work is a limitation (see discussion on funding national LR conservation strategies under 2.2.3).

- It was also emphasized that for LR, only basic inventorying is expected. There are no complete LR NIs yet and the methodology for planning a national LR conservation strategy still requires more work. For LR, it is more difficult to develop a comprehensive strategy than it is for CWR as the information is not so readily available and *in situ* LR conservation requires the collaboration of many different people (i.e., the LR maintainers).

- It was noted that three countries have funding to develop LR NIs during the PGR Secure project—Finland, Italy and the UK.

- The issue of agreeing on a definition of a LR was raised. There was no consensus during the workshop so individual nations will interpret the definition in varied and broader contexts. However, it was stressed that we have a working understanding of how to take forward LR inventories in PGR Secure using an agreed definition.

Landrace descriptors

- It was noted that an agreed set of minimum descriptors that can be applied in all countries is needed in order to take forward LR NIs.

- The ECPGR Documentation and Information Network has offered to review and revise the minimum and extended descriptor lists.

- It was noted that two groups have been set up in the context of the PGR Secure project by Bioversity to develop CWR and LR ontologies. These groups should include members from both the ECPGR *in situ* and on-farm conservation network and the Information and Documentation Network. Anyone interested in being involved should contact Sonia Dias at Bioversity (s.dias@cgiar.org).

Other issues

- The issues of seed marketing legislation and the legislative context for farmers' rights were raised.

6.1.5 Working group 3: CWR and LR information management

The WG3 rapporteur summarized the main topics covered during the session and highlighted some key issues arising.

National Focal Point reports on CWR and LR information management

The NFPs briefed the meeting on the quality and quantity of on-farm information that they had available. Some of the key issues arising were:

- The majority of countries have no formal *in situ* or on-farm NIs or monitoring programmes; lack of funding at national level has hindered progress in this area.

- Very few countries have attempted to inventory LR in a structured way.

- Some countries have official lists of conservation varieties but these may not meet LR criteria.
- Information is available on LR in EURISCO—an estimated 250,000 LR accessions are currently maintained *ex situ*. There may be scope to extrapolate information from this source.

Development of LR descriptor lists

- The Documentation and Information Network has offered to review and revise the draft list of 25 LR descriptors so that it can be finally formally agreed; Bioversity has agreed to facilitate this process using its own staff resources.
- The group felt that any agreed list would need a minimum list of mandatory fields.
- A separate session is required to carry out this review.
- Once an agreed descriptor list is produced, a subset can be extracted for the purposes of PGR Secure project needs.
- The group agreed that the list of ten descriptors needed expanding upon for the PGR Secure project in order to maximize important data capture (e.g., 'unique identifier', 'in an *ex situ* collection', 'threat level'.

6.1.6 Working group 3: CWR and LR information management – discussion summary

Role of the ECPGR Networks in developing the CWR and LR conservation strategies

- The respective roles of the ECPGR *In Situ* and On-farm Conservation Network and Documentation and Information Network in the development of CWR and LR conservation strategies were discussed. It was emphasized that it is the responsibility of the members of the *In Situ* and On-farm Conservation Network to develop the CWR and LR conservation strategies and of the Documentation and Information Network to manage the data associated with the strategies and make them available to the user community. Collaboration on the development of LR descriptors is also needed. The need for more synergy between the two groups was acknowledged.
- A suggestion was put forward for the organization of a training workshop on ontologies. Biologists, conservationists and information technologists need to work together to agree on definitions of concepts.

6.1.7 Plenary discussion: understanding user community needs

The main issue discussed in this session was how to deal with commercial sensitivity when seeking information on the use of CWR and LR in plant breeding. It was noted that information is less likely to be forthcoming from large breeding companies; therefore, it is important to target smaller companies which are more likely to release information. It was stressed that in the PGR Secure project, we only want to gain an impression of the use of CWR by breeding companies— we want to ascertain what the limitations in the use of CWR and LR are and to propose ways of overcoming these.

6.1.8 Wrap-up

The PGR Secure Project Coordinator and Project Manager thanked the delegates for their participation in the workshop, giving special thanks to the rapporteurs for their contributions.

References

Anderson, E. and Cutler, H. C. (1942) Races of *Zea mays*: I. Their recognition and classification. *Annals of Missouri Botanical Garden* 29, 69–89.

Asfaw, Z. (2000) The barleys of Ethiopia. In: Brush S.B (ed.), *Genes in the Field*. *On-Farm Conservation of Crop Diversity.* IPGRI, Rome/IDRC, Ottawa/Lewis Publishers, Boca Raton. Pp. 77–107.

Barazani, O., Perevolotsky, A. and Hadas, R. (2008) A problem of the rich: prioritizing local plant genetic resources for *ex situ* conservation in Israel. *Biological Conservation* 141, 596–600.

Bilz, M., Kell, S.P., Maxted, N. and Landsdown, R.V. (2011) *European Red List of Vascular Plants*. Luxembourg: Publications Office of the European Union. http://data.iucn.org/dbtw-wpd/edocs/RL-4-016.pdf

Brush, S.B. (1992) Ethnoecology, biodiversity and modernization in Andean potato agriculture. *Journal of Ethnobiology* 12, 161–185.

Brush, S.B. (1995) *In situ* conservation of landraces in centres of crop diversity. *Crop Science* 35, 346–354.

Camacho Villa, T.C., Maxted, N., Scholten, M.A. and Ford-Lloyd, B.V. (2005) Defining and identifying crop landraces. *Plant Genetic Resources: Characterization and Utilization* 3(3), 373–384.

CBD (2002) *Global Strategy for Plant Conservation 2002–2010*. Secretariat of the Convention on Biological Diversity, Montreal, Quebec, Canada. www.cbd.int/decision/cop/?id=7183

CBD (2010a) *Global Strategy for Plant Conservation 2011–2020*. Secretariat of the Convention on Biological Diversity, Montreal, Quebec, Canada. www.cbd.int/gspc/

CBD (2010b) *Strategic Plan for Biodiversity 2011–2020*. Secretariat of the Convention on Biological Diversity, Montreal, Quebec, Canada. www.cbd.int/sp/

Cheffings, C.M. and Farrell, L. (eds.), Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D., Rumsey, F.J., Taylor, I. (2005) *The Vascular Plant Red Data List for Great Britain. Species Status* 7, 1-116. Joint Nature Conservation Committee, Peterborough.

CMP (2007) *Open Standards for the Practice of Conservation, Version 2.0*. The Conservation Measures Partnership. www.conservationmeasures.org

Costanza, M.T., Barbagiovanni Miracolo, I., Taviani, P., Paletti, S., Rea, R., Lelli, L., Garzia, J.H., Porfiri, O., Nardi, P. and Tanca, M. (2012) On-farm conservation of plant genetic resources in Lazio Region, Italy. Implementation of Regional Act 1st March 2000 N° 15. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.) *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. Pp. 161–172.

FAO (1996) *Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture*. Food and Agriculture Organization of the United Nations. www.fao.org/ag/AGP/AGPS/GpaEN/gpatoc.htm

FAO (2001) International Treaty on Plant Genetic Resources for Food and Agriculture. Food and Agriculture Organization of the United Nations. www.fao.org/ag/cgrfa/itpgr.htm

Ferguson, M.E., Ford-Lloyd, B.V., Robertson, L.D., Maxted, N. and Newbury, H.J. (1998) Mapping the geographical distribution of genetic variation in the genus *Lens* for the enhanced conservation of plant genetic diversity. *Molecular Ecology* 7, 1743–1755.

Flor, A., Bettencourt, E., Arriegas, P.I. and Dias, S.R. (2006) European crop wild relative conservation criteria – indicators for the CWR species' list prioritization. In: Ford-Lloyd, B.V., Dias, S.R. and Bettencourt, E. (eds.), *Genetic Erosion and Pollution Assessment Methodologies: Proceedings of PGR Forum Workshop 5, Terceira Island, Autonomous Region of the Azores, Portugal, 8–11 September 2004.* Pp. 83–87. Bioversity International, Rome, Italy.

Ford-Lloyd, B.V., Maxted, N. and Kell, S.P. (2008) Establishing conservation priorities for crop wild relatives. In: Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J., Dulloo, E. and Turok, J. (eds,), *Crop Wild Relative Conservation and Use.* Pp. 110–119. CAB International, Wallingford, UK.

Frankel, O.H. and Bennett, E. (1970) *Genetic Resources in Plants – their Exploration and Conservation*. International Biological Programme Handbook No. 11. Blackwell, Oxford and Edinburgh.

Friis-Hansen, E. and Sthapit, B. (2000) *Participatory Approaches to the Conservation and use of Plant Genetic Resources*. International Plant Genetic Resources Institute, Rome, Italy.

Harlan, J.R. (1975) Our vanishing genetic resources. *Science* 188, 618–621.

Harlan, J.R. and de Wet, J.M.J. (1971) Towards a rational classification of cultivated plants. *Taxon* 20, 509–517.

Hawkes, J.G., Maxted, N. and Ford-Lloyd, B.V. (2000) *The* Ex Situ C*onservation of Plant Genetic Resources*. Kluwer, Dordrecht. 250 pp.

Heywood, V.H., Kell, S.P. and Maxted, N. (eds.) (2007). *Draft Global Strategy for Crop Wild Relative Conservation and Use*. University of Birmingham, United Kingdom. www.pgrforum.org/Documents/Conference/Global_CWR_Strategy_DRAFT_11-04-07.pdf

Heywood, V.H., Kell, S.P. and Maxted, N. (2008) Towards a global strategy for the conservation and use of crop wild relatives. In: Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J., Dulloo, E. and Turok, J. (eds.), *Crop Wild Relative Conservation and Use*. CAB International, Wallingford, UK. Pp. 657–666.

Hanelt, P. and IPK Gatersleben (eds.) (2001) *Mansfeld's Encyclopedia of Agricultural and Horticultural Crops. 6 vols. 1st English edition. Springer, Berlin/Heidelberg/New York, 3645 pp.*

Hopkins, J. J. and Maxted, N. (2010) *Crop Wild Relatives: Plant Conservation for Food Security.* Natural England Research Reports, Number 037. Natural England, Sheffield. http://www.fcrn.org.uk/sites/default/files/Crop_Wild_Relatives_-_Conservation_for_Food_Security.pdf

IPK Gatersleben (2003) *Mansfeld's World Database of Agricultural and Horticultural Crops*. Leibniz Institute of Plant Genetics and Crop Plant Research, Gatersleben, Germany. http://mansfeld.ipk-gatersleben.de/mansfeld/mf-inf_e.htm

Iriondo, J.M., Maxted, N., Kell, S.P., Ford-Lloyd, B., Lara-Romero, C., Labokas, J. and Magos Brehm, J. (2012) Quality standards for genetic reserve conservation of crop wild relatives. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.) A*grobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. Pp. 72–77.

IUCN (2001) *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. Ii + 30 pp. http://www.iucnredlist.org/technical-documents/categories-and-criteria

Kell, S.P., Knüpffer, H., Jury, S.L., Maxted, N. and Ford-Lloyd, B.V. (2005) *Catalogue of Crop Wild Relatives for Europe and the Mediterranean*. Available online via the PGR Forum Crop Wild Relative Information System (CWRIS – http://www.pgrforum.org/cwris/cwris.asp) and on CD-ROM. © University of Birmingham, UK.

Kell, S.P., Knüpffer, H., Jury, S.L., Ford-Lloyd, B.V. and Maxted, N. (2008) Crops and wild relatives of the Euro-Mediterranean region: making and using a conservation catalogue. In: Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J., Dulloo, E. and Turok, J. (eds.), *Crop Wild Relative Conservation and Use*. CAB International, Wallingford, UK. Pp. 69–109.

Kell, S.P., Maxted, N., Frese, L. and Iriondo, J.M. (2012a) *In situ* conservation of crop wild relatives: a strategy for identifying priority genetic reserve sites. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.) *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. Pp. 7–19.

Kell, S.P., Maxted, N. and Bilz, M. (2012b) European crop wild relative threat assessment: knowledge gained and lessons learnt. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.) *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. Pp. 218–242.

Lorenzetti, F. and Negri, V. (2009) The European seed legislation on conservation varieties. In: Vetelainen, M., Negri V. and Maxted, N. (eds.) *European Landraces: On-farm Conservation, Management and Use.* Bioversity Technical Bulletin No. 15, Bioversity International, Rome, Italy. Pp. 287–295.

Magos Brehm, J. (2009) In Situ *Conservation of Wild Plant Genetic Resources in Portugal.* PhD thesis. The University of Birmingham.

Magos Brehm, J., Maxted, N., Martins-Loução, M.A. and Ford-Lloyd, B.V. (2010) New approaches for establishing conservation priorities for socio-economically important plant species. *Biodiversity and Conservation* 19, 2715–2740.

Magos Brehm, J., Ford-Lloyd, B.V., Maxted, N. and Martins-Loução, M.A. (2012) Using neutral genetic diversity to prioritize crop wild relative populations: a Portuguese endemic case study for *Dianthus cintranus* Boiss. & Reut. subsp. *barbatus* R. Fern. & Franco. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M., Pinheiro de Carvalho, M.A.A. (eds.), *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces.* CAB International, Wallingford, UK. Pp. 193–210.

Marino, M. (2010) Implementazione del Piano Nazionale per la biodiversità in agricoltura. *Dal Seme* 4, 37–41.

Marshall, D.R. and Brown, A.H.D. (1975) Optimum sampling strategies in genetic conservation. In: Frankel, O.H. and Hawkes, J.G (eds.), *Crop Genetic Resource for Today and Tomorrow.* Cambridge University Press, Cambridge. Pp. 53–80.

Maxted, N. and Kell, S. (2009) *Establishment of a Network for the In situ Conservation of Crop Wild Relatives: Status and Needs***.** Commission on Genetic Resources for Food and Agriculture. Food and Agriculture Organization of the United Nations, Rome, Italy. 211 pp. http://www.fao.org/docrep/013/i1500e/i1500e18a.pdf

Maxted, N., Hawkes, J.G., Guarino, L. and Sawkins, M. (1997) The selection of taxa for plant genetic conservation. *Genetic Resources and Crop Evolution* 44, 337–348.

Maxted, N., Ford-Lloyd, B.V., Jury, S.L., Kell, S.P. and Scholten, M.A. (2006) Towards a definition of a crop wild relative. *Biodiversity and Conservation* 15(8), 2673–2685.

Maxted, N., Scholten, M., Codd, R. and Ford-Lloyd, B. (2007) Creation and use of a National Inventory of crop wild relatives. *Biological Conservation* 140, 142–159.

Maxted, N., Ford-Lloyd, B.V. and Kell, S.P. (2008a) Crop wild relatives: establishing the context. In: Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J., Dulloo, E. and Turok, J. (eds.), *Crop Wild Relative Conservation and Use.* CAB International, Wallingford, UK. Pp. 3–30.

Maxted, N., Dulloo, E., Ford-Lloyd, B.V., Iriondo, J.M. and Jarvis, A. (2008b) Gap analysis: a tool for complementary genetic conservation assessment. *Diversity and Distributions* 14, 1018–1030.

Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.) (2012) *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. 365 pp.

Mitteau, M. and Soupizet, F. (2000) Preparation of a preliminary list of priority target species for *in situ* conservation in Europe. In: Laliberté, B., Maggioni, L., Maxted, N. and Negri, V. (compilers), *ECP/GR In situ and On-farm Conservation Network Report of a Task Force on Wild Species Conservation in Genetic Reserves and a Task Force on On-farm Conservation and Management Joint Meeting, 18–20 May 2000, Isola Polvese, Italy.* Pp. 32–42. IPGRI, Rome, Italy.

Moore, J.D., Kell, S.P., Maxted, N., Iriondo, J.M. and Ford-Lloyd, B.V. (2008) CWRML: representing crop wild relative conservation and use data in XML. *BMC Bioinformatics* 9, 116. doi:10.1186/1471-2105-9-116.

Negri, V. (2003) Landraces in central Italy: Where and why they are conserved and perspectives for their on-farm conservation. *Genetic Resources and Crop Evolution* 50(8), 871–885.

Negri, V. (2005) Agrobiodiversity conservation in Europe: ethical issues. *Journal of Agricultural and Environmental Ethics* 18(1), 3–25.

Negri, V. (in press) Policies supportive of on-farm conservation and their impact on custodian farmers in Italy. *Proceeding of the On-farm Conservation of Neglected and Underutilized Species: Status, Trends and Novel Approaches to Cope with Climate Change. International Conference, Friedrichsdorf, Frankfurt, Germany, 14–16 June, 2011*. Bioversity International, Rome, Italy.

Negri, V., Maxted, N. and Vetelainen, M. (2009) European landrace conservation: an introduction. In: Vetelainen, M., Negri, V. and Maxted, N. (eds.), *European Landraces: On-farm Conservation, Management and Use.* Bioversity Technical Bulletin No. 15, Bioversity International, Bioversity International, Rome, Italy. Pp. 1–22.

Negri, V., Barocco, R., Pacicco, L., Veronesi, F. and Venanzoni, R. (2012) An approach towards prioritizing landrace rich areas as a priority for protection in Europe. In: Maxted, N., Dulloo, M.E., Ford-Lloyd, B.V., Frese, L., Iriondo, J.M. and Pinheiro de Carvalho, M.A.A. (eds.), *Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces*. CAB International, Wallingford. Pp. 118–124.

O'Neill, E. (2007) *Conservation Audits: Auditing the Conservation process. Lessons Learned, 2003–2007.* The Conservation Measures Partnership. www.conservationmeasures.org

PGR Forum (2005) *Crop Wild Relative Information System (CWRIS)*. University of Birmingham, Birmingham, UK. http://www.pgrforum.org/cwris/cwris.asp

Papa, C. (1996) The 'farre de Montelione': landrace and representation. In: Padulosi, S., Hammer, K. and Heller, J. (eds.) *Hulled Wheats. Promoting the Conservation and Use of Underutilized and Neglected Crops*. *Proceedings of the First International Workshop on Hulled Wheats, 21–22 July, 1995, Castelvecchio Pascoli, Italy*. IPGRI, Rome Pp. 154–171.

Papa, C. (1999) Il farro a Monteleone di Spoleto: pratiche agrarie, consuetudini giuridiche e ritualità. In: Papa, C. (ed.) Il *Farro. Saperi, Usi e Conservazione delle Varietà Locali. Quaderni del CEDRAV 1*. CEDRAV Cerreto di Spoleto, Italy. Pp. 9–26.

Pimentel, D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Tran, Q., Saltman, T. and Cliff, B. (1997) Economic and environmental benefits of biodiversity. *BioScience* 47, 747–757.

Planta Europa (2008) *A Sustainable Future for Europe; the European Strategy for Plant Conservation 2008–2014*. Plantlife International (Salisbury, UK) and the Council of Europe (Strasbourg, France). www.plantlife.org.uk/uploads/documents/New_European_Strategy_for_Plant_Conservation_(2008–2014).pdf

Polegri, L. and Negri, V. (2010) Molecular markers for promoting agro-biodiversity conservation: a case study from Italy. How cowpea landraces were saved from extinction. *Genetic Resources and Crop Evolution* 57, 867–880.

Porfiri, O., Costanza, M.T. and Negri, V. (2009) Landrace inventories in Italy and the Lazio Region Case Study. In: Veteläinen, M., Negri, V. and Maxted, N. (eds.), *European Landraces: On-farm Conservation, Management and Use.* Bioversity Technical Bulletin No. 15, Bioversity International, Rome, Italy. Pp. 117–123.

Saxena, S. and Singh, A.K. (2006) Revisit to definitions and need for inventorization or registration of landrace, folk, farmers' and traditional varieties. *Current Science* 91(11), 1451–1454.

Schultze-Motel, J. (1966) *Verzeichnis forstlich kultivierter Pflanzenarten [Enumeration of cultivated forest plant species]. Kulturpflanze Beiheft 4.*

Torricelli, R., Tiranti, B., Spataro, G., Castellini, G., Albertini, E., Falcinelli, M. and Negri, V. (submitted) Differentiation and structure of an Italian landrace of celery (*Apium graveolens* L.): inferences for on-farm conservation. *Genetic Resources and Crop Evolution*.

USDA, ARS, National Genetic Resources Programme (2009) *Germplasm Resources Information Network – (GRIN)* [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. www.ars-grin.gov/cgi-bin/npgs/html/wep.pl?language=en&chapter=econ1

Zeven, A.C. (1998) Landraces: A review of definitions and classifications. *Euphytica* 104, 127–139.

Annex 1. Workshop programme

Wednesday 7 September 2011: Morning session

Plenary session 1

08:30	**Welcome and opening of the workshop**	**Chair: E Dulloo**
08:30	– Welcome address: Chairman and Member of the Committee on Environment Protection, Seimas (Parliament), Republic of Lithuania	J Simenas / A Petkus
08:40	– Welcome address: PGR Secure Project Coordinator	N Maxted
08:45	– Welcome address: ECPGR Coordinator	L Maggioni
08:50	– Overview of workshop work plan	S Kell
08:55	– Workshop logistics	J Labokas
09:00	**Workshop context and overview**	**Chair: E Dulloo**
09:00	– PGR Secure: project context and overview	N Maxted
09:30	– Developing a European CWR conservation strategy	S Kell
09:55	– Developing a European LR conservation strategy	V Negri
10:20	– PGR Secure Helpdesk	N Maxted
10:30	**COFFEE**	
11:00	**Workshop context and overview cont'd**	**Chair: L Maggioni**
11:00	– European *in situ* information management – vision and options	S Harrer
11:20	– Development of a European information system for CWR and LR conservation and use data and implementation of the Trait Information Portal	S Dias
11:40	– Understanding user community needs	G Poulsen
12:00	– Discussion	L Maggioni / All
12:30	**LUNCH**	
14:00	**Working group sessions (14:00–17:30 and all day Thursday)**	
	– Working group 1: CWR conservation	
	– Working group 2: LR conservation	
	– Working group 3: CWR and LR information management	

Working group 1: CWR conservation (Day 1)

14:00	**Developing a European CWR conservation strategy**	**Chair: J Iriondo**
14:00	– Background to and aims of the group 1 session	N Maxted
14:05	– Participant introductions	All
14:20	– National CWR conservation strategy planning	N Maxted
14:45	**CWR inventories: the backbone for conservation and use**	**Chair: J Iriondo**
14:45	– The CWR Catalogue for Europe and the Mediterranean	S Kell
15:00	– Creating the national CWR inventory of Ireland	H Fitzgerald
15:20	– Current situation regarding CWR inventories in Europe	S Harrer
15:30	– Group discussion on generating national CWR inventories	J Iriondo /All
16:00	**TEA**	
16:20	**CWR prioritization**	**Chair: Å Asdal**
16:20	– Options for CWR prioritization	S Kell
16:40	– CWR prioritization at national level	J Magos Brehm
17:00	– Group discussion on CWR prioritization	Å Asdal /All
17:30	**CLOSE OF WORKSHOP DAY 1**	
19:30	**INTERNATIONAL FOOD PARTY** at Hotel Alka	

Working group 1: CWR conservation (Day 2)

08:30	**CWR diversity and gap analysis**	**Chair: M Aronsson**
08:30	– *In situ* and *ex situ* gap analysis: overview	N Maxted
09:00	– Ecogeographic data analysis: an introduction	J Iriondo
09:30	– Tools for CWR genetic diversity analysis	H Korpelainen
10:00	– Genetic diversity analysis of CWR in Portugal	J Magos Brehm
10:30	**COFFEE**	
11:00	**CWR diversity and gap analysis cont'd**	**Chair: M C Duarte**
11:00	– Threat assessment of European CWR	S Kell
11:30	– Group discussion on CWR diversity and gap analysis	M C Duarte /All
12:00	– CWR working group feedback preparation	J Iriondo
12:30	**LUNCH**	
14:00	**Working group interim feedback session**	**Chair: N Maxted**
14:00	– Working group 1: CWR conservation	WG 1 Rapporteur
14:15	– Working group 2: LR conservation	WG 2 Rapporteur
14:30	– Working group 3: CWR and LR information management	WG 3 Rapporteur
14:45	**CWR conservation data management**	**Chair: J Labokas**
14:45	– CWRIS: the PGR Forum information management model	S Kell
15:00	– Bioversity *in situ* CWR descriptors	I Thormann
15:15	– Group discussion on CWR conservation data management and minimum data types	J Labokas / All
15:45	**TEA**	
16:05	**Development and implementation of national CWR conservation strategies by the ECPGR network members**	**Chair: V Holubec**
16:05	– Taking forward the national CWR conservation strategies: procedures and responsibilities	N Maxted
16:15	– Using the FAO Agrobiodiversity Toolkit	J Magos Brehm
16:30	– Group discussion on development and implementation of the national CWR conservation strategies	V Holubec /All
17:30	**CLOSE OF WORKSHOP DAY 2**	
19:30	**SOCIAL DINNER** at Virkštininku dvaras	

Working group 2: LR conservation (Day 1)

14:00	**Developing a European LR conservation strategy**	**Chair: M Veteläinen**
14:00	– Background to and aims of the working group 2 session	V Negri
14:30	– Participant introductions	All
15:00	**LR inventories: the backbone for conservation and use**	**Chair: M Veteläinen**
15:00	– LR definitions, LR use and on-farm conservation	V Negri
15:30	– Generating national LR inventories	V Negri / R Torricelli
16:00	**TEA**	
16:20	**LR inventories cont'd**	**Chair: P Freudenthaler**
16:20	– National LR inventories: available tools, information and current situation	M Veteläinen
16:50	– Discussion on generating national LR inventories	All
17:30	**CLOSE OF WORKSHOP DAY 1**	
19:30	**INTERNATIONAL FOOD PARTY** at Hotel Alka	

Working group 2: LR conservation (Day 2)

08:30	**Generating national LR inventories: data collection and availability**	**Chair: M Ambrose**
08:30	– Data to be collected and availability	M Veteläinen, V Negri
09:00	– Interviewing farmers: how to get information?	M Heinonen
09:30	– Historical data as background information	M Heinonen
09:45	– Discussion on LR data collection, availability and data standards	All
10:30	**COFFEE**	
11:00	**LR characterization and threat assessment**	**Chair: P Moreira**
11:00	– LR characterization for identity assessment	R Torricelli
11:15	– LR threat assessment (the Lazio region example)	R Torricelli
11:30	**Linking LR conservation to use**	**Chair: Z Bulinska**
11.30	– Adding value to LR with cultural information	M Heinonen
12.00	– Linking conservation to local use: some examples	
12.00	➢ Maize bread from LR	P Moreira
12.15	➢ Emmer products from LR	R Torricelli
12:30	**LUNCH**	
14:00	**Working group interim feedback session**	**Chair: N Maxted**
14:00	– Working group 1: CWR conservation	WG 1 Rapporteur
14:15	– Working group 2: LR conservation	WG 2 Rapporteur
14:30	– Working group 3: CWR and LR information management	WG 3 Rapporteur
14:45	**Linking LR conservation to use cont'd**	**Chair: Z Bulinska**
14:45	– LR diversity of cereals for organic and low input agriculture in the German Biosphere Reserve Schorfheide-Chorin	R Vögel
15:00	– Linking LR diversity to conventional and participatory breeding	M Ambrose
15:15	**Development and implementation of national LR conservation strategies by the ECPGR network members**	**Chair: J Weibull**
15:15	– Use of National Inventories for defining the most appropriate conservation areas (MAAs)	V Negri
15:45	**TEA**	
16:05	– Taking forward the national LR conservation strategies: procedures and responsibilities	M Veteläinen
16:35	– Group discussion on development and implementation of the	All

national LR conservation strategies

17:30 **CLOSE OF WORKSHOP DAY 2**

19:30 **SOCIAL DINNER** at Virkštininku dvaras

Wednesday 7 September 2011: Afternoon session

Working group 3: CWR and LR information management (Day 1)

14:00	**Current status of *in situ* and on-farm National Inventories**	**Chair: TBD**
14:00	– Introduction to the agenda, participant introductions and expectations	S Harrer / All
14:30	– Role of National Inventories in the European PGRFA documentation landscape	S Harrer
15:00	– State of National Inventories on *in situ* / on-farm PGRFA	10–15 NFPs, 5–10 min each (to be identified)

16:00 **TEA**

16:20	**Current status of *in situ* and on-farm National Inventories cont'd**	**Chair: TBD**
16:20	– State of National Inventories on *in situ* / on-farm PGRFA	4–8 NFPs, 5–10 min each (to be identified)
17:00	– Group discussion on the status of *in situ* / on-farm National Inventories	All

17:30 **CLOSE OF WORKSHOP DAY 1**

19:30 **INTERNATIONAL FOOD PARTY** at Hotel Alka

Working group 3: CWR and LR information management (Day 2)

08:30	– WG3 to join WG2 session, 'Generating national LR inventories: data collection and availability' (see page 11)	
10:30	**COFFEE**	
11:00	**LR (on-farm) data management cont'd**	**Chair: TBD**
11:00	– Discussion on data types, data standards and data availability	All
11:45	– Draft recommendations for standards for data exchange	All
12:30	**LUNCH**	
14:00	**Working group interim feedback session**	**Chair: N Maxted**
14:00	– Working group 1: CWR conservation	WG 1 Rapporteur
14:15	– Working group 2: LR conservation	WG 2 Rapporteur
14:30	– Working group 3: CWR and LR information management	WG 3 Rapporteur
14:45	– WG3 to join WG1 session, 'CWR conservation data management' (see page 9)	
15:45	**TEA**	
16:05	**CWR conservation data management cont'd**	**Chair: TBD**
	– Discussion on data types, data standards and data availability	All
	– Draft recommendations for standards for data exchange	All
17:30	**CLOSE OF WORKSHOP DAY 2**	
19:30	**SOCIAL DINNER** at Virkštininku dvaras	

Plenary session 2

08:30	**Working group reports and discussion**	**Chair: G Poulsen**
08:30	– Working group 1: CWR conservation	WG 1 Rapporteur
09:00	– Plenary discussion: CWR conservation	N Maxted / All
09:30	– Working group 2: LR conservation	WG 2 Rapporteur
10:00	– Plenary discussion: LR conservation	V Negri / All
10:30	**COFFEE**	
11:00	**Working group reports and discussion cont'd**	**Chair: J Wiersema**
11:00	– Working group 3: CWR and LR information management	WG 3 Rapporteur
11:30	– Plenary discussion: CWR and LR information management	S Harrer / All
12:00	– Plenary discussion: Understanding user community needs	G Poulsen / All
12:30	– Wrap-up	N Maxted
13:00	**CLOSE OF WORKSHOP DAY 3**	
13:00	**LUNCH**	
14:30	**Excursion to the Curonian Spit, including dinner in Nida**	

Annex 2: Workshop working groups

* = Participant represents both Working Groups of the ECPGR *In Situ* and On-farm Conservation Network; ** = Participant was unable to attend

WG 1: CWR conservation

Akparov, Zeynal
Aronsson, Mora
Asdal, Åsmund
Boguslavskyi, Roman
Burchi, Gianluca
Cop, Jure
Duarte, Maria Cristina
Dulloo, Ehsan
Fielder, Hannah
Fitzgerald, Heli
Fu Dostatny, Denise
Gailite, Agnese
Germeier, Christoph
Harutyunyan, Margarita
Hauptvogel, Pavol
Holubec, Vojtech
Iriondo Alegría, José
Jacobsen, Lars
Jinjikhadze, Tamar
Kadiasi, Najada*
Karpavičienė, Birutė
Kell, Shelagh
Korpelainen, Helena
Kratovalieva, Suzana
Labokas, Juozas
Labokas, Juozapas
Magos Brehm, Joana
Maxted, Nigel*
Miron, Aliona
Nilsen, Linn Borgen**
Petrovic, Sofija
Radun, Marina*
Ralli, Parthenopi*
Rometsch, Sibylla
Rubio-Teso, María Luisa
Sandru, Dan
Singer, Alon
Smekalova, Tamara
Spasova Uzundjalieva, Katya
Stesevic, Danijela**
Tan, Ayfer
Venanzoni, Roberto
Vincent, Holly
Vörösváry, Gabor
Wiersema, John

WG 2: LR conservation

Ambrose, Mike
Berishvili, Taiuli
Bulinska-Radomska, Zofia
Daugstad, Kristin
Dimitrijevic, Miodrag
Fasoula, Dionysia
Ferant, Natasa
Freudenthaler, Paul
Gelvonauskis, Bronislovas
Gorina, Valentina
Heinonen, Maarit
Jovovic, Zoran
Kadiasi, Najada*
Kir, Alev
McLaughlin, Caitlin
Musayev, Mirza
Negri, Valeria*
Pintea, Maria
Ponicsán, Ágnes Gyovai
Poulsen, Gert
Radun, Marina*
Ralli, Parthenopi*
Reis Mendes Moreira, Pedro
Ruiz Martinez, Juan José
Rungis, Dainis
Sarikyan, Karine
Stehno, Zdenek
Stoilova, Tzvetelina
Strajeru, Silvia
Talovina, Galina
Thormann, Imke
Torricelli, Renzo
Veteläinen, Merja
Vögel, Rudolf
Weibull, Jens

WG 3: Info management

Aavola, Rene
Annamaa, Külli
Aykas, Lerzan
Collins, Noel
Cristea, Neculai
De la Rosa, Lucia
Dias, Sónia
Djukic, Ivana
Diulgheroff, Stefano**
Dokukina, Kseniia
Elezi, Fetah
Epitsahvili, Tinatin
Faberova, Iva
Gaile, Anita
Ganea, Anatol
Gixhari, Belul
Guteva, Yana
Harrer, Siegfried**
Hovhannisyan, Marina
Koehler, Christoph
Mackay, Michael
Maggioni, Lorenzo
Mammadov, Afig
Meglic, Vladimir
Prodanovic, Slaven
Simon, Attila
Van Hintum, Theo
Wilkinson, Steve
Zaczynski, Marcin

Annex 3: List of participants

Mr. Rene **Aavola**
Jõgeva Plant Breeding Institute (PBI)
J. Aamisepa 1, 48309 Jõgeva
Estonia
Tel: +372 7768372
Fax: +372 7766902
Email: rene.aavola@jpbi.ee

Mr. Åsmund **Asdal**
Norwegian Genetic Resource Centre
P.O.Box 115, 1431 Aas
Norway
Tel: +47 91365166
Fax: +47 37044278
Email: aasmund.asdal@bioforsk.no

Prof. Zeynal **Akparov**
Genetic Resources Institute of ANAS (AGRI)
155, Azadlig ave., AZ1106, Baku
Azerbaijan
Tel: +994 12 562 91 71
Fax: +994 12 449 92 21
Email: akparov@yahoo.com

Ms. Lerzan **Aykas**
Aegean Agricultural Research Institute (AARI)
P.O. Box 9, Menemen, Izmir 35661
Turkey
Tel: +90 232 8461331
Fax: +90 232 84611107
Email: lerzanaykas@yahoo.com

Mr. Michael **Ambrose**
John Innes Centre
Norwich research Park, Colney, Norwich, NR4 7UH
United Kingdom
Tel: +44 1603 450630
Email: mike.ambrose@bbsrc.ac.uk

Dr. Taiuli **Berishvili**
Biological Farming Association ELKANA
Gazapkhuli Street#16, 0177 Tbilisi
Georgia
Tel: +995 322 536489
Fax: +995 322 536487
Email: crop@elkana.org.ge

Ms. Külli **Annamaa**
Jõgeva Plant Breeding Institute (PBI)
J. Aamisepa 1, 48309 Jõgeva
Estonia
Tel: +372 7768372
Fax: +372 7766902
Email: kylli.annamaa@jpbi.ee

Dr. Roman **Boguslavskyi**
Plant Production Institute nd. a. V. Ya. Yuryev
Moskovskyi prospect, 142, Kharkiv, 61060
Ukraine
Tel: +380 577 779 7763
Fax: +380 577 779 7763
Email: ncpgru@gmail.com

Mr. Mora **Aronsson**
Swedish Species Information Centre
P.O. Box 7007
Sweden
Tel: +46 18 67 34 14
Email: Mora.Aronsson@slu.se

Prof. Zofia **Bulinska-Radomska**
Plant Breeding and Acclimatization Institute at Radzików
05-870 Blonie
Poland
Tel: +48 227 334652
Fax: +48 227 334649
Email: z.bulinska@ihar.edu.pl

Mr. Gianluca **Burchi**
CRA-VIV Landscaping Plants and Nursery Research Unit
Via dei Fiori 8 - 51012 Pescia (PT)
Italy
Tel: +39 0572451033
Fax: +39 0572453309
Email: gianluca.burchi@entecra.it

Mr. Noel **Collins**
Department of Agriculture, Fisheries and Food, Crop Evaluation Centre
Backweston Farm, Leixlip, Co. Kildare
Ireland
Tel: +353 1 6302921
Fax: +353 1 6280634
Email: Noeld.collins@agriculture.gov.ie

Dr. Jure **Cop**
University of Ljubljana, Biotechnical Faculty
Jamnikarjeva 101, SI-1000 Ljubljana
Slovenia
Tel: +386 1 320 3274
Fax: +386 1 423 1088
Email: jure.cop@bf.uni-lj.si

Inf. Neculai **Cristea**
Suceava Gene Bank
B-dul 1 Mai, no. 17, 720224 Suceava
Romania
Tel: +40 230 521016
Fax: +40 230521016
Email: neculai.cristea@svgenebank.ro

Ms. Kristin **Daugstad**
Norwegian Institute of Agricultural and Environmental Research
Nyhagevegen 35, 2940 Heggens
Norway
Tel: +47 40622927
Email: kristin.daugstad@bioforsk.no

Dr. Lucia **De la Rosa**
CRF-INIA (National Plant Genetic Resources Centre)
Autovía de Aragón km 36
28800 Alcalá de Henares, Madrid
Spain
Tel: +34 918819261 ext.22
Fax: +34 918819287
Email: rosa@inia.es

Ms. Sónia **Dias**
Bioversity International
Via dei tre Denari 472/a, Rome
Italy
Tel: +39 066118204
Fax: +39 0661979661
Email: s.dias@cgiar.org

Dr. Miodrag **Dimitrijevic**
Faculty of Agriculture, University of Novi Sad
Sq. Dositeja Obradovića 8, 21000 Novi Sad
Serbia
Tel: +381 214853211
Fax: +381 21459243
Email: mishad@polj.uns.ac.rs

Ms. Ivana **Djukic**
Genetic Resources Institute
University of Banja Luka
Bulevar vojvode Petra Bojovica 1A, 78 000 Banja Luka
Bosnia and Herzegovina
Tel: +387 51312216
Fax: +387 51312818
Email: ivana.djukic@griunibl.rs.ba

Ms. Kseniia **Dokukina**
Plant Production Institute nd. a. V. Ya. Yuryev
Moskovskyi prospect, 142, Kharkiv, 61060
Ukraine
Tel: +380 0577 7797763
Fax: +380 0577 7797763
Email: ncpgru@gmail.com

Dr. Maria Cristina **Duarte**
Instituto de Investigação Científica Tropical,
Jardim Botânico Tropical
Trav. Conde da Ribeira 9, 1300-142 Lisboa
Portugal
Tel: +351 213616348
Fax: +351 213631460
Email: mcduarte@iict.pt

Dr. Ehsan **Dulloo**
Bioversity International
Via dei tre Denari 472/a, Rome
Italy
Tel: +39 066118204
Fax: +39 0661979661
Email: e.dulloo@cgiar.org

Dr. Fetah **Elezi**
Agricultural University of Tirana
Albanian Gene Bank
Rruga 'Siri Kodra' 132/1, Tirana
Albania
Tel: +355 4 320413
Fax: +355 4 320413
Email: elezi_fetah@yahoo.com;
elezi_felezi@ubt.edu.al

Ms. Tinatin **Epitsahvili**
Academy of Agricultural Sciences of Georgia
D. Agmashenebli Alley, 13 km, 0131 Tbilisi
Georgia
Tel: +995 555 936493
Fax: +995 32 2595683
Email: n_epitashvili@yahoo.com

Ms. Iva **Faberová**
Crop Research Institute
Drnovska 507, 161 06 Praha 6, Ruzyne
Czech Republic
Tel: +420 233 022478
Fax: +420 233 022286
Email: faberova@vurv.cz

Dr. Dionysia **Fasoula**
Agricultural Research Institute
P.O. Box 22016, 1516, Nicosia
Cyprus
Tel: +35722403124
Email: dfasoula@arinet.ari.gov.cy

Ms. Nataša **Ferant**
Inštitut za hemeljarstvo in pivovarstvo Slovenije
Cesta Žalskega tabora 2, 3310 Žalec
Slovenia
Tel: +386 37121600
Fax: +386 37121620
Email: Natasa.ferant@ihps.si

Ms. Hannah **Fielder**
School of Biosciences, University of Birmingham
Edgbaston, Birmingham, B15 2TT
United Kingdom
Tel: +44 7512 800055
Email: hannahfielder88@gmail.com

Ms. Heli **Fitzgerald**
Botanic Garden and Plant Museum, Natural
History Museum, Helsinki University
00014, Helsinki
Finland
Tel: +358504150307
Email: heli.fitzgerald@helsinki.fi

Mr. Paul **Freudenthaler**
AGES, Austrian Agency for Health and Food Safety
A-4020 Linz, Wieningerstraße 8
Austria
Tel: +43 50 555 41200
Fax: +43 50 555 41139
Email: paul.freudenthaler@ages.at

Dr. Denise **Fu Dostatny**
Plant Breeding and Acclimatization Institute at
Radzików, 05-870 Blonie 1
Poland
Tel: +48 22 733 46 52
Fax: +48 22 733 46 49
Email: d.dostatny@ihar.edu.pl

Ms. Anita **Gaile**
LSFRI 'Silava', Genetic Resource Centre
111 Rigas street, Salaspils
Latvia
Email: anita.gaile@silava.lv

Ms. Agnese **Gailite**
LSFRI 'Silava', Genetic Resource Centre
111 Rigas street, Salaspils
Latvia
Email: agnese.gailite@silava.lv

Dr. Anatolie **Ganea**
Centre for Plant Genetic Resources
Academy of Sciences of Moldova
P.O. Box 302, MD-2001 Chisinau
Republic of Moldova
Tel: +373 22 550249
Fax: +373 22 550249
Email: a_ganea@yahoo.com;
anatol.ganea@gmail.com

Dr. Bronislovas **Gelvonauskis**
Plant Gene Bank
Stoties g. 2, LT 58343 Akademija, Kedainiai distr.
Lithuania
Tel: +370 34737289
Fax: +370 34737002
Email: b.gelvonauskis@agb.lt

Dr. Christoph **Germeier**
Julius Kühn Institute, Institute for Breeding
Research on Agricultural Crops
Erwin-Baur-Str. 27, D-06484 Quedlinburg
Germany
Tel: +49 3946 47702
Email: christoph.germeier@jki.bund.de

Dr. Belul **Gixhari**
Agricultural University of Tirana
Albanian Gene Bank, Rruga 'Siri Kodra' 132/1
Tirana
Albania
Tel: +35 692112252
Email: gixharibelul@yahoo.com

Dr. Valentina **Gorina**
Nikitsky Botanical Gardens, National Scientific
Centre, Yalta, Nikita, Crimea 98648
Ukraine
Tel: +38 654335516
Fax: +38 654335386
Email: fruit_culture@mail.ru

Dr. Yana **Guteva**
Institute of Plant Genetic Resources 'K. Malkov'
Drujba 2 Str., 4122 Sadovo, Plovdiv Distr.
Bulgaria
Tel: +359 32 629026
Fax: +359 32 629026
Email: yaguteva@abv.bg

Dr. Margarita **Harutyunyan**
Armenian State Agrarian University
Teryan Str. 74, Yerevan 0009
Armenia
Tel: +374 10 563840
Fax: +374 10 581597
Email: pgr_lab@mail.ru

Dr. Pavol **Hauptvogel**
Plant Production Research Centre Piestany
Bratislavská cesta 121, 92168 Piestany
Slovak Republic
Tel: +421 33 7722311
Fax: +421 33 7726306
Email: hauptvogel@vurv.sk

Mrs. Maarit **Heinonen**
MTT Agrifood Research Finland
Myllytie 1, FIN-31600 Jokioinen
Finland
Tel: +358 40 195 9943
Email: maarit.heinonen@mtt.fi

Dr. Vojtech **Holubec**
Crop Research Institute, Gene Bank
Drnovska 507
Czech Republic
Tel: +420 233 022 497
Fax: +420 233 022 286
Email: holubec@vurv.cz

Dr. Marina **Hovhannisyan**
Armenian State Agrarian University
Teryan Str. 74, Yerevan 0009
Armenia
Tel: +374 10 563840
Fax: +374 10 581597
Email: pgr_lab@mail.ru

Prof. José **Iriondo**
Universidad Rey Juan Carlos
Dept. Biología y Geología, c/ Tulipán s/n
E28933 Móstoles, Madrid
Spain
Tel: +34 914888144
Fax: +34 916647490
Email: jose.iriondo@urjc.es

Mr. Lars Henrik **Jacobsen**
University of Aarhus
Department of Food Sciences
Kirstinebjergvej 10, DK-5792 Aarslev
Denmark
Tel: +45 89993382
Fax: +45 89993490
Email: larsh.jacobsen@agrsci.dk

Mrs. Tamar **Jinjikhadze**
National Botanical Garden of Georgia
Dariali lane #2, 0162, Tbilisi
Georgia
Tel: +995 5 93 256267
Email: tamrikoj@yahoo.com

Prof. Zoran **Jovovic**
University of Montenegro, Biotechnical Faculty
Mihaila Lalica 1, 81000 Podgorica
Montenegro
Tel: +382 69072064
Fax: +382 20268432
Email: jovovic@t-com.me

Ms. Najada **Kadiasi**
Agricultural University of Tirana
Faculty of Environment and Agriculture
Department of Crop Production
Koder Kamez, Tirana
Albania
Tel: +355 689019612
Email: kadiasi@yahoo.com

Dr. Birutė **Karpavičienė**
Institute of Botany, Nature Research Centre
Žaliųjų Ežerų 49, LT-08406 Vilnius
Lithuania
Tel: +370 52729930
Fax: +370 5 2729950
Email: birute.karpaviciene@botanika.lt

Ms. Shelagh **Kell**
School of Biosciences, University of Birmingham
Edgbaston, Birmingham, B15 2TT
United Kingdom
Tel: +44 1297 678117
Fax: +441297 678117 or +44 121 414 5925
Email: s.kell@bham.ac.uk

Dr. Alev **Kir**
Aegean Agricultural Research Institute
P.O. Box 9, Menemen, Izmir 35661
Turkey
Tel: +90 2328461331/236
Fax: +90 23284611107
Email: alevpinar@yahoo.com;
ayfer_tan@yahoo.com;
ayfertna-pgr@hotmail.com

Mr. Christoph **Koehler**
Swiss Commission of the Conservation of Cultivated plants
Route de Duillier 50, Case postale 1012, CH-1260 NYON 1
Switzerland
Tel: +41 22 3634702
Email: christoph.koehler@acw.admin.ch

Dr. Helena **Korpelainen**
University of Helsinki
P.O. Box 27 (Latokartanonkaari 5)
Finland
Tel: +358 9 19158383
Fax: +358 9 19158582
Email: helena.korpelainen@helsinki.fi

Dr. Suzana **Kratovalieva**
UKiM Agriculture Institute, Gene Bank - Skopje
Blvd. Aleksandar Makedonski bb p.o. 191 1000 Skopje
Republic of Macedonia
Tel: +389 2 3230 910
Fax: +389 2 3114 283
Email: suzanakrat@yahoo.com

Dr. Juozas **Labokas**
Institute of Botany, Nature Research Centre
Akademijos g. 2, LT-08412 Vilnius
Lithuania
Tel: +370 52729930
Fax: +370 5 2729950
Email: juozas.labokas@botanika.lt

Mr. Juozapas **Labokas**
Institute of International Relations and Political Science, Vilnius University
Vokieciu str. 10, LT-01130, Vilnius
Lithuania
Tel: +370 620 82627
Email: juolab@gmail.com

Dr. Michael **Mackay**
Bioversity International
Via dei tre Denari 472/a, Rome
Italy
Tel: +39 066118235
Fax: +39 0661979661
Email: m.mackay@cgiar.org

Mr. Lorenzo **Maggioni**
ECPGR c/o Bioversity International
Via dei tre Denari 472/a, 00057 Maccarese, Rome
Italy
Tel: +39 06 6118231
Fax: +39 06 61979661
Email: l.maggioni@cgiar.org

Dr. Joana **Magos Brehm**
National Museum of Natural History
Rua da Escola Politécnica 58, 1250-102 Lisboa
Portugal
Tel: +35 1213921882
Email: joanabrehm@gmail.com

Mr. Afig **Mammadov**
Genetic Resources Institute of ANAS (AGRI)
155, Azadlig ave., AZ1106, Baku
Azerbaijan
Tel: +994 12 4499221
Fax: +994 12 4499221
Email: afiqmuellim@rambler.ru

Dr. Nigel **Maxted**
School of Biosciences, University of Birmingham
Edgbaston, Birmingham, B15 2TT
United Kingdom
Tel: +44 121 414 5571
Fax: +44 121 414 5925
Email: nigel.maxted@dial.pipex.com

Ms. Caitlin **McLaughlin**
School of Biosciences, University of Birmingham
Edgbaston, Birmingham, B15 2TT
United Kingdom
Tel: +44 7896898249
Email: cxm854@bham.ac.uk

Dr. Vladimir **Meglič**
Agricultural Institute of Slovenia
Hacquetova 17, 1000 Ljubljana
Slovenia
Tel: +386 1 2805180
Fax: +386 1 2805255
Email: vladimir.meglic@kis.si

Mr. Pedro **Mendes Moreira**
ESAC
Bencanta
Portugal
Tel: +351 919256447
Email: pmoreira@esac.pt

Dr. Aliona **Miron**
Forest Research and Management Institute
69, Calea Lesilor Street, Chisinau, MD 2069
Republic of Moldova
Tel: +373 22928956
Fax: +373 22593351
Email: aliona_miron@yahoo.com

Dr. Mirza **Musayev**
Genetic Resources Institute of the Azerbaijan
National Academy of Sciences
155, Azadliq Ave., AZ1106 Baku
Azerbaijan
Tel: +994 12 3424907
Fax: +994 12 4499221
Email: m_musayev4@yahoo.com

Prof. Valeria **Negri**
Department of Applied Biology
University of Perugia
Borgo XX Giugno, 74–06121 Perugia
Italy
Tel: +39 075 5856218
Fax: +39 075 5856224
Email: vnegri@unipg.it

Prof. Sofija **Petrović**
Faculty of Agriculture, University of Novi Sad
Sq. Dositeja Obradovića 8, 21000 Novi Sad
Serbia
Tel: +381 21 485 3208
Fax: +381 21 459243
Email: sonjap@polj.uns.ac.rs

Prof. Maria **Pintea**
Research Institute for Horticulture and
Alimentary Technologies
Costiujeni str 14, Chisinau MD19
Republic of Moldova
Tel: +37 322/787 717
Fax: +37 322/76 44 27
Email: pyntea2011@gmail.com

Ms. Ágnes **Ponicsánné Gyovai**
Research Centre for Agrobiodiversity
Külsömezö 15, H-2766 Tápiószele
Hungary
Tel: +3653380070
Fax: +3653380072
Email: agyovai@zpok.hu

Dr. Gert **Poulsen**
NordGen, Smedjevägen 3, SE23053 Alnarp
Sweden
Tel: +46 702599018
Fax: +46 40536650
Email: gert.poulsen@nordgen.org

Dr. Slaven **Prodanovic**
University of Belgrade, Faculty of Agriculture
Nemanjina 6, 11080 Belgrade
Serbia
Tel: +381 64 3450470
Fax: +381 11 3161987
Email: slavenp@agrif.bg.ac.rs

Ms. Marina **Radun**
Genetic Resources Institute
University of Banja Luka
Bulevar vojvode Petra Bojovica 1A
78 000 Banja Luka
Bosnia and Herzegovina
Tel: +387 51312216
Fax: +387 51312818
Email: marina.radun@griunibl.rs.ba

Ms. Parthenopi **Ralli**
National Agricultural Research Foundation (NAGREF), Agricultural Research Centre of Northern Greece, Greek Gene Bank
P.O. Box 60458, 57 001 Thermi, Thessaloniki
Greece
Tel: +302310471110
Fax: +302310471209
Email: kgeggb@otenet.gr; rallip@agro.auth.gr

Ms. Sibylla **Rometsch**
Swiss Commission for Wild Plant Conservation
Route de Duillier 50, Case postale 1012, CH-1260 NYON
Switzerland
Tel: +41 22 363 47 28
Fax: +41 22 363 46 90
Email: sibylla.rometsch@acw.admin.ch

Ms. María Luisa **Rubio-Teso**
Universidad Rey Juan Carlos
Dep. Biología y Geología, ESCET, c/ Tulipán s/n, E28933 Móstoles, Madrid
Spain
Tel: +34 91 488 82 88
Email: marialuisa.rubio@urjc.es

Prof. Juan José **Ruiz Martinez**
Miguel Hernanez University
CRTA. De Beniel, km 3, 2 -03312-Orihuela (Alicante)
Spain
Tel: +34 966749675
Fax: +34 966749619
Email: juanj.ruiz@umh.es

Dr. Dainis **Rungis**
GRC, LSFRI 'Silava'
Rigas 111, Salaspils, LV-2169
Latvia
Tel: +371 28344201
Fax: +371 67901359
Email: dainisrungis@gmail.com; dainis.rungis@silava.lv

Mr. Marius Dan **Şandru**
National Gene Bank in Suceava
B-dul 1 Mai, no. 17
Romania
Tel: +40 231 524189
Fax: +40 231 521016
Email: dan.19igor@gmail.com

Dr. Karine **Sarikyan**
Scientific Centre Vegetable and Industrial Crop
Ararat reg Masis, Daracert
Armenia
Tel: +37 4867030
Fax: +374 10581597
Email: Karuine_Sarikyan@mail.ru

Mr. Attila **Simon**
Research Centre for Agrobiodiversity
Külsömezö 15, Tápiószele
Hungary
Tel: +36 53380070
Fax: +36 53380072
Email: jensen@agrobot.rcat.hu

Dr. Alon **Singer**
Israel Plant Gene Bank, Institute of Plant Sciences
ARO-Volcani Centre, P.O. Box 6, Bet-Dagan 50250
Israel
Tel: +972 3 9683501
Fax: +972 3 9683895
Email: singer@volcani.agri.gov.il

Dr. Tamara **Smekalova**
N.I. Vavilov All-Russian Institute of Plant Industry
Bolshaja Morskaja str.42–44, St. Petersburg
Russian Federation
Tel: +7 812 314 79 58
Fax: +7 812 571 8762
Email: t.smekalova@vir.nw.ru

Ing. Zdeněk **Stehno**
Crop Research Institute
Drnovská 507, 161 06 Praha 6
Czech Republic
Tel: +420 233022364
Fax: +420 233022286
Email: stehno@vurv.cz

Dr. Tzvetelina **Stoilova**
Institute of Plant Genetic Resources
4122 Sadovo, 2 Drugba str.
Bulgaria
Tel: +32 6290 26
Fax: +32 62 90 26
Email: tzvets@yahoo.com;
tz_st@abv.bg

Dr. Silvia **Strãjeru**
National Gene Bank in Suceava
B-dul 1 Mai, no. 17
Romania
Tel: +40 230521016
Fax: +40 230521016
Email: genebank@suceava.astral.ro

Dr. Galina **Talovina**
N.I. Vavilov Institute of Plant Industry
St-Petersburg, 190000, Bolshaja Morskaja str.
42-44, VIR Agrobotany dept.
Russian Federation
Tel: +7 812 3144848; +7 812 3144827
Fax: +7 812 5718762
Email: g.talovina@vir.nw.ru

Dr. Ayfer **Tan**
Aegean Agricultural Research Institute
P.O. Box 9, Menemen, Izmir 35661
Turkey
Tel: +90 2328461337; +90 5325031380
Fax: +90 23284611107
Email: ayfer_tan@yahoo.com;
alevpinar@yahoo.com

Mrs. Imke **Thormann**
Bioversity International
Via dei tre denari 472/a, 00057 Maccarese, Rome
Italy
Tel: +39 066118295
Email: i.thormann@cgiar.org

Dr. Renzo **Torricelli**
Department of Applied Biology
University of Perugia
Borgo XX Giugno, 74–06121 Perugia
Italy
Tel: +39 075 5856212
Fax: +39 075 5856224
Email: torricel@unipg.it

Dr. Katya **Uzundzhalieva**
Institute of Plant Genetic Resources
2 Droujba str., Sadovo 4122, Plovdiv Region
Bulgaria
Tel: +359 32 629026
Fax: +359 32 629026
Email: k_spassova@abv.bg

Dr. Theo **van Hintum**
Centre for Genetic Resources, The Netherlands (CGN)
P.O. Box 16, 6700AA Wageningen
The Netherlands
Tel: +31 317 480913
Email: theo.vanhintum@wur.nl

Prof. Roberto **Venanzoni**
University of Perugia
Borgo XX Giugno 74, 06121 Perugia
Italy
Tel: +39 075 5856430
Fax: +39 075 5856404
Email: rvenanzo@unipg.it

Dr. Merja **Veteläinen**
MTT, ET-building, FI-31600 Jokioinen
Finland
Tel: +358 3 4188 3683
GSM: +358 400 666 836
Fax: +358 3 4188 3244
Email: merja.vetelainen@mtt.fi

Ms. Holly **Vincent**
School of Biosciences, University of Birmingham
Edgbaston, Birmingham B15 2TT
United Kingdom
Email: Hxv307@bham.ac.uk

Mr. Rudolf **Vögel**
LUGV-BB (State agency for environment, health and consumers protection, Branderburg)
D-16227 Eberswalde, Tramper Chausses 2 Hs.7
Germany
Tel: +49 3334662728
Fax: +49 3334662710
Email: rudi.voegel@lua.brandenburg.de; Rudolf.voegel@lugv.brandenburg.de

Mr. Gabor **Vörösváry**
Research Centre for Agrobiodiversity
2766 Tápiószele
Hungary
Tel: +36 53 380 070
Fax: +36 53 380 072
Email: gaborv@agrobot.rcat.hu

Mr. Jens **Weibull**
Swedish University of Agricultural Sciences
Swedish Biodiversity Centre
P.O. Box 57, SE-230 53 Alnarp
Sweden
Tel: +46 40415531; +46 705732248
Fax: +46 40415576
Email: jens.weibull@slu.se

Dr. John **Wiersema**
United States Department of Agriculture
Agricultural Research Service
Beltsville Agricultural Research Centre, Beltsville
MD 20707-2350
USA
Tel: +1 301 504 9181
Fax: +1 301 504 5536
Email: john.wiersema@ars.usda.gov

Dr. Steve **Wilkinson**
Joint Nature Conservation Committee
Monkstone House, City Road, Peterborough
United Kingdom
Tel: +44 1733 866865
Fax: +44 1733 555948
Email: steve.wilkinson@jncc.gov.uk

Mr. Marcin **Zaczyński**
Plant Breeding and Acclimatization Institute at Radzików, 05-870 Blonie 1
Poland
Tel: +48 22 7334640
Fax: +48 22 7334649
Email: m.zaczynski@ihar.edu.pl

Unable to attend

Dr. Tom **Curtis**
Genetic Heritage Ireland
17 Davitt Road, Bray, Co. Wicklow
Ireland
Tel: +353877631315
Email: tomcurtis@eircom.net

Mr. Stefano **Diulgheroff**
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla, Rome
Italy
Tel: + 39 0657055544
Email: Stefano.Diulgheroff@fao.org

Dr. Lothar **Frese**
Julius Kühn-Institut, Federal Research Centre for Cultivated Plants (JKI), Institute for Breeding Research on Agricultural Crops
Erwin-Baur-Str. 27, D-06484 Quedlinburg
Germany
Tel: +49 3946 47701
Fax: +49 3946 47255
Email: lothar.frese@jki.bund.de

Mr. Siegfried **Harrer**
Federal Office for Agriculture and Food
Deichmanns Aue 29, D-53179 Bonn
Germany
Tel: +49 228 6845 3240
Fax: +49 228 6845 3105
Email: Siegfried.harrer@ble.de

Ms. Linn Borgen **Nilsen**
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla, Rome
Italy
Tel: + 39 06 5705 54306
Email: Nielsen.LinnBorgen@fao.org

Dr. Danijela **Stešević**
Faculty of Natural Sciences and Mathematics
University of Montenegro
Džodrža Vašingtona bb, Podgorica
Montenegro
Tel: +382 02430816
Fax: +382 02430816
Email: denist@t-com.me