

# **Report of a Working Group on *Beta* and the World *Beta* Network**

**Third Joint Meeting, 8-11 March 2006, Puerto de la Cruz, Tenerife, Spain**  
L. Frese, L. Maggioni and E. Lipman, *compilers*

**PART I**

**REVISED DRAFT**

**Updated March 2008**



# CONTENTS

<b>PART I. DISCUSSION AND RECOMMENDATIONS</b>	<b>1</b>
Introduction	1
<i>Opening of the meeting</i>	1
Section I. Scientific and technical aspects of <i>in situ</i> management	2
<i>The PGR Forum project: some conclusions and recommendations</i>	2
<i>Reconstructing the evolutionary history of the Beta section with molecular data.</i>	
<i>A focus on the Canary Islands</i>	2
<i>Protection and distribution of Beta (s.l.) species in the Canary Islands: perspectives of conservation</i>	3
<i>Biodiversity of Beta species in the Transcaucasus region (Armenia, Azerbaijan, Georgia, Iran)</i>	3
<i>Survey of Beta nana in Greece</i>	4
<i>Survey of Beta vulgaris subsp. maritima populations in Ireland</i>	5
<i>The International Database for Beta (IDBB) and in situ management: potential role and functions</i>	6
<i>Screening techniques for root growth parameters under dry and compacted conditions in sugar beet germplasm</i>	7
<i>Recent progress in Beta germplasm evaluation in the USA</i>	7
<i>Evaluation of beet germplasm and progress towards the development of sugar beet for disease resistance and root structure</i>	8
<i>Poster session</i>	9
<i>Beta genetic resources in Morocco</i>	9
<i>Germination ability of sugar and fodder beet seeds after long-term storage in the Polish genebank</i>	9
<i>Genetic diversity analysis in four elite diploid populations of sugar beet (B. vulgaris L.) using RAPD and ISSR</i>	9
Section II. Technical meeting, including review of the workplan	9
<i>General briefing on ECP/GR</i>	9
<i>A European Genebank Integrated System (AEGIS)</i>	10
<i>Country reports</i>	11
Critical assessment of the achievements at country level	11
Statements and comments of other WBN countries	14
<i>Standardized reporting format and future workplan</i>	15
<i>Establishment of ad hoc working groups, if desired</i>	16
<i>Recommendations and conclusions</i>	16
<i>Visit to the Institute</i>	17
<i>Introduction to in situ management methodology with emphasis on threat assessment</i>	17
<i>Conclusion</i>	17
Election of the Coordinating Committee of the ECP/GR Working Group on Beta / World Beta Network	17
Closing remarks	17
<b>PART II. VISIT TO KNOWN BETA COLLECTING SITES. TRAINING ON THREAT ASSESSMENT AND POPULATION MONITORING IN THE NATURAL HABITAT</b>	<b>18</b>
<b>PART III. PRESENTATIONS AND PAPERS</b>	<b>21</b>

<b>APPENDICES</b>	<b>23</b>
Appendix I. Progress report of the ECP/GR Working Group on <i>Beta</i> for the period (1999) 2002 to March 2006 and workplan for the future	24
Appendix II. Acronyms and Abbreviations	29
Appendix III. Agenda	31
Appendix IV. List of participants	33

## PART I. DISCUSSION AND RECOMMENDATIONS

### Introduction

#### *Opening of the meeting*

Manuel Caballero, Scientific Director of the Instituto Canario de Investigaciones Agrarias (ICIA), opened the meeting on behalf of the President of ICIA and Director of the Jardín de Aclimatación de La Orotava, Puerto de la Cruz. He welcomed all the participants to the Canary Islands and explained the richness of botanical diversity and the rare plants growing in these islands, with 600 endemic species, including some representatives of the *Beta* section. He wished the Group a successful meeting.

On behalf of the International Plant Genetic Resources Institute (IPGRI<sup>1</sup>), Lorenzo Maggioni, Coordinator of the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR)<sup>2</sup> welcomed the Group to the third joint meeting of the Working Group on *Beta* and the World *Beta* Network. He thanked the local hosts for their kindness, patience and efficiency during the preparation of the meeting. He was also pleased to note that for the first time a meeting was to be associated with a practical action, i.e. monitoring of the wild *Beta* populations occurring on the island of Tenerife, during the fourth day. Looking forward to the outcome of this meeting, largely focused on *in situ* conservation of wild relatives, he expressed the wish for a constructive meeting to a small, but dedicated group.

Lothar Frese, Chair of the ECP/GR Working Group on *Beta* and Secretary of the World *Beta* Network, reminded the Group of the history of the development of collaborative work on *Beta* genetic resources, dating back to the first *ad hoc* meeting held in 1987 in Wageningen, the Netherlands. This was a phase of germplasm collecting. After the establishment of the World *Beta* Network, in 1989, the Group entered the phase of establishment of the International Database for *Beta* (IDBB), which was followed by a phase dedicated to characterization and evaluation (1990s) and the creation of an alliance from 1998 onwards between the Working Group on *Beta* (with ECP/GR funding) and the World *Beta* Network. With the meeting of 2002 in Bologna, Italy, a phase of increased task sharing was encouraged, and concepts for sharing responsibilities for conservation were outlined; tasks were also shared by sub-group coordinators within the Network. This was also the phase of a shift towards themes related to *in situ* management, including through the collaboration with the EU-funded project PGR Forum. Currently the challenge consists in finding new and fascinating goals for the Group that can be useful to the user community. This meeting is opening with the focus dedicated to investigating the Why, How and Where of *in situ* management of *Beta* wild relatives.

After approval of the agenda, the participants briefly introduced themselves.

---

<sup>1</sup> With effect from 1 December 2006, IPGRI and INIBAP operate under the name "Bioversity International", Bioversity for short. This new name echoes their new strategy, which focuses on improving people's lives through biodiversity research.

<sup>2</sup> Following the decision of the 10<sup>th</sup> meeting of the ECPGR Steering Committee in September 2006, the name of the Programme was simplified to "European Cooperative Programme for Plant Genetic Resources" and the acronym was also modified to "ECPGR", removing the traditional slash of "ECP/GR".

## Section I. Scientific and technical aspects of *in situ* management

Full papers of the presentations summarized below will be included in the published report of the meeting.

### **The PGR Forum project: some conclusions and recommendations**

Brian Ford-Lloyd gave a description of the PGR Forum project and its results, essentially the Crop Wild Relatives (CWR) list, obtained from the Mansfeld's World Database and the Euro+Med PlantBase. The list is inclusive and it has reached a number of nearly 24 000 taxa. Criteria are needed to prioritize species in order to focus the limited resources for conservation.

The global red lists do not seem to provide suitable criteria, since only 163 species included in the CWR list have been globally red-listed and appear as threatened species, while many more taxa are listed in the national red lists.

An approach was chosen, based on the number of geographic units in which the taxon is recorded. Any taxon which occurs in more than 10 geographic units is considered not threatened and therefore not a priority for conservation. Geographic units are defined within the Euro+Med database and correspond to those used by the Flora Europea. Admittedly these do not all have the same weight, but the system can be used with some precautions and adjustments.

An application of the geographic units criteria to the wild *Beta* species results in a prioritization of all the species except a few: *B. macrocarpa* (occurring in 20 geographic units), *B. trigyna* (16), *B. vulgaris* subsp. *maritima* (62) and *Patellifolia patellaris* (or *B. patellaris*) (16). Further criteria for prioritization can be added in terms of use of the crop, with food, fodder/forage and industrial crops as the most important. A further criterion is based on current conservation status.

The selected criteria for prioritization justify from all points of view the conservation of most wild species of *Beta*.

Further activities that can be planned to better implement conservation consist in adding *Beta* priority species to the existing global red lists; undertaking population assessment and monitoring; and molecular population genetic assessment.

It may be questionable whether we are already in a position to designate, design and establish new reserves and whether appropriate monitoring is taking place in existing reserves.

One overarching problem for the funding of plant conservation is the occurrence of major threats such as bird flu and other stresses which are likely to require a large part of the available financial resources from potential donors.

During the discussion, it was noted that there may be more genetic diversity in species that are more widespread, such as *Beta vulgaris* subsp. *maritima*, and that there may be specific populations that are known to host useful traits and important richness in variation, such as is the case of the Po Valley populations. The prioritization criteria described are therefore a very useful starting point, but conclusions should also be drawn on the basis of specific expertise and the knowledge of interest groups.

### **Reconstructing the evolutionary history of the *Beta* section with molecular data. A focus on the Canary Islands**

Sarah Villain presented a study of the chloroplast diversity of *Beta* section *Beta*, which was analyzed on a sample representative of the geographical distribution of three taxa, i.e. *B. vulgaris* subsp. *maritima*, *B. vulgaris* subsp. *adanensis* and *B. macrocarpa*. Chloroplast DNA fragments and nuclear regions were sequenced to analyze intra- and interspecific diversity.

Polymorphism analyses indicate that *B. vulgaris* subsp. *maritima* exhibits relatively greater levels of haplotype and nucleotide diversity. In general, it can be concluded that the *Beta* section has low levels of polymorphism. The structure of the haplotype network seems to indicate a recent differentiation of *B. vulgaris* subsp. *adanensis* from *B. vulgaris* subsp. *maritima* in the Aegean Sea. The diploid types of *B. macrocarpa* contain a major haplotype, distributed from the Canary island of Fuerteventura to Turkey. The two tetraploid Canarian accessions from Gran Canaria and Tenerife share a single haplotype with *B. vulgaris* subsp. *maritima*, confirming the hybrid origin of these tetraploid accessions as a result of a cross between *B. v. maritima* (as the male parent) and the diploid *B. macrocarpa*.

Phylogeographic studies of *B. vulgaris* subsp. *maritima* indicate that assumptions can be made on the glacial refugia from which postglacial recolonization started. An eastern European refugium is suggested, while the Iberian Peninsula or, most likely, the Moroccan area was the source for colonization of the Atlantic coasts.

Studies on the possible origin of the Canarian tetraploid *B. macrocarpa*, based on mini- and micro-satellite markers, indicate that an hybridization of *B. vulgaris* subsp. *maritima* x *B. macrocarpa* (2x) might have occurred (perhaps in Morocco) before colonization of the Canary Islands. The diploid *B. macrocarpa* is hypothesized to deserve the status of a different and new species.

### **Protection and distribution of Beta (s.l.) species in the Canary Islands: perspectives of conservation**

(A. Santos Guerra and J. Alfredo Reyes)

Arnoldo Santos Guerra gave an account of the taxonomy, distribution, ecology and conservation of *Beta* in the Macaronesian region.<sup>3</sup> The actual accepted taxa include, within section *Beta*, *Beta macrocarpa* Guss., *Beta vulgaris* subsp. *maritima* L. and *Beta patula* Aiton; and within section *Procumbentes*, *Beta patellaris* Moq., *Beta procumbens* C. Sm. ex Hornem and *Beta webbiana* Moq. A number of taxonomic uncertainties were highlighted. These include: the doubtful attribution to *B. procumbens* of the species growing in the island of Salvajens; and the likelihood that *B. hastata* Link in Buch may be the legitimate name for *B. procumbens*. Also the distribution of the species still requires further investigation. A record of the presence of *B. patellaris* in the Socotra region was highlighted and recommended for verification. The only species that can be considered threatened is *B. patula*, growing in Madeira, Porto Santo and Desertas. *B. webbiana* also needs to be checked since its taxonomic status may be confused. The Canarian *Beta* are not considered threatened, since they largely grow within protected areas, covering nearly 35% of the Canarian territory. In particular, *Beta patellaris* grows within the National Parks of Timanfaya and Caldera of Taburiente, *Beta macrocarpa* within Timanfaya National Park, *Beta procumbens* in several protected Natural and Rural parks and *Beta webbiana* in the Isleta protected area. Regarding the management of the protected areas, it was made clear that the governments of the individual islands are responsible for them, except for the national parks, which are under the national authority.

### **Biodiversity of Beta species in the Transcaucasus region (Armenia, Azerbaijan, Georgia, Iran)**

(G. Aleksidze, Z. Akparov, A. Melikyan, and M.N. Arjmand)

Guram Aleksidze described in detail the distribution of *Beta* species in the Transcaucasus area. The following list of species was given for the respective countries:

---

<sup>3</sup> Macaronesia is a biogeographical region which includes the Canaries, Madeira and the Azores.

### Armenia

*B. vulgaris* L.; *B. vulgaris* subsp. *maritima* (L.) Arcang; *B. corolliflora* Zosimovich; *B. macrorrhiza* Stev.; *B. lomatogona* Fischer et Meyer and *B. trigyna* Wald. et Kit.

*B. corolliflora*, *B. macrorrhiza* and *B. lomatogona* are represented in *ex situ* collections in Armenia, although these collections need support for long-term maintenance.

### Azerbaijan

*B. vulgaris* subsp. *maritima* (L.) Freyn, *B. lomatogona* Fischer et Meyer; *B. macrorrhiza* Stev.; *B. patula* (Soland) W. Aiton, Hortus Kewensis; *B. trigyna* Wald. et Kit. and *B. vulgaris*.

At the Institute of Plant Genetic Resources 39 accessions of *Beta* are conserved *ex situ* (*B. vulgaris* L., *B. lomatogona* and *B. vulgaris* subsp. *maritima* L.).

### Georgia

*B. vulgaris* L. subsp. *vulgaris* (cultivated leaf beet, garden beet, fodder beet and sugar beet); *B. corolliflora* Zosimovich and *B. trigyna* Wald. et Kit.

Only five accessions of cultural *Beta* L. species *B. vulgaris* are conserved in the genebank.

### Iran

*B. lomatogona* and *B. vulgaris* subsp. *maritima*

In the case of *B. lomatogona* in Iran, population size is apparently decreasing in a number of localities, suggesting the need for protection of this natural reservoir of potentially useful traits. Collecting missions were carried out and *in situ* conservation was established in the Ardabil Research Station.

There are strong political, biological and economic reasons why wild beet populations should be considered for *in situ* management in the Transcaucasus region. Detailed information is available on the distribution of the species and individual populations. Good taxonomic and biosystematics knowledge is available, as well as a central crop database for *Beta*, which could be used as an *in situ* management tool. There is a strong interest among scientists in investigating the specific requirements for *in situ* management of *Beta*.

There is also a serious need to organize collecting missions to collect *Beta* species and to increase *ex situ* collections with new accessions, as well as to increase on-farm conservation.

During the discussion, the validity of the presence of *B. patula* in Azerbaijan was questioned, considering that this species is considered endemic to Madeira Island.

### Survey of *Beta nana* in Greece

(R. Hannan, B. Hellier, L. Frese, S. Samaras and L. Panella)

Lee Panella described the joint exploration mission organized in 2005 by the United States Department of Agriculture (USDA), the Federal Centre for Breeding Research on Cultivated Plants (BAZ)<sup>4</sup> and the Greek Gene Bank to survey *Beta nana* populations in Greece. *Beta nana*, an inconspicuous diploid belonging to the monotypic section *Nanae*, only grows at high altitude (above 1800) and is endemic to Greece. Little is known about its genetic variation, while phenotypic variation is considered low within and between populations. The species is considered rare but not endangered. However, species in alpine regions are sensitive to

---

<sup>4</sup> Update at time of publication: on 1 January 2008 the former Federal Centre for Breeding Research on Cultivated Plants (BAZ) has been merged with other institutions. The newly established "Julius Kuehn Institute (JKI), Federal Research Centre for Cultivated Plants", is working on plant protection, plant breeding, crop and soil science.

global climate change. Reproduction and migration mechanisms of the species have not been investigated, demographic processes are not well understood, the impact of climate change is difficult to predict and gene flow and genetic variation within and among populations is little understood. The exploration was therefore meant to: 1) obtain fresh seed from a few, larger populations, enabling further research; 2) jointly develop an *in situ* management programme with the Greek counterparts; 3) develop a database tool suited to document monitoring data; 4) determine environmental conditions to design efficient *ex situ* regeneration procedures. This mission was also a follow-up to the previous recommendations of ECP/GR to monitor the status of this species. Twenty-six populations were found in mountainous areas throughout Greece, in grazed places, at medium risk of genetic erosion. Mt. Olympus was identified as the most suitable site for *in situ* conservation, since it is already a national park.

There still remains a significant area to explore in Greece in order to confirm the full extent of the species distribution. It is also needed in order to understand how effectively *B. nana* populations are protected by national or provincial nature park statutes, when they are located in or near these areas. The extent of overlap between legally protected areas and growing sites needs to be explored by integrating GIS and floristic studies to determine the scope of the relationship between conservation measures and plant species survival. It is also necessary to match the distribution of *B. nana* to existing protected areas and determine overlap, in order to suggest locations for the development of genetic conservation sites

A more informed choice of populations and sites for conservation priority should be based on genetic distance measures and genetic variation detected within and among populations. Studies with microsatellite markers are proposed. How effectively agroenvironmental measures subsidized by the EU Commission can be deployed for managing these sites also remains a question to be verified.

In the discussion which followed it was remarked that it is easier to identify and conserve populations already included within protected areas. However, the question remains of how much diversity is present within or outside these areas.

It was also noted that research with microsatellites is likely to take place in the US on the collected material, in the hope that the markers used for section *Beta* also work on section *Nanae*.

It was concluded that an important outcome of this mission had been to realize that *B. nana*, which had been believed possibly to be extinct, was still present and moreover, with several populations. The collected material will be very useful for further research and characterization and evaluation work.

### **Survey of *Beta vulgaris subsp. maritima* populations in Ireland**

Dermot Grogan reported on a survey of *Beta v. maritima* populations that took place in Ireland in 2002-2003, when 56% (24) of the sites previously sampled in 1987 were checked, as well as three new sites. Geographical locations of the populations were mapped on the basis of a high GPS accuracy (<3 m). Plants were always found in proximity (within 100 m) of the sea edge. Habitats included stone walls, concrete walls, coastal defences, cliffs, road verges, reclamation areas, park benches, caravan parks, yacht parks and (less often) sand dunes. The populations were generally quite well established, except for a few. The proximity to cultivated sugar beet was estimated to be within 1 km in 28% of the cases, between 1 and 5 km (30%), >5 km (44%). In no cases could the populations be considered to have been completely isolated throughout history. Diseased plants were found very rarely and in only one case was a probable virus disease noticed.

The ongoing threats to the habitats of maritime beet populations in Ireland are coastal erosion and human leisure and commercial activities.

Two sites are under threat of extinction and should be designated for conservation: 1) Ross's Point, Co. Sligo, where no plants are present any longer in this area and the actual habitat is not very suitable for *B. vulgaris* subsp. *maritima*; 2) Dunmore East, Co. Waterford, where less than 10 plants were found.

A number of sites are included in Special Areas for Conservation, although the species is not mentioned in the lists of "interesting" plants. Recommendations need to be made to the authorities to take these plants into consideration.

In the discussion, it was noted that in Italy too, *B. vulgaris* subsp. *maritima* only grows in close proximity to the sea. However, B. Ford-Lloyd mentioned that more and more occurrences of maritime beet growing inland were being recorded (e.g. in Minorca).

The observation was also made that in the South of England it seems that smaller amounts of seed are being produced, possibly as an effect of global warming, which could reduce the vernalization effect. This observation was also confirmed for the case of Sweden, where huge plants with no seed at all had been noticed. On the other hand, this tendency towards seed set reduction could not be confirmed for Ireland, but possibly the Irish populations might already have become adapted to a lower requirement for vernalization.

*G. Janssen chaired the afternoon session.*

### ***The International Database for Beta (IDBB) and in situ management: potential role and functions***

*(C. Germeier and L. Frese)*

Christoph Germeier explained to the Group the arguments in favour of a crop-specific approach combining *in situ* and *ex situ* information:

- Managing *ex situ* and *in situ* data are complementary issues. Thus they need a common information source;
- *Ex situ* collecting sites can be used to find interesting *in situ* populations and vice versa;
- Evaluation and characterization of *in situ* populations will imply repeated sampling and keeping reference samples as genebank accessions;
- Users of genetic resources will use both sources and need a tool for integrating research for interesting traits within *in situ* and *ex situ* collections;
- Breeding-related interests (e.g. characterization and evaluation) are crop-specific. Multicrop information systems in these domains impair simplicity of use and performance.

Interacting information systems for *in situ* management were described, including EUNIS (European Nature Information System = information on nature reserves with emphasis on nature protection, geographical, faunistic and floristic focus – multi-species inventories with special regard for biologists' favourites); CWRIS (the PGR Forum Crop Wild Relative Information System = lists of wild species of potential importance for breeding and agriculture and their habitats); and the Central Crop Databases (CCDBs), integrating data on occurrence *ex situ* and *in situ*, characterization and evaluation. Cooperation and integration among the above-mentioned databases is an option that needs to be pursued. This can be achieved by making use of shared open source software, such as CropForge. CropForge is a collaborative software development site, maintained by the biometric and bioinformatics unit of IRRI, providing tools and a centralized workspace for developers to control and manage software development.

The representation of wild species in the IDBB (<http://idbb.bafz.de>) corresponds to 33% (3506 accessions) of the total number of accessions, and most of these are well documented for site information.

New features of the IDBB include pictures of some accessions and interactive maps of the collecting sites. Evaluation and characterization data can be geographically mapped as well. The IDBB records 16 067 observations related to the wild species, mainly for *B. vulgaris* subsp. *maritima*, *B. vulgaris* subsp. *adanensis* and *B. macrocarpa*. This represents 53% of the total number of observations in the IDBB.

A data model for *in situ* field observations was created. It is necessary to define the population. A certain geographic point (reference site) on the map can identify a population of a certain taxon. Population data can be linked to site data and habitat data, as well as to data for a survey of the population carried out at a defined time. Moreover, patch and demography data correspond to the observations made on a subpopulation or part of a population.

While there are good reasons to create and manage a database at the crop level, some elements of the database that are not crop-specific should be managed by a central repository, at the multi-crop level, for instance the site information. The currently available taxonomy backbone can derive from CWRIS and/or GBIF (Global Biodiversity Information Facility). However, several taxonomic problems still remain to be solved.

### **Screening techniques for root growth parameters under dry and compacted conditions in sugar beet germplasm**

Eric Ober described ongoing work on improving tolerance to water stress. The rooting characteristic of the plant is an important phenotype that can be correlated to drought tolerance. Evaluation is made by looking for root variation in the field. Genotypic differences in rooting patterns and water use at the different soil layers were measured in an experiment under managed drought conditions in the field. It was also noted that greater water extraction corresponds to greater sugar yield. However, differences may not be large enough for breeders to use. A related character that needs to be considered is the differential ability to root under compacted conditions.

In the discussion, it was noted that research at Broom's Barn is still continuing, although funding cutbacks have been made. The most interesting recent development is the identification of a dozen proteins that could be candidate genes for drought tolerance.

E. Ober also announced the launching of an on-line newsletter on germplasm evaluation and pre-breeding, which should be published soon, following his request for contributions. The request was sent to 265 email addresses and 19 responses were obtained, including from public and private breeders. The Group considered the newsletter initiative very commendable and is looking forward to receiving the first issue.

### **Recent progress in Beta germplasm evaluation in the USA**

Lee Panella reported that the US National Plant Germplasm System (NPGS) has 470 986 accessions. It is a cooperative effort by public (state and federal) and private organizations to preserve the genetic diversity of plants. Considering that scientists must have access to genetic diversity to help bring forth new varieties that can resist pests, diseases, and environmental stresses, the NPGS aids the scientists and supports the need for genetic diversity by acquiring, preserving, evaluating, documenting and distributing crop germplasm.

The system is loosely coordinated, in the sense that there is not one single head of the NPGS. The Sugarbeet Crop Germplasm Committee (CGC) advises the NPGS on the *Beta* collection. It includes federal, state (university), and industry members and coordinates a national *Beta* evaluation programme. It is funded by competitive grants from the USDA-ARS National Programme Staff.

An organization and a scientist (private or public) are responsible for the evaluation of each of the descriptors of interest. After evaluation, data are processed and entered into the GRIN database. Resistant accessions are re-screened and often selected as parents for pre-breeding. ARS scientists begin pre-breeding at the different locations and the resulting germplasm is released to seed company breeders.

Currently, the following research is under development:

- Beet cyst nematode pre-breeding (ARS-Salinas and Fort Collins). Germplasm to be released in 2005/2006 (Salinas);
- Beet cyst nematode marker development (ARS-Salinas, Fort Collins and Fargo);
- Continued development of rhizomania resistant germplasm, especially against emerging races (Salinas);
- New populations for *Cercospora* resistance (Fort Collins). Release planned for 2007 or 2008;
- Molecular mapping of *Aphanomyces* resistance (ARS-East Lansing);
- Continued breeding for sugar beet root maggot resistance (ARS-Fargo). Germplasm is continuously released;
- Research into *Fusarium* race structure and species composition (ARS-Fort Collins).

What makes the evaluation programme so important in the US is that, after evaluation, the useful traits are introgressed into sugar beet germplasm and released for cultivar development.

### ***Evaluation of beet germplasm and progress towards the development of sugar beet for disease resistance and root structure***

(M. Mesbah et al., presented by M. N. Arjmand)

Mohamad Nasser Arjmand reported that the most important research activities of the Sugar Beet Seed Institute (SBSI), Karaj, Iran, concerning utilization of *Beta* germplasm in sugar beet breeding programmes, are as follows:

1. Evaluation of germplasm for resistance to *Polymyxa betae*;
2. Transfer of Rhizomania resistance gene(s) from *B. vulgaris* subsp. *maritima* and cultivated sources to sugar beet;
3. Transfer of beet cyst nematode resistance genes from resistant sources to sugar beet;
4. Transfer of root roundness and smoothness from fodder beet and red beet to sugar beet.

### **Poster session**

The following posters were displayed and discussed:

#### **Beta genetic resources in Morocco**

*Y. El Bahloul<sup>(1)</sup>, P. van Cutsem<sup>(2)</sup>, M. Sadiki<sup>(3)</sup> and C. Al Faiz<sup>(1)</sup>*

*(1) National Institute of Agronomy Research, Genetic Resources and Plant Breeding Unit, CRRA-Rabat, BP 415, Rabat RP, Morocco*

*(2) University of Namur, Plant Cell Biology Unit, Rue de Bruxelles 61, 5000 Namur, Belgium*

*(3) Agronomy and Veterinary Institute Hassan II, BP 6202 Rabat Instituts, Morocco*

Wild *Beta* species are widespread in Morocco. *B. maritima* and *B. macrocarpa* are widespread all over the country, while *B. patellaris* can only be found on the southern coast. Pastures and urbanization are putting many sites at risk.

It was explained that no landraces of sugar beet or leaf beet are present in Morocco.

#### **Germination ability of sugar and fodder beet seeds after long-term storage in the Polish genebank**

*Kamilla Kuzdowicz, IHAR, Bydgoszcz, Poland*

The efficiency of the system used was confirmed, but differences were detected in accessions' response.

#### **Genetic diversity analysis in four elite diploid populations of sugar beet (*B. vulgaris* L.) using RAPD and ISSR**

*H.M. Srivastava, S. Srivastava, P.S. Gupta and V.X. Saxena*

*Division of Crop Improvement, Indian Institute of Sugarcane Research, Lucknow, India*

Four populations of sugar beet were screened and the ability of DNA-based markers to detect a high degree of polymorphism among these populations suggested the possibility of screening a higher number of anonymous loci in sugar beet to enable selection of the most suitable parents to obtain new genetic combinations.

## **Section II. Technical meeting, including review of the workplan**

### **General briefing on ECP/GR**

L. Maggioni described the current status of the ECP/GR programme. He explained that the ECP/GR had entered its VII<sup>th</sup> Phase (2004–2008) with some modifications made to the structure and mode of operation by the Steering Committee at its last meeting in Izmir, Turkey, in October 2003.<sup>5</sup> With specific relevance for the Working Group on *Beta*, it should be noted that the former Industrial Crops Network changed its name to the "Sugar, Starch and Fibre crops Networks", which includes three Working Groups (*Beta*, Potato and the new Working Group on Fibre Crops (Flax and Hemp)).

The Steering Committee endorsed four priority areas for Phase VII: 1) Characterization and evaluation; 2) Task sharing; 3) *In situ* and on-farm conservation; and 4) Documentation.

The Steering Committee also requested a Network Coordinating Group (NCG) to define two priority groups within the Network and to make proposals, in consultation with the Working Groups, for actions on the basis of a budget of about 83 000 euro allocated to the Network. As a result of this exercise, carried out during 2004, the Working Group on *Beta*

<sup>5</sup> See Report of the Ninth Steering Committee Meeting, also available on Internet at <http://www.ecpgr.cgiar.org/SteeringCommittee/SC9.htm>

was included among the priority Working Groups for Phase VII, together with Fibre Crops (Flax and Hemp). The following use of funds relevant for *Beta* was eventually approved:

- June 2005: Network database managers meeting (3600 euro)
- March 2006: Third *Beta* WG meeting (11 500 euro)
- March 2006: *Beta in situ* assessment day (3600 euro)
- March 2006: Meeting of all Networks' Coordinating Groups (on a different budget line)
- 2006: *Beta* WG sub-coordinators *ad hoc* meeting (2000 euro)
- Publication of meeting report (4000 euro)

For further information on ECP/GR, the ECP/GR Web site can be consulted, where several reference documents are available, including the Networks' budget and the Terms of Reference for the ECP/GR operational bodies. A specific Web page is also dedicated to the Working Group on *Beta*, and this can be improved with the help of Group members and according to the needs of the Working Group.

### **A European Genebank Integrated System (AEGIS)**

A short account was given of the ECP/GR-funded project AEGIS (A European Genebank Integrated System), which is planning, initially through a feasibility study, to promote the creation of a rational European plant genetic resources genebank system of genetically unique and important accessions, in order to conserve them safely in the long term, at the same time ensuring their genetic integrity, viability and availability to users. According to a draft "Strategic Framework" document which was prepared during the feasibility study, the operational principles of an integrated system for the operation of genebanks in Europe would be the following:

- Transparency of information,
- Agreed quality standards of operation,
- Joint planning for rational conservation,
- Sharing resources (facilities and expertise),
- Joint financing (common fund),
- Ready and easy access to germplasm.

In the most likely scenario, germplasm would continue to be conserved in the same location where it is currently stored, but management of conservation of the accessions which are voluntarily designated by the member countries as being part of the system would be coordinated regionally at the crop level. ECP/GR Crop Working Groups would prepare and coordinate implementation of crop conservation action plans, possibly delegating (part of) these tasks to Coordinating European (Lead) Institutions.

Principal benefits of an integrated system for the operation of a European Genebank Integrated System (AEGIS) would be the following:

- Improved collaboration among European countries and a stronger unified Europe,
- Cost-efficient conservation activities,
- Reduced redundancy in European collections,
- Improvement of quality standards across Europe,
- More effective regeneration,
- Facilitated access to germplasm,
- Improved security of germplasm through safety-duplication,
- Improved linkages to *in situ* conservation and users.

The AEGIS establishment process foresees the need for a formal approval by the ECP/GR Steering Committee in September 2006 of the “Strategic Framework” and of the establishment process itself, including the definition of a financial strategy. ECP/GR member countries would then be offered the opportunity to sign a Collective Memorandum of Understanding, defining countries’ responsibilities.<sup>6</sup>

More information on AEGIS is available from [www.ecpgr.cgiar.org/AEGIS/AEGIS.htm](http://www.ecpgr.cgiar.org/AEGIS/AEGIS.htm).

## Country reports

### Critical assessment of the achievements at country level

The Chair asked attending members of the Working Group to report highlights of national genetic resources activities carried out since the last meeting of the Group, in particular on the following subjects:

- *In situ* management
- On-farm management and management strategies complementing the *ex situ* work
- Data exchange
- Regeneration guidelines
- Quality standards
- Task sharing
- Research and utilization
- Funding opportunities

*Full reports of the country activities will be published in the final report (including from non-attending members wishing to send their notes on progress).*

#### • Georgia

Guram Aleksidze described the situation for the entire Transcaucasus area, explaining that Azerbaijan is in good position to make progress with *in situ* management, since an experimental station has been established for this purpose; also that Armenia and Iran have already completed excellent preliminary surveys. On the other hand, in Georgia it is still necessary to first undertake surveys of the resources existing *in situ*.

Cooperation among Caucasus countries was said to be very good, especially for exchange of information. The need to identify funding opportunities is common to all the countries.

#### • Germany

Lothar Frese introduced the main highlights for Germany:

- ***In situ* management:** only on the North Sea island of Helgoland and in a small area in the Baltic Sea region south of Denmark do a few wild *Beta* populations occur which have been surveyed. It seems that *B. vulgaris* subsp. *maritima* is expanding in the Baltic Sea area, a development which was not expected 10-15 years ago. Opportunities for *in situ* management are very limited in Germany.
- **Data exchange:** international cooperation is exemplified by the commitment to manage the International Database for *Beta* (IDBB), even though there are often insufficient personnel to properly administer the database.

<sup>6</sup> The Strategic Framework discussion paper was finalized in February 2008 and is now available: ECPGR. 2008. A Strategic Framework for the Implementation of A European Genebank Integrated System. European Cooperative Programme for Plant Genetic Resources (ECPGR). Bioversity International, Rome, Italy. ([http://www.ecpgr.cgiar.org/AEGIS/Docs/AEGIS\\_DiscussionPaper.pdf](http://www.ecpgr.cgiar.org/AEGIS/Docs/AEGIS_DiscussionPaper.pdf)).

- **Regeneration guidelines:** all curators have returned information related to regeneration practices and the document is on-line on the ECP/GR Web site. This document needs continual amendments. IPK will need to make improvements in the course of its ongoing reorganization.
- **Quality standards:** the merger of the two German collections will result in the definition of a concept for quality standards, which will be developed by IPK (in a similar way to what was done by CGN, Wageningen, where the ISO standards were adopted).
- **Research and utilization:** very few institutes are undertaking this task: some are, such as the Institute for Sugarbeet Research at Göttingen and the University of Kiel (looking for resistance genes and investigating the bolting gene). The BAZ is a federal breeding research centre having no clear mandate for *Beta* breeding research.
- **Funding opportunities:** EC Regulation 870/04 is one opportunity, but there are also several foundations which could be tapped for funds. For example, the Humboldt Foundation allows senior scientists to undertake sabbatical periods in Germany. The Humboldt Foundation also manages the Marie-Curie Foundation, which allows exchanges of young female scientists, on the basis of very competitive grants. One example of a project funded by the Marie-Curie Foundation is a botanic survey of the mountain species of Greece.

The Group was reminded that no further seed requests can be processed by BAZ Braunschweig, and that they should be sent to IPK.

- **Ireland**

Dermot Grogan explained that Ireland needs to develop a strategy for dealing with *in situ* populations, following the completion of the wild *Beta* survey. A proposal will be prepared with the aim of promoting the establishment of a national conservation policy.

Regeneration of the existing seed bank germplasm is needed, but this task cannot be proposed for any realistic plan at present, since funds for conservation are being focused exclusively on crops with national importance, i.e. potato and forages.

Data on *in situ* accession sites are available.

Very limited research and utilization is carried out.

Funding is available in Ireland through co-funding at 50% and this opportunity should be available every year for the next two years to undertake work on maritime beets.

- **Italy**

Enrico Biancardi reported that locations of new sites of sea beets were found near Bari, Foggia and in other places. New localities were also found in Croatia, within the context of the EU-funded 6<sup>th</sup> Framework Programme SIGMEA project.

The overall objective of SIGMEA is to set up a science-based framework, strategies, methods and a practical toolbox for assessing ecological and economic impacts of genetically modified crops and for effective management of their development within European farming systems. The main objectives of the Project are: i) to bring together programmes studying crop-to-crop gene flow across Europe within a diversity of agricultural systems; ii) to collate and synthesize existing and developing experimental information on gene flow and environmental impacts; iii) to conduct landscape scale evaluations of gene flow and develop biogeographical models of outcrossing, seed dispersal and persistence, covering whole farms and regional scales.

The aim of the researches carried out at Rovigo is the detailed study of variation in natural populations of sea beet in some areas of Italy and Croatia. A further objective is the evaluation of the influence of the presence of cultivated beet on the biodiversity of the populations in these areas. Data on population genetic structure would allow an estimation

of gene flow between crop and wild populations of beet in the central Mediterranean area. The information gained during this study would be of great value for the estimation of gene flow, the protection of the biodiversity within sea beet in relation to the influence from cultivated beet, and for the correct management of the sugar beet crop.

The Istituto Sperimentale per le Colture Industriali (ISCI) in Rovigo is continuing to collect in the Po Delta and the Venice lagoon. The collected seed samples are then grown in a greenhouse for evaluation. Correlation was established between stress situations (drought) and the development of the root system. This work is carried out in collaboration with Mitch McGrath from the USDA-ARS of East Lansing, Michigan.

- **Poland**

Kamilla Kuzdowicz explained that the *Beta* collection in Poland is situated in the Bydgoszcz Research Division of the Plant Breeding and Acclimatization Institute, as part of the National Centre for Plant Genetic Resources (NCPGR) based in Radzików which coordinates, finances and provides storage facilities for crop genetic resources in Poland.

There are no species of *Beta* in the wild flora of Poland. The *Beta* collection in Poland consists of wild species from other countries, old cultivars and breeding materials of sugar and fodder beets. At present, it contains 343 accessions: 112 sugar beets, 199 fodder beets and 32 wild forms belonging to sections *Beta*, *Corollinae* and *Procumbentes*. This collection is conserved in the Long-Term Storage Laboratory in Radzików as seed samples kept in glass jars at -15°C and 5-8% moisture content. Accessions were obtained mainly from national breeding institutions and through exchange among beet collections and foreign research laboratories. Evaluation for morphological, cytological and biochemical traits, seed quality and seed germination tests are carried out in Bydgoszcz. Each year 20-25 accessions are evaluated. During the last ten years some of the accessions have been evaluated for two economically important beet diseases: *Aphanomyces cochlioides* Drechsler and *Cercospora beticola* Sacc. At present, accessions are being evaluated for tolerance to drought stress. The collected and evaluated germplasm is used in sugar and fodder beet breeding and in several research programmes. Information and seed samples are distributed freely.

- **United Kingdom**

Brian Ford-Lloyd explained that a “Gene flow” project had been completed and the results were in press. This work includes a GMO risk assessment study.

The University of Birmingham is engaged in studies on prioritization of wild beets for conservation and a lot of experience was accumulated by doing threat assessment red-listing. There is now an IUCN Species Survival Commission (SSC) Specialist Group for crop wild relatives. Threat assessment red-listing for *Beta* was initiated and the work will be completed in six months for submission to the Specialist Group for consideration. There may be a need to contact members of the *Beta* WG in the near future in order to complete this work.

E. Ober reminded the Group that Broom’s Barn participated in the *Beta* GENRES project. Accessions were evaluated in terms of drought stress and disease resistance and these descriptors’ data are now publicly available in the IDBB. Standardization of abiotic stresses is still considered to be an issue where an agreed standardized test is required. Evaluation of phenotypic characteristics could be worth the establishment of a consortium project, on the model of the previous GENRES project. This project could be multi-crop and include abiotic stresses.

A large project on *Polymyxa* resistance is ongoing, looking for new sources in genebank material. A likely source of resistance was found and a mapping exercise is currently going on.

Storage conditions for material at Broom's Barn are not ideal (glass jars kept at 5-7°C), with limited storage life. A database system is used to manage the institute's seed inventory, with a bar coding system for each stored accession. The system can be shared with other institutes upon request.

Regarding the opportunity to standardize tests for abiotic stresses, C. Germeier commented that it is more important to describe exactly how the tests are done than to standardize the test precisely, since the methods used are always evolving due to the continual progress of modern technologies.

### **Statements and comments of other WBN countries**

The Chair asked representatives of other WBN member countries to add comments, if they so wished, reporting the situation in their respective countries.

#### **• Iran**

Mohamad Nasser Arjmand informed the Group that exploration will be continued to find new sites of *Beta* germplasm. Characterization and evaluation activity will also continue, as well as regeneration. Recently, 85 landraces of garden beet were characterized and evaluated for several traits.

The SBSI *Beta* genebank contains beet germplasm plus varieties from Germany, Poland and USA, as well as local and foreign species, landraces and breeding material.

Information is openly exchanged with all colleagues.

Many projects are going on regarding utilization of material resistant to *Rhizoctonia* and other diseases. All activities are focused on sugar beet.

The Ministry of Agriculture is funding the national projects and funds from international organizations would be welcome

#### **• Morocco**

Activity on wild *Beta* genetic resources is new for Morocco, but there is an active beet breeding programme, going on in parallel with the identification of suitable sites for sugar beet seed production, which are limited in Morocco. Collecting of wild species seed samples has started. Some plants are being evaluated for phenotypic traits.

Projects are taking place to evaluate biotic and abiotic (salinity and drought) resistance in wild populations and plans were made to continue exploration of the distribution of wild species in Morocco. The opportunity to link with the ongoing work of S. Villain on the distribution of *B. macrocarpa* was an immediate result of interactions established during the current meeting.

Funding for *Beta* genetic resources are very limited, since this is not a priority for Morocco.

The opportunity for breeding local sugar beet varieties is under investigation. There are a few cultivated garden beets, but all are foreign varieties.

#### **• Spain**

Arnoldo Santos explained that work on taxonomy is carried out in the Canary Islands. He would like to get engaged in projects on morphology, taxonomy, genetic diversity and typification of Macaronesian material. A project is in progress to collect seed for the botanic garden seed bank in Gran Canaria., while a project is being started to collect seed in Tenerife for a local seed bank.

The availability of help for interested scholars to collect wild *Beta* material in the Canary Islands was re-confirmed.

- **Sweden**

Geert Janssen explained that the Syngenta breeding company does not have a genebank for wild species, but only a collection of hybrids and landraces. Discussions are in progress on whether this collection should be passed on to the Nordic Gene Bank.<sup>7</sup>

He thought that it would be desirable to ensure some commitment from breeding companies for genetic resources collaboration and for funding, especially for pre-competitive research. Ideally, breeding companies could join the effort in order to offer a joint commitment for the conservation of genetic resources.

- **USA**

The main activity is evaluation. There are 2513 accessions conserved, including lines, old varieties and 571 *B. vulgaris* subsp. *maritima*. Much research is based on pathology, ranging from epidemiology to the detection of markers.

An ongoing project is the study of *B. vulgaris* subsp. *maritima* from the coasts of France. Plants are grown in a garden and quantitative measurements are being taken, with the aim of determining where is the largest genetic variation of the collection, and also in order to help identifying suitable candidate accessions for a core collection. Another aim is finding morphological differences and correlating these with genes. M. McGrath is trying to locate genes and doing mapping.

The only collecting mission carried out recently was focused on *Beta nana* in Greece and previously reported.

Following an ECP/GR *ad hoc* meeting on the *Beta* core collection, the national core collection was coordinated with the GENRES *Beta* project core collection.

### **Standardized reporting format and future workplan**

L. Frese presented to the Group the draft standard report of the activities of the Working Group, which is expected to be submitted to the ECP/GR Steering Committee for consideration before its September 2006 meeting. He opened the discussion on the revision and finalization of this document.

Discussion took place on whether the previously planned sub-working group moderators' meeting should actually be held, and it was no longer considered necessary. It was preferred to utilize the available funds for a technical meeting aiming at the development of a descriptor list and data model for *in situ* monitoring of wild *Beta* species (see Appendix I, section III. Plans).

Regarding germplasm evaluation, it was decided to publish the newsletter on evaluation and pre-breeding being compiled by E. Ober, and then to consider the opportunity for the preparation of a project. Many workers know what the other groups are doing, but there could be developing countries' groups which are not aware of what is going on. It seems sensible to first verify who is doing what through the newsletter, then possibly to arrange a meeting and plan joint activities.

The need to include evaluation data into the IDBB was stressed. Currently it is possible to send evaluation and characterization data to the IDBB manager in Excel format (see report of the second meeting, 2002, Bologna). A possibility for the future should be to enable everybody to input their own data on-line. This would require a major programming project.

It was commented that the update of the IDBB was being kept on hold until the AEGIS project can give an indication of the future of the ECCDBs. The hope is that DB managers will be able to operate more rationally after this reorganization. Another reason not to

---

<sup>7</sup> As of 1 January 2008, the Nordic Gene Bank (NGB) has joined with the Nordic Forestry Resource and Nordic Animal Genetic Resource institutes to form NordGen, the Nordic Genetic Resource Center of the five Nordic countries (Denmark, Finland, Iceland, Norway and Sweden).

proceed with updating in the traditional way is the recent possibility offered by EURISCO of directly downloading passport data.

Further work on the quality concept was also put on hold, pending the development of AEGIS. Development of a quality concept for *Beta* is a task for genebank managers.

The revised standardized reporting format, including results, contributions to priority activities, analysis and plans for the future of the Working Group, is attached as Appendix I.

### ***Establishment of ad hoc working groups, if desired***

A group composed of L. Frese, C. Germeier, B. Ford-Lloyd, A. Santos Guerra, D. Grogan and B. Harris was formed and met in the morning of 10 March to discuss the preparation of a project to be submitted to the second call of EC Regulation 870/04. The project could become a workpackage of the planned EGRISI project or a separate one. As opposed to the current EGRISI concept, the new workpackage would include field work in a limited number of potential genetic reserves. The group wishes to include non-EU countries (Caucasus/Transcaucasus and North Africa) in the project to cover the whole range of life forms of *Beta* and a broad range of sites with distinctive features.

Focusing on the climate change issue, B. Ford-Lloyd had compiled further suggestions that could be elaborated in a project proposal which could be for instance submitted under the 7<sup>th</sup> framework programme of the EU.

### ***Recommendations and conclusions***

*Many data on new collection sites have been generated by surveys and research projects that can be used to produce point precise distribution maps of Beta. However, these do not always relate to ex situ genebank samples. When new structures become available, it will be possible to document this kind of material in the IDBB. How to manage and publish them seems also to be a legal and political matter. It will be necessary to find a legal solution to make it possible for the CCDBs to operate. One possible solution will be to make data providers aware that uploading the data implies that these are held in the public domain.*

*The meeting was a joint one with botanists. It is recommended to encourage cooperation between botanists/conservation biologists and the PGR sector to allow for better exchanges of knowledge and information. Close cooperation between such experts is an essential requirement for the implementation of the in situ management concept in practice.*

*Changes in European agriculture impact on sugar beet production acreages, and there is growing interest in production areas outside Europe: production there may lead to new pest and disease problems. Though the production of sugar within the EU may decrease, the need for breeding improved varieties adapted to new growing areas and the need for genetic resources to be well maintained ex situ and in situ will remain unchanged.*

*Climate change consequences for the maintenance for Beta in natural habitats were discussed in relation to drought, flowering patterns and changes in disease patterns. These are considered issues for future research targets.*

*Countries located in important parts of the distribution areas of Beta are encouraged to seriously consider nominating members to attend the Working Group meetings.*

### **Visit to the Institute**

The botanic garden of La Orotava is the second oldest of Spain, founded in 1788. It is part of the Canarian Institute for Agricultural Research. There are two units in the gardens, i.e. the “botanical garden” and the “botanical unit”, which does research. There are 40 000 stored herbarium sheets.

A. Santos guided the Group around the garden and also showed us a population of *B. procumbens* growing in the garden.

### **Introduction to in situ management methodology with emphasis on threat assessment**

The quantitative method for genetic erosion risk assessment developed by Guarino (1995)<sup>8</sup> was introduced to the Group as well as some descriptors suited to describe populations located in a genetic reserve. The applicability of Guarino’s method and the descriptors were discussed in the field on Saturday (see Part II, pp. 18-20).

### **Conclusion**

#### **Election of the Coordinating Committee of the ECP/GR Working Group on *Beta* / World *Beta* Network**

The Group wished to thank Lothar Frese for effectively chairing the ECP/GR Working Group for several years and offered him the opportunity to continue in this role until the next meeting of the Group. He kindly accepted this offer and suggested, with the consent of the Group, nominating Guram Aleksidze as Vice-Chair: he kindly accepted.

Dermot Grogan was elected Chair of the Coordinating Committee of the World *Beta* Network.

Sub-working groups’ moderators were also reconfirmed:

Eric Ober (Evaluation and breeding)

Brian Ford-Lloyd (Genetic diversity)

Ayfer Tan (Genetic resources management) (to be confirmed)

### **Closing remarks**

The Group discussed the possible location for the next meeting. It was suggested that the meeting could be held in 2009 either in France or in the location where the meeting of the Study Group Breeding and Genetics of the IIRB (International Institute for Beet Research) will be held. It was also acknowledged that Dr H.M. Srivastava had kindly offered to hold the next meeting in India. However, considering that the largest part of the group is based in Europe and that ECP/GR only provides funds for meetings in Europe, it was not considered practical to accept the offer from Dr H.M. Srivastava, which was politely declined.

---

<sup>8</sup> Guarino, L. 1995. Assessing the threat of genetic erosion. Pp. 67-74 in *Collecting Plant Genetic Diversity, Technical Guidelines* (L. Guarino, V. Ramanatha Rao and R. Reid, eds). CAB International, Wallingford, United Kingdom.

## **PART II. VISIT TO KNOWN *BETA* COLLECTING SITES. TRAINING ON THREAT ASSESSMENT AND POPULATION MONITORING IN THE NATURAL HABITAT**

An excursion to *Beta* collecting sites visited 25 years ago was organized on 11 March by the Instituto Canario de Investigaciones Agrarias on request of the Working Group. The sites visited were the following:

1. Near Garachico Village
2. Caleta de Interián-Sibora
3. Punta de Teno
4. Masca
5. Parque Nacional Cañadas del Teide

This activity aimed at the discussion of a quantitative approach to estimate the threat of genetic erosion that a particular taxon faces in a defined area (Guarino 1995) for two reasons. Firstly, the risk of extinction of a particular species is a function of the loss of genetic variability within individual populations of that species and in consequence its adaptability. Secondly, if a particular population is to be selected for protection in a genetic reserve, a threat assessment is required to determine the survival chances of this population. Factors affecting the genetic diversity and persistence of this population can then be reduced or eliminated. The discussion was held at the sites to check the descriptors elaborated in the office against the real data recording situation during a collecting or monitoring mission.

It turned out very soon that the descriptors can roughly be categorized into those that are related to the specific population and can only be recorded at the site, partly with the help of local administration and experts, and those that can only be found in information sources such as flora, habitat maps or weather stations. The descriptor list and notes referring to the discussions are provided in Table 1. Descriptors more related to the population for which the assessment is being made were qualified with the addition "at site". The model promoted by Guarino (1995) does not yet sufficiently take into account the species biology. Some species may even need accidental fires (descriptor 1.4) or some degree of disturbance resulting from grazing (descriptor 3.9) or irrigation schemes (descriptor 3.13) to form persistent populations. A ratio of present livestock density to estimated carrying capacity at a site of <0.5 (score 0) may even impair the species survival. It was recommended not to mix site and plant traits in a single descriptor. Instead, the threat should be calculated by weighting site traits with biological traits of the species. Any population threat assessment must always be species-specific and reasoned in the context of its ecology and ought to consider the specific conditions at the site.

It was also noted that the demographic structure of a "population" cannot be determined readily in species having a prostrate growth habit and where plants deposit seeds in the immediate vicinity of the mother plant. These features impede the identification of single plants in *B. patellaris*, *B. procumbens* and *B. webbiana* which form closed canopies. Individuals of species of the sections *Beta*, *Nanae* and *Corollinae* can be identified more easily.

Before doing any threat assessment, some terms used in the descriptor list have to be defined, such as "human population growth rate", "major population centre", "major road" and geographic terms such as "region", "area", and "site" as well as terms like "habitat" and "patch" which compound biological aspects with geographical. The human population growth rate in a remote study area may be quite different from the national average growth rate and trends in population movement may also need to be considered. In Azerbaijan young people are moving back from the major cities into remote areas while in Greece the

rural population is decreasing. Both demographic trends have their specific impacts on land use.

An interesting discussion began when the participants standing at the first site tried to define the limits of the *Beta* population growing there. Since this is impossible without any further knowledge of the species' geographic distribution pattern, spatial barriers between groups of plants and the extent of gene flow, it was suggested that observers should take records on defined patches of plants and keep these data separate. The limits of a "population" may be determined by genetic distance measures later and, in the case of clinal variation, adjacent groups of plants can perhaps be delineated by definition of threshold levels of genetic distance.<sup>9</sup>

In summary, the excursion was not only enjoyable but also instructive.

**Table 1.** Population threat assessment

(Based on: Guarino, L. 1995. Assessing the threat of genetic erosion. Pp. 67-74 in *Collecting Plant Genetic Diversity, Technical Guidelines* (L. Guarino, V. Ramanatha Rao and R. Reid, eds). CAB International, Wallingford, United Kingdom)

Factor	Score	Scored	Data source
<b>1.1 Taxon distribution</b>			
Rare	10		CWRIS, CCDB
Locally common	5	5	
Widespread or abundant	0		
<b>1.2 Drought</b>			
Occurred in 2 or more consecutive years	10		Closest weather station
On average one or more times every ten years, but not in consecutive years	5		
Less than once every ten years	0	0	
<b>1.3 Flooding, at site</b>			
Area known to be very flood prone	10		Topographic map, local administrations such as coast guards
Area not known to be flood prone	0	0	
<b>1.4 Accidental fires, at site</b>			
Area known to be very prone to fires	10		Local administrations such as forestry departments
Area not known to be prone to fires	0	0	
<b>1.5 Potential risk from global warming</b>			
Summit areas or low-lying coastal areas	10	10	Topographic map, closest weather station, botanical surveys
<b>3.1 Extent of wild <u>habitat</u> of target species within study area</b>			
Very restricted (<5%)	15	15	Geological & soil & topographic maps, in particular habitat maps
Restricted (5-15%)	10		
15-50%	5		
Extensive (>50%)	0		
<b>3.2 Conservation status of target <u>species</u></b>			
Species not known to occur in any protected area	10		EUNIS, CWRIS, national and state red lists
Species known to occur within a protected area, but protection status poor or unknown	5	5	
Species known to occur within a protected area, and protection status good	0		

<sup>9</sup> (Note by L. Frese on 16 March 2006): The task of defining a population is well known in forest genetics where the delineation of provenances is an important issue. See: Kleinschmit, J.R.G., D. Kownatzki and H.-R. Gregorius. 2004. Adaptational characteristics of autochthonous populations – consequences for provenance delineation. *Forest Ecology and Management* 197:213-224.

**Table 1 (cont.)** Population threat assessment

Factor	Score	Scored	Data source
<b>3.3 Extent of use of wild <u>habitat</u> of target species, at site</b>			
Industrial exploitation	15		Local administrations, NGOs
Exploitation by surrounding populations (e.g. fuelwood gathering from nearby towns)	10	10	
Hunting and gathering by small local communities	2		
Completely protected	0		
<b>3.4 Extent of use of target <u>species</u>, at site</b>			
Industrial exploitation	15		Local administrations, NGOs
Exploitation by surrounding populations	10		
Local exploitation	5		
Protected or not used	0	0	
<b>3.5 Agricultural pressure on wild habitat, at site</b>			
Large-scale cultivation within habitat margins	15	15	Local administrations, georeferenced images
Subsistence cultivation areas within habitat margins	12		
Land suitable for cultivation, cultivated areas within 3 km of habitat margins	5		
Land unsuitable for cultivation	0		
<b>3.6 Human population growth rate per year, close to site</b>			
>3%	10		Local administrations
1-3%	5		
<1%	0	0	
<b>3.7 Availability of agricultural land, at site</b>			
> 70 ha / sqkm cultivated	10	10	Local administrations, georeferenced images
30-70 ha / sqkm cultivated	5		
< 30 ha / sqkm cultivated	0		
<b>3.8 Species palatability</b>			
High	10		CWRIS
Medium	5	5	
Low	0		
<b>3.9 Ratio of present livestock density to estimated carrying capacity at site</b>			
>1	10		Local administrations
0.5 – 1	5		
<0.5	0	0	
<b>3.10 Average proximity to borehole or other all-year round water supply at site</b>			
<10 km	10	10	Survey, collecting mission
10-20 km	5		
>20 km	0		
<b>3.11 Distance to major population centre, at site</b>			
<20 km	10	10	Survey, collecting mission
20-50 km	5		
>50 km	0		
<b>3.12 Distance to major road, at site</b>			
<10 km	10	10	Survey, collecting mission
10-30 km	5		
>30 km	0		
<b>3.13 Distance to development projects (irrigation scheme, tourism complex, mining site ...), at site</b>			
<20 km	10	10	Survey, collecting mission
20-50 km	5		
>50 km	0		

MAXIMAL POINTS = 200  
SUM OF ACTUAL ASSESSMENT

## **PART III. PRESENTATIONS AND PAPERS**

**TO BE INCLUDED**



## **APPENDICES**

<b>Appendix I. Progress report of the ECP/GR Working Group on <i>Beta</i> for the period (1999) 2002 to March 2006 and workplan for the future</b>	<b>24</b>
<b>Appendix II. Acronyms and abbreviations</b>	<b>29</b>
<b>Appendix III. Agenda</b>	<b>31</b>
<b>Appendix IV. List of participants</b>	<b>33</b>

## Appendix I. Progress report of the ECP/GR Working Group on *Beta* for the period (1999) 2002 to March 2006 and workplan for the future

<b>I. RESULTS</b>			
<b>a. Comparison of workplan (milestones) versus results obtained</b>			
<i>Workplan (milestones)</i>	<i>What results have been obtained?</i>	<i>Which aims/goals have not been (fully) reached?</i>	<i>Completeness ratio (%)</i>
Hold the third joint meeting of the WG on <i>Beta</i> and the World <i>Beta</i> Network in Spain.	The meeting was jointly organized with the Instituto Canario de Investigaciones Agrarias, Gobierno de Canarias, Puerto de la Cruz Spain.	-	100
Hold an <i>ad hoc</i> meeting of the sub-working groups' moderators, to discuss topics related to germplasm evaluation, utilization, molecular markers, data documentation.	An email newsletter was designed by the sub-working group moderator for germplasm evaluation and distributed within the ECP/GR <i>Beta</i> Working Group and WBN. Colleagues were encouraged to publish short communications in the newsletter. The response to the sub-group moderator's initiative was very positive.	During the third meeting at Puerto de la Cruz the need for a sub-working group moderators' meeting was discussed. The plenum suggested using the funds for the development of a descriptor list for <i>in situ</i> management data and related data modelling.	5
Provide the IDBB manager with passport accession data in the EURISCO/MCPDv2 format.  After receiving their passport update, send to the curators a Windows application displaying duplicate groups and enabling them to fill in their agreements regarding responsibility, restrictions and resulting storage status for their accessions.  Make the result of the first round of decisions on sharing of responsibilities available on-line via the IDBB.	On hold until the end of AEGIS project. It is hoped that the results of the project will strengthen the role of CCDB managers.  The CCDB manager received <i>Beta</i> passport data from Ukraine.  It is planned to exchange data with non-European countries. With respect to European countries the CCDB manager will wait for the completion of EURISCO and then download data for an update.	-	2
Following the scheme agreed during the meeting, develop a draft document on quality concept for <i>Beta</i> genetic resources conservation and circulate it.  Send comments and revisions to the proposed document.  Circulate a revised document for final endorsement.	None. On hold. Part of the AEGIS procedure.  The development of a quality concept is considered a task of the curators of <i>Beta</i> holdings.	-	0

Workplan (milestones)	What results have been obtained?	Which aims/goals have not been (fully) reached?	Completeness ratio (%)
Provide the IDBB manager with additional characterization and evaluation data, following the suggested guidelines.	Wild beet photos were added to the database.	-	1
Provide the <i>Beta</i> curators and/or WG members with a base document on seed production procedures.  Complete the document in accordance with specific local conditions and return it to the BAZ Gene Bank.  Compile individual reports and publish them on the ECP/GR WG on <i>Beta</i> Web pages.	Done.	-	100
Provide the IDBB with GIS software (Milestone from 1999).	An on-line mapping tool has been developed on the basis of the open source map server available from the University of Minnesota.	The methodology for recording and processing of geo-referenced data needs to be developed further.	80
Encourage inclusion of wild relatives of <i>Beta</i> , and especially <i>B. macrocarpa</i> Guss. and <i>B. nana</i> Boiss. et Heldr. and possibly species from section <i>Procumbentes</i> , in <i>in situ</i> conservation projects by the respective countries and in the monitoring of populations under potential danger (Milestone from 1999).	A <i>Beta nana</i> exploration was organized and successfully completed in 2005. A survey and risk assessment for <i>B. vulgaris</i> subsp. <i>maritima</i> was implemented in Ireland. The need for specific actions for <i>B. macrocarpa</i> , <i>B. patula</i> , <i>B. procumbens</i> and <i>B. webbiana</i> was discussed during the third ECP/GR - WBN meeting.  Concepts for <i>in situ</i> management for <i>B. macrocarpa</i> , <i>B. patula</i> , and <i>Procumbentes</i> species have been developed and are in the process of being implemented.		100
Prepare a funding proposal to hire additional staff in charge of entering GRIN, GENRES and additional evaluation data into the database (Milestone from 1999).	The database expert visited GRIN in the year 2000 and discussed opportunities for such joint work. The visit was partly funded by the German Ministry of Agriculture. The GRIN data model was made available to the IDBB managers. At an appropriate time a proposal aiming at the establishment of the International Database for <i>Avena</i> will be submitted to FAO. Since the <i>Beta</i> and <i>Avena</i> databases are based on the same data model the <i>Beta</i> will profit from such a project equally.	A funding proposal was not prepared. GRIN accession number refers to IDBB numbers. GRIN adopted the taxonomic system suggested by the WBN and used by the IDBB. The whole task is a very complicated matter since the data models for passport data are different. The development of a data warehouse was discussed. The continued support of a data warehouse would however require the permanent engagement of an administrator.	50

**b. Contribution to the four ECP/GR priorities for Phase VII**

## 1. Characterization/evaluation (including modern technologies)

During the 2002 meeting of the *Beta* Working Group participants from Belarus, Bulgaria, Czech Republic, Germany, Hungary, Iran, Lithuania, the Nordic countries, Poland, Romania, Russia, Slovenia, Turkey, Ukraine, United Kingdom, and the USA reported on characterization, evaluation and research activities.

## 2. Task sharing

On hold until the end of AEGIS.

Management of an international core collection for *Beta* has been discussed by an *ad hoc* group in the year 2000. The developed concept never completely materialized (see I.d. 2), except for GRIN.

3. *In situ*/on-farm conservation and development

The Working Group Chair attended PGR Forum meetings and provided information on *Beta* to this project group. Reports presented by country representatives (Romania, Ukraine, Bulgaria, Italy, the Nordic Countries, Azerbaijan, Morocco and Spain) during the 2002 and 2006 meetings provided new information or confirmed data on the geographical distribution of the genus *Beta*. The Cape Verdean Islands were reported as the distribution area of the *Patellifolia* genus (syn. *Beta* section *Procumbentes*) in the old literature. This report was confirmed enabling the *Beta* network to close another geographic gap in *ex situ* holdings.

The Working Group Chair joined the above mentioned *B. nana* exploration largely financed by the USDA/ARS, Washington Pullman. The Greek Gene Bank guided the group. A base line for monitoring of *B. nana* was established.

Sugar beet breeders are contributing to the "on-farm" management of beet genetic resources through buffer populations.

## 4. Documentation and information

See report of the *Avena* Working Group. The elements developed for *Avena* are/can also be applied for *Beta*, since the information systems for both crops are based on the same object and data model. A tool for geographic mapping of characterization and evaluation data was developed that may be of interest to other CCDBs.

**c. Relevance (regional / international)**

*Did your work and/or outputs have inter-regional dimension? (if it did, give precise details)*

The ECP/GR Working Group on *Beta* emerged from the World *Beta* Network. There has therefore been a continuing cooperation with the USA (Fort Collins, Colorado; Washington, Pullman), the Asian (in particular Iran) and the North African region since 1989 and this cooperation has been further evidenced by continuing participation of representatives from those regions. The *Beta* working group shares common interests with the working group Genetics and Breeding of the IIRB (International Institute for Beet Research, Brussels). The book "Genetics and Breeding of Sugar Beet" published in 2005 includes a chapter on genetic resources and it can be considered a product of international cooperation.

**d. Lessons learnt (recommendations)**

*Which lessons learnt are also relevant for other Working Groups?*

1. Working groups are composed of persons with different scientific backgrounds, interests and tasks. Knowledge in the fields of conservation biology, plant breeding and genetics, and information science is developing at high speed. While most of the Working Group members can communicate on crop-related agronomic matters as well as plant breeding and genetics, it is more difficult to generate the same common in-depth knowledge on information science, geo-informatics and conservation biology. Due to the size of the Working Group, the number of participants having this specific knowledge often is below a critical mass. The tasks to be solved by information scientists, geoscientists or conservation biologists are probably similar for many crops. Just because of the need to solve tasks, each Working Group starts developing individual solutions where a general one would be more appropriate and effective. There is therefore a need for more interaction between the crop-specific working groups and the thematic networks on cross-cutting activities such as informatics and in situ and on-farm management. This can perhaps be achieved by sending ECP/GR employed consultants to working meetings (on request of the Working Group) that on the one hand mediate knowledge between Working Groups as well as advise groups, and on the other hand collect ideas emerging during crop specific Working Group meetings.
2. The progress of such heterogeneous Working Groups largely depends on the ability of the chair to keep contact with each individual member, to stimulate the cooperation and new projects. This ability clearly is a function of capabilities and facilities. The work the Chairman and the database managers of Working Groups are investing is input in kind by their institutions, which is a weak basis for running a European Plant Genetic Resources Conservation Programme. The ECP/GR provides a framework for cooperation; the member states should also accept their role and tasks by assigning mandates to institutions that play a leading role for a specific crop. The mandate needs to be underpinned by a legal status and an earmarked budget / grant. The negotiation of mandates could be a task for the ECP/GR Steering Committee.
3. Cooperation with partners outside Europe was always considered by the ECPGR Working Group on Beta as a basic aim for two reasons. Wild species and especially landraces of leaf and garden beet are distributed in Asian and African countries. Significant evaluation work is implemented in the USA which in turn benefits all, since information and even improved material is freely available. The Global Crop Diversity Trust may be interested in funding a global conservation strategy for Beta which will allow partners in Asian and African to develop improved cooperation with ECP/GR partners.
4. The group discusses frequently how to acquire additional funds needed to fulfil the workplan. There is a large diversity of funding agencies and programmes. Some guidance by the ECP/GR in fund raising would be helpful.

**II. ANALYSIS**

**a. Bottlenecks**

<i>What were the bottlenecks experienced?</i>	<i>How do you plan to solve the bottlenecks?</i>
1. Too little communication within the Group between the Working Group's meetings.	See <b>I.d. 2.</b> The publication of a newsletter
2. Only little progress in entering characterization and evaluation data.	See <b>I.d. 2.</b>
3. Knowledge in the field of geoscience needs to be improved.	Project application and <b>I.d. 1</b>
4. There should be more formalized contact with the main players in the field of nature conservation and the PGR sector. The potential of agro-environmental measures for <i>in situ</i> conservation projects must be better understood.	Working relation with IUCN exists and will be intensified by interaction with the IUCN/SSC CWR Specialist Group (CWRSRG).

**b. Internal support needed (Secretariat, Steering Committee, other Working Groups, etc.)**

Secretariat: Support in the preparation and organization of Working Group meetings including report writing and editing is always very efficient and is really appreciated by the Working Group.

Steering Committee: Flexibility in the use of the NCG budget would allow us to overcome some of the work capacity bottlenecks. The Sugar, Starch and Fibre crops' Network Coordinating Group has launched a test case, the Flax Database proposal.

Other working groups: There is potential for cooperation in the field of *in situ* management concept development and implementation. The respective thematic network could play a coordinating role.

<b>c. External resources needed (collaboration, external funding)</b>	
<p>For reasons explained under I.d. 2., financial support is no longer requested from companies or other bodies to facilitate the participation of experts from Asian, Arabic and North African countries. The international working group for <i>Beta</i>, the WBN, has therefore become a smaller one more focused on Europe. The establishment of similar working groups for <i>Beta</i> in the Asian, Arabic and North African region by IPGRI or any other funding mechanism to encourage the invitation of key persons from these regions would be helpful.</p> <p>The Council regulation 1467/94 allowed the <i>Beta</i> Network to achieve major progress in the field of evaluation. ECP/GR should strive for the establishment of an alternative funding mechanism.</p>	
<b>III. PLANS</b>	
<b>a. Planned activities, last part of phase VII</b>	<b>b. Expected results</b>
1. Identification of target populations for <i>in situ</i> conservation. Partners in Greece, Spain, Morocco and the Caucasus countries should explore the feasibility of creating genetic reserves as soon as possible.	Geographical location of populations identified.
2. Develop a data model and module for In Situ Management (ISM). Develop and agree on descriptor list for ISM.	12 taxa, each 1 within and 1 outside protected areas.
3. Organize a technical meeting aiming at the development of a descriptor list and a data model.	Meeting with BAZ, Birmingham, IPGRI, IBV
4. Solve some taxonomic problems.	Help to determine " <i>B. patula</i> " observed in Azerbaijan. Complete description of the geographical distribution of <i>B. patellaris</i> .
5. Inclusion of additional C&E data into the IDBB. IDBB manager will not request data. It is the task of the institutions producing data to submit them to the IDBB.	Depending on data received.
6. Establishment of a baseline of genetic diversity data for monitoring.	Some populations analyzed by Syngenta as input in kind to the network.
7. Providing USDA/ARS, Pullmann with the duplicate samples (Greece, Germany, UK) of F.Dale 1980/1981 <i>Beta nana</i> collecting mission.	Seed exchange organized and populations established for further research.

### **Phase VIII - Suggested activities of the ECP/GR Working Group on Beta**

- Meeting of the Working Group jointly with the WBN;
- *Ad hoc* Working Group meetings focusing on specific themes such as the creation of an on-line descriptor list for *Beta*, meeting of collection curators to decide on/organize responsibility and task sharing, etc;
- Continued characterization and evaluation work;
- Monitoring of genetic reserves once established and the initiation of characterization and evaluation projects for these populations;
- Maintenance of cooperation with the WBN in the field of characterization and evaluation is considered essential as there are limited capacities for evaluation work in Europe. Much of the pre-bred germplasm used in European breeding programmes is provided by the USDA/ARS system.

## **Appendix II. Acronyms and abbreviations**

To be included



## Appendix III. Agenda

### **Third Meeting of the ECP/GR Working Group on Beta and the World Beta Network 8-11 March 2006, Tenerife, Spain**

Venue: Jardín de Aclimatación de la Orotava, Puerto de la Cruz, Tenerife

#### **Tuesday 7 March**

Arrival of participants

#### **Wednesday 8 March - Joint scientific meeting of the World Beta Network representatives and the ECP/GR Working Group on Beta**

08:45 – 09:00	<b>Introduction</b> <ul style="list-style-type: none"> <li>Opening of the meeting</li> <li>Welcome by the local host, L. Maggioni and L. Frese</li> </ul>
	<b>Section I - Scientific and technical aspects of in situ management</b>
09:00 – 09:30	<ul style="list-style-type: none"> <li>The PGR Forum project: some conclusions and recommendations (<i>B.V. Ford-Lloyd</i>)</li> </ul>
09:30 – 10:00	<ul style="list-style-type: none"> <li>Reconstructing the evolutionary history of the <i>Beta</i> section with molecular data. A focus on the Canary Islands (<i>S. Villain</i>)</li> </ul>
10:00 – 10:30	<ul style="list-style-type: none"> <li>Protection and distribution of <i>Beta</i> (s.l.) species in the Canary Islands: perspectives of conservation (<i>A. Santos Guerra and J.A. Reyes-Betancort</i>)</li> </ul>
10:30 – 11:00	<i>Coffee break</i>
11:00 – 11:20	<ul style="list-style-type: none"> <li>Biodiversity of <i>Beta</i> species in the Transcaucasus region (Armenia, Azerbaijan, Georgia, Iran) (<i>G. Aleksidze et al.</i>)</li> </ul>
11:20 – 11:40	<ul style="list-style-type: none"> <li>Survey of <i>Beta nana</i> in Greece (<i>R. Hannan et al., presented by L. Panella</i>)</li> </ul>
11:40 – 12:00	<ul style="list-style-type: none"> <li>Survey of <i>Beta vulgaris</i> subsp. <i>maritima</i> populations in Ireland (<i>D. Grogan</i>)</li> </ul>
12:00 – 14:00	<i>Lunch</i>
14:00 – 14:20	<ul style="list-style-type: none"> <li>GIS application for the <i>in situ</i> conservation and management programme in Turkey (<i>A. Tan</i>) – <i>unable to attend</i></li> </ul>
14:20 – 14:40	<ul style="list-style-type: none"> <li>The International Database for <i>Beta</i> and <i>in situ</i> management: potential role and functions (<i>C. Germeier and L. Frese</i>)</li> </ul>
14:40 – 15:00	<ul style="list-style-type: none"> <li>Screening techniques for root growth parameters under dry and compacted conditions in sugar beet germplasm (<i>E. Ober</i>)</li> </ul>
15:00 – 15:30	<i>Coffee break</i>
15:30 – 15:50	<ul style="list-style-type: none"> <li>Recent progress in <i>Beta</i> germplasm evaluation in the USA (<i>L. Panella</i>)</li> </ul>
15:50 – 16:10	<ul style="list-style-type: none"> <li>Evaluation of beet germplasm and progress towards the development of sugar beet for diseases resistance and root structure (<i>M. Mesbah et al., presented by M.N. Arjmand</i>)</li> </ul>
16:10 – 16:30	<ul style="list-style-type: none"> <li><i>Beta</i> genetic resources activities in India (1990-2005) - a review (<i>H.M. Srivastava and S. Srivastava</i>) - <i>unable to attend</i></li> </ul>
16:30 – 17:00	Break for individual discussions
	<b>Section II - Technical meeting, review of the workplan</b>
17:00 – 17:30	<ul style="list-style-type: none"> <li>General briefing on ECP/GR (<i>L. Maggioni, 15 min</i>)</li> <li>Report of the Working Group Chair (<i>L. Frese, 15 min</i>)</li> </ul>
17:30 – 18:00	<ul style="list-style-type: none"> <li>A European Genebank Integrated System (AEGIS) (<i>L. Maggioni</i>)</li> </ul>

**Thursday 9 March - Meeting of the ECP/GR Working Group on *Beta***

08:30 – 10:00	<b>Review of the workplan</b> <ul style="list-style-type: none"> <li>• Critical assessment of the achievements and discussion of the next workplan by ECP/GR countries (attending members: Armenia, Georgia, Germany, Ireland, Italy, Poland, Turkey, UK)</li> <li>• Statements and comments from other WBN member countries (France, Iran, India, Morocco, Spain, USA) <ul style="list-style-type: none"> <li>- <i>In situ</i> management</li> <li>- On-farm management and management strategies complementing the <i>ex situ</i> work</li> <li>- Data exchange</li> <li>- Regeneration guidelines</li> <li>- Quality standards</li> <li>- Task sharing</li> <li>- Research and utilization</li> <li>- Funding opportunities</li> </ul> </li> </ul>
10:00 – 10:30	<i>Coffee break</i>
10:30 – 12:30	<b>Establishment of <i>ad hoc</i> working groups, if desired</b> <b>Recommendations and conclusions</b>
12:30 – 14:00	<i>Lunch</i>
14:00 – 17:00	<b>Visit to the Institute</b> <b>Introduction into the <i>in situ</i> management methodology with emphasis on threat assessment</b>

**Friday 10 March**

09:00 – 12:00	<b>Drafting of the report by task force</b> <b><i>Ad hoc</i> working group meetings to discuss project proposals to be submitted under EU Council Regulation 870/2004</b>
13:00 – 14:30	<i>Lunch</i>
14:30 – 16:00	<b>Plenary meeting and approval of the report</b>
16:00 – 16:30	<i>Coffee break</i>
16:30 – 17:00	<ul style="list-style-type: none"> <li>• Election of new Chair and Vice-Chair for the Working Group</li> <li>• Closing remarks</li> </ul>
20:00	<i>Social dinner</i>

**Saturday 11 March**

Visit to known *Beta* collection sites. Training on threat assessment and population monitoring in the natural habitat

**Sunday 12 March**

Departure of participants

## Appendix IV. List of participants

N.B. Contact details updated at time of publication. The composition of the Working Group is subject to changes, and is constantly updated on the Working Group's Web page ([http://www.bioversityinternational.org/networks/ecpgr/contacts/ecpgr\\_wgbe.asp](http://www.bioversityinternational.org/networks/ecpgr/contacts/ecpgr_wgbe.asp)).

### Chairperson

Lothar Frese  
Federal Research Centre for Cultivated  
Plants - Julius Kuehn Institute  
Institute for Breeding Research on  
Agricultural Crops  
Erwin-Baur-Str. 27  
06484 Quedlinburg  
**Germany**  
Tel: (49-3946) 47701  
Fax: (49-3946) 47255  
Email: l.frese@bafz.de

Bernard Harris<sup>10</sup>  
Department of Agriculture and Food  
Crop Variety Testing Division  
Backweston Farm  
Leixlip, Co. Kildare  
**Ireland**

Dermot Grogan  
(*Observer*)  
Department of Agriculture and Food  
CVE Division  
Backweston Farm  
Leixlip, Co. Kildare  
**Ireland**  
Tel: (353) 1 6302918  
Fax: (353) 1 6280634  
Email: dermot.grogan@agriculture.gov.ie

### ECP/GR Working Group Members

Guram Aleksidze  
Academy of Agricultural Sciences of  
Georgia  
13 km, D. Agmashenebeli Alley  
0131 Tbilisi  
**Georgia**  
Tel: (995-32) 595695  
Fax: (995-32) 595383  
Email1: guram\_aleksidze@yahoo.com  
Email2: guram\_aleksidze@cac-  
biodiversity.org

Enrico Biancardi  
(*representing Paolo Ranalli*)  
Istituto Sperimentale per le Colture  
Industriali (ISCI)  
Via Amendola 82  
45100 Rovigo  
**Italy**  
Tel: (39) 0425 360113  
Fax: (39) 0425 34681  
Email: enrico.biancardi@entecra.it

Christoph Germeier  
Federal Research Centre for Cultivated  
Plants - Julius Kuehn Institute  
Institute for Breeding Research on  
Agricultural Crops  
Erwin-Baur-Str. 27  
06484 Quedlinburg  
**Germany**  
Tel: (49-3946) 47702  
Fax: (49-3946) 47255  
Email: c.germeier@bafz.de

---

<sup>10</sup> Replaced in July 2007 by:  
John Claffey  
Department of Agriculture and Food  
Backweston Farm  
Leixlip, Co. Kildare, Ireland.  
Tel : (353) 16302909  
Fax: (353) 16280634  
Email: John.Claffey@agriculture.gov.ie

Kamilla Kuzdowicz  
Plant Breeding and Acclimatization Institute  
Powstancow Wielkopolskich 10  
85 090 Bydgoszcz

**Poland**

Tel: (48-52) 5816939  
Fax: (48-52) 3224454  
Email: k.kuzdowicz@ihar.bydgoszcz.pl

Brian Ford-Lloyd  
School of Biosciences  
University of Birmingham  
Edgbaston

Birmingham B15 2TT

**United Kingdom**

Tel: (44-121) 4145565  
Fax: (44-121) 4145925  
Email: B.Ford-Lloyd@bham.ac.uk

**World Beta Network Members**

Pascal Touzet  
UMR CNRS 8016  
Laboratoire de Génétique et Evolution des  
Populations Végétales  
Bât SN2

Université des Sciences et Technologies de  
Lille 1

59655 Villeneuve d'Ascq cedex

**France**

Tel: (33) (0) 320336397  
Fax: (33) (0) 320436979  
Email: pascal.touzet@univ-lille1.fr

Sarah Villain<sup>11</sup>  
UMR CNRS 8016  
Laboratoire de Génétique et Evolution des  
Populations Végétales  
Bât SN2

Université des Sciences et Technologies de  
Lille 1

59655 Villeneuve d'Ascq cedex

**France**

Mohamad Nasser Arjmand  
Iranian Sugar Factories Syndicate  
23 Shahidgoumnam, Fattmi Sq.  
Tehran

**Iran**

Tel: (98) (0) 2188965715  
Fax: (98) (0) 2188969055  
Email: mnarjmand@yahoo.com

Yasmina El Bahloul  
Institut National de Recherche  
Agronomique (INRA)  
Unité d'Amélioration des Plantes  
Conservation et Valorisation des Ressources  
Génétiques CRRA - Rabat

BP 6570  
10101 Rabat Instituts

**Morocco**

Tel: (212) 61 586375  
Fax: (212) 37 772583  
Email: yas\_ba@yahoo.fr

Jorge Alfredo Reyes-Betancort  
Jardín de Aclimatación de La Orotava (ICIA)  
C/ Retama n. 2  
38400 Puerto de La Cruz, Tenerife

**Spain**

Tel: (34) 922 389464  
Fax: (34) 922 371596  
Email: areyes@icia.es

Arnoldo Santos Guerra  
Jardín de Aclimatación de La Orotava (ICIA)  
C/ Retama n. 2  
38400 Puerto de La Cruz, Tenerife

**Spain**

Tel: (34) 922 389464  
Fax: (34) 922 371596  
Email: asantos@icia.es

Geert Janssen  
Syngenta Seeds AB  
Box 302  
26123 Landskrona

**Sweden**

Tel: (46) 734 437089  
Fax: (46) 418 437155  
Email: Geert.Janssen@syngenta.com

<sup>11</sup> Left University after completion of PhD.

Current details:

22 rue d'Eth  
59990 Sebourg

France

Tel: (33) 686673888 (mobile)

Email: sarahv@wanadoo.fr

Eric Ober  
 Broom's Barn Research Station  
 Higham, Bury St Edmunds, IP28 6NP  
**United Kingdom**  
 Tel: (44-1284) 812209  
 Fax: (44-1284) 811191  
 Email: eric.ober@bbsrc.ac.uk

Lee Panella  
 United States Department of Agriculture-  
 Agricultural Research Service, USA  
 (USDA-ARS)  
 Northern Plain Area (NPA)  
 Crops Research Laboratory  
 1701 Centre Avenue  
 80526 Fort Collins, Colorado  
**USA**  
 Tel: (1-970) 492 7140  
 Fax: (1-970) 491 7160  
 Email: Lee.Panella@ars.usda.gov

#### **ECP/GR Secretariat**

Lorenzo Maggioni  
 Regional Office for Europe  
**Bioversity International**  
 Via dei Tre Denari 472/a  
 00057 Maccarese (Fiumicino)  
 Rome  
 Italy  
 Tel: (39) 06 6118 231  
 Fax: (39) 06 61979661  
 Email: l.maggioni@cgiar.org

#### **Unable to attend**

Eqrem Mecollari  
 Centre of Agricultural Technology Transfer  
 Korçe  
**Albania**  
 Tel: (355) 69 2790928  
 Fax: (355) 8243086  
 Email1: mecollarieqrem@yahoo.com  
 Email2: stacionieksperimental@yahoo.com

Josef Rieppel  
 Austrian Agency for Health and Food Safety  
 (AGES)  
 Straudorferstrasse 1  
 2286 Haringsee  
**Austria**  
 Tel: (43) 2214 71005  
**Fax:**  
 Email: josef.rieppel@ages.at

Andreas Melikyan  
 Plant Growing Department  
 Armenian Agriculture Academy  
 74 Teryan st.  
 375009 Erevan  
**Armenia**  
 Tel: (374-2) 581532  
 Fax: (374-1) 560711  
 Email: a\_melikyan@yahoo.com

Zeynal I. Akparov  
 Institute of Genetic Resources  
 Azerbaijan National Academy of Sciences  
 155 Azadliq Ave.  
 1106 Baku  
**Azerbaijan**  
 Tel: (994-12) 5629171  
 Fax: (994-12) 499221  
 Email1: akparov@yahoo.com  
 Email2: afiqmuellim@rambler.ru  
 Email3: z.akparov@cac-biodiversity.org

Marianne Malengier  
 Dept. Plantengenetica en -veredeling  
 Agricultural Research Centre, CLO, Gent  
 Caristasstraat 21  
 9090 Gent  
**Belgium**  
 Tel: (32-9) 2722859  
 Fax: (32-9) 2722901  
 Email:  
 marianne.malengier@ilvo.vlaanderen.be

Jordan Milkov Angelov  
 Institute of Plant Genetic Resources  
 "K. Malkov"  
 4122 Sadovo, Plovdiv district  
**Bulgaria**  
 Tel: (359-32) 620782  
 Fax: (359-32) 620782  
 Email: bioproteins@abv.bg

Athena Della  
Ministry of Agriculture, Natural Resources  
and Environment  
PO Box 2016  
1516 Nicosia  
**Cyprus**  
Tel: (357-2) 2403219/2403100  
Fax: (357-2) 2316770  
Email: Athena.della@arinet.ari.gov.cy

Zdeněk Stehno  
Genebank Department  
Crop Research Institute (CRI)  
Drnovská 507  
161 06 Praha 6 - Ruzyně  
**Czech Republic**  
Tel: (420) 233022364  
Fax: (420) 233022286  
Email: stehno@vurv.cz

Gert Bundgaard Poulsen  
Faculty of Agricultural Sciences  
Department of Horticulture  
University of Aarhus  
Kirstinebjergvej 10  
5792 Årslev  
**Denmark**  
Tel: (45) 2086 8094  
Fax: (45) 8999 3490  
Email: Gert.Poulsen@agrsci.dk

Bruno Desprez  
Florimond Desprez Créations Variétales  
BP 41  
59242 Cappelle-en-Pévèle  
**France**  
Tel: (33) (0) 320849490  
Fax: (33) (0) 320596601  
Email: bruno.desprez@florimond-desprez.fr

Nikolaos Stavropoulos  
Greek Gene Bank  
Agricultural Research Centre of Makedonia  
and Thraki (ARCMTH)  
PO Box 312  
57001 Thermi-Thessaloniki  
**Greece**  
Tel: (30) 2310471544  
Fax: (30) 2310471209  
Email: kgeggb@otenet.gr

Attila Simon  
Central Agricultural Office  
Directorate of Plant Production and  
Horticulture  
Research Centre for Agrobotany  
Külsömezö 15  
2766 Tápiószele  
Hungary  
Tel: (36-53) 380070  
Fax: (36-53)380072  
Email: jensen@agrobot.rcat.hu

Hari Mohan Srivastava  
Division of Crop Improvement  
Indian Institute of Sugarcane Research  
PO Dilkusha  
226 002 Lucknow  
**India**  
Tel: (91-522) 2374058  
Fax: (91-522) 2761125  
Email: hmsrivastava@yahoo.co.uk

Tzion Fahima  
Institute of Evolution, University of Haifa  
Mt. Carmel  
31905 Haifa  
**Israel**  
Tel: (972-4) 8240784  
Fax: (972-4) 8246554  
Email: fahima@research.haifa.ac.il

Paolo Ranalli  
Istituto Sperimentale per le Colture  
Industriali (ISCI)  
Via di Corticella 133  
40129 Bologna  
**Italy**  
Tel: (39) 051 6316847  
Fax: (39) 051 6316847/374857  
Email1: p.ranalli@isci.it  
Email2: direzione@isci.it

Rima Tamošiūniene  
UAB "NATURLITA"  
Kaunas str. 30  
54333 Babtai, Kaunas region  
**Lithuania**  
Tel: (370-687) 92747  
**Fax:**  
Email: naturlita@naturlita.lt  
Email2: info@naturlita.lt

Ioan Gherman  
Institutul de Cercetare Dezvoltare Pentru  
Cartof si Sfecla de Zahar Brasov  
(Research Institute for Potato and Sugar  
Beet)

Str. Fundaturii nr. 2  
500470 Brasov

**Romania**

Tel: (40-268) 476795  
Fax: (40-268) 476608/475248  
Email1: ioangherman@xnet.ro  
Email2: icpc@potato.ro

Ivica Stancic  
ARI SERBIA  
"Selekcija" Aleksinac  
18220 Aleksinac

**Serbia and Montenegro**

Tel: (381-18) 873515  
Fax: (381-18) 873325  
Email: selekcija\_al@bankerinter.net

Kristina Ugrinović  
Agricultural Institute of Slovenia  
Hacquetova 17  
1001 Ljubljana

**Slovenia**

Tel: 386 1 28 05 284

**Fax:**

Email: kristina.ugrinovic@kis.si

Ayfer Tan  
Aegean Agricultural Research Institute  
(AARI)  
PO Box 9 Menemen  
35661 Izmir

**Turkey**

Tel: (90-232) 8461331  
Fax: (90-232) 8461107  
Email1: etae@aari.gov.tr  
Email2: pgr@aari.gov.tr