

A Strategic Framework for the Implementation of a European Genebank Integrated System (**AEGIS**)

Discussion paper





A Strategic Framework for the Implementation of a European Genebank Integrated System (AEGIS)

Discussion paper

Bioversity International is an independent international scientific organization that seeks to improve the well-being of present and future generations of people by enhancing conservation and the deployment of agricultural biodiversity on farms and in forests. It is one of 15 centres supported by the Consultative Group on International Agricultural Research (CGIAR), an association of public and private members who support efforts to mobilize cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. Bioversity has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The Institute operates through four programmes: Diversity for Livelihoods, Understanding and Managing Biodiversity, Global Partnerships, and Commodities for Livelihoods.

The international status of Bioversity is conferred under an Establishment Agreement which, by January 2008, had been signed by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Ethiopia, Ghana, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mali, Mauritania, Morocco, Norway, Oman, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

Financial support for Bioversity's research is provided by more than 150 donors, including governments, private foundations and international organizations. For details of donors and research activities please see Bioversity's Annual Reports, which are available in printed form on request from bioversity-publications@cgiar.org or from Bioversity's Web site (www.bioversityinternational.org).

The European Cooperative Programme for Plant Genetic Resources (ECPGR) is a collaborative programme among most European countries aimed at facilitating the long-term conservation and the increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the member countries, is overseen by a Steering Committee composed of National Coordinators nominated by the participating countries and a number of relevant international bodies. Bioversity International provides the Coordinating Secretariat. The Programme operates through nine networks in which activities are carried out through a number of permanent working groups or through *ad hoc* actions. The ECPGR networks deal with either groups of crops (cereals; forages; fruit; oil and protein crops; sugar, starch and fibre crops; vegetables, medicinal and aromatic plants) or general themes related to plant genetic resources (documentation and information; *in situ* and on-farm conservation; inter-regional cooperation). Members of the working groups and other scientists from participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme.

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

Mention of a proprietary name does not constitute endorsement of the product and is given only for information.

Citation:

ECPGR. 2008. A Strategic Framework for the Implementation of a European Genebank Integrated System (AEGIS). Discussion paper. European Cooperative Programme for Plant Genetic Resources (ECPGR). Bioversity International, Rome, Italy.

Acknowledgements to Dr L. Currah for English language editing.

ISBN: 978-92-9043-774-1

Bioversity International
Via dei Tre Denari 472/a
00057 Maccarese
Rome, Italy

© Bioversity International, 2008

CONTENTS

| | |
|---|-----------|
| Foreword | iv |
| Background | 1 |
| Problem and opportunity analysis | 2 |
| Goal | 6 |
| Scope | 6 |
| Membership | 6 |
| Germplasm to be included in a European Genebank Integrated System | 7 |
| Activities | 7 |
| Description of a European Genebank Integrated System (AEGIS) | 9 |
| Benefits of establishing a European Genebank Integrated System | 11 |
| Collaborative effort | 11 |
| Cost efficiency and financial resources | 11 |
| Redundancy | 12 |
| Quality | 12 |
| Regeneration | 12 |
| Improved access | 13 |
| Improved long-term security | 13 |
| Information and knowledge sharing | 13 |
| The International Treaty and its relationship with AEGIS | 14 |
| Objectives and the major component of the Treaty | 14 |
| Conservation | 14 |
| Facilitated Access to PGRFA | 16 |
| Benefit-sharing | 17 |
| Implementation process of AEGIS | 18 |
| References | 19 |
| Appendix I. The elements of AEGIS | 22 |
| Appendix II. Acronyms and abbreviations | 24 |

Foreword

How can existing genebanks in Europe operate more rationally if the available financial and human resources remain at their current capacity? One of the ways to improve efficiency and effectiveness and to ensure rational ex situ conservation and use of plant genetic resources in Europe is through the sharing of tasks, based on an active collaboration among genebanks in the long term.

A feasibility study to address this challenge was conducted in 2004-2006 within the framework of the European Cooperative Programme for Plant Genetic Resources (ECPGR). The objective of this study was to come up with a set of recommendations on how to develop a European genebank integrated system based on analysis of organizational, technical, legal and financial aspects. The analysis was made within four pilot crop working groups (Allium, Avena, Brassica and Prunus), each with a wide range of partners participating from different countries.

The ECPGR Steering Committee commissioned the feasibility study with the aim of reviewing its findings and recommendations and of considering options for the implementation of a future European genebank integrated system. One of the main outputs of the study is this publication, entitled “A Strategic Framework for the Implementation of a European Genebank Integrated System”.

The aim of this paper is to put the vision of future task sharing among genebanks and other germplasm collection holders in Europe into the context of its possible implementation process. The paper aims at raising awareness and encouraging further debate about the technical and policy issues associated with developing such an ambitious system, at all stakeholder levels.

This publication, therefore, should be considered as a discussion paper that provides direction and guidance to the ECPGR member countries and which reflects the status of an important process at this particular point in time. Although not a consensus document, it is a summary of the general views of the ECPGR Steering Committee on sharing responsibilities and provides the basis for the development of the so-called Collective Memorandum of Understanding. This paper is part of an “evolution” leading to development of the final product, a European Genebank Integrated System (AEGIS). AEGIS was conceived at a time when the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) had just been ratified by most countries of the European Region and the Governing Body of the International Treaty had held its first meeting and agreed on a standard Material Transfer Agreement, i.e. in June 2006 in Madrid, Spain. The concept of AEGIS is intended to be fully supportive of the Treaty and to contribute to its rapid implementation.

The publication was prepared by the Local AEGIS Task Force at Bioversity International, consisting of Ehsan Dulloo, Jan Engels, Birgitte Lund, Lorenzo Maggioni, Gerald Moore, and Jozef Turok, through a consultative process under the guidance of the AEGIS Advisory Committee. Members of this Committee contributed with many useful comments and inputs, in addition to the AEGIS project partners involved in the pilot crop working groups and many other colleagues. Inputs received from the ECPGR Steering Committee, including the results of a roundtable discussion on AEGIS held during the Tenth Steering Committee Meeting in Riga, Latvia, were also taken into account when preparing the final version of this “Strategic Framework”.

It is hoped that this paper will contribute towards stimulating further discussions at the national and (sub-) regional levels as well as promoting progress of the process which will potentially result in an integrated genebank system, which will enable managing the very precious plant genetic resources existing in all European countries in the most rational way, leading to their safe conservation, availability and easy accessibility for users.

A Strategic Framework for the Implementation of a European Genebank Integrated System (AEGIS)

Discussion Paper

Background

The value of plant genetic resources in sustaining world food security and peoples' livelihoods has been recognized since the early 1900s. From this period onwards some of the first collecting expeditions were carried out worldwide by Nikolay I. Vavilov and Harry V. Harlan to find, conserve and use plant genetic resources for research purposes and in breeding programmes. N.I. Vavilov and his colleagues at VIR continued to run collecting expeditions during the 1920s and 1930s in the USSR and in over 50 countries in Asia, the Americas, Northern Africa and Europe. At the time of the outbreak of World War II VIR maintained a national network of at least 40 satellite collections and breeding stations. The VIR seed collection in the 1930s contained the legendary number of 250 000 samples from over 50 countries (Plucknett *et al.* 1987). Plant material obtained from collecting expeditions provided the basis for developing the first germplasm collections. In the mid-1930s it became evident that traditional crop varieties and adapted landraces were being replaced by new improved varieties, and the first alarms were sounded (Harlan and Martini 1936). Systematic germplasm conservation activities were first initiated in Germany in the 1940s and followed later by other West European countries. The COMECON network, possibly the first PGR network in Europe, formed a foundation for the national collections of Hungary, Bulgaria, Poland, Czechoslovakia and the German Democratic Republic. Recognizing the importance of plant genetic resources (PGR) for food security in the world, in the 1970s, *ex situ* collections were promoted by international institutions, in particular by the Food and Agriculture Organization of the United Nations (FAO) and the International Board for Plant Genetic Resources (IBPGR), later the International Plant Genetic Resources Institute (IPGRI), both precursors of Bioversity International. During this period international genebanks were established at International Agricultural Research Centres (IARCs). Today there are approximately 1500 genebanks or germplasm collections worldwide, housing some 6 million accessions (FAO 1998).

There have been many changes in the way that the world has perceived the ownership of genetic resources. Prior to the adoption of the Convention on Biological Diversity (CBD) in 1992, plant genetic resources were regarded as a common heritage of humankind and were freely exchanged. This notion formed the foundation of the International Undertaking, the precursor of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). With the CBD, there has been a paradigm shift, in particular caused by the stress placed by countries on their sovereign rights over biological diversity within their territories as well as the importance of the fair and equitable sharing of benefits arising from the use of these plant genetic resources. The CBD also called on States to take measures to effectively conserve their biodiversity both *in situ* and *ex situ*.

The first State of the World Report on plant genetic resources prepared by FAO in 1996 (FAO 1998) revealed that many important collections were in an unsatisfactory state because of excessive expansion of the collections, insufficient resources to manage these collections adequately, and backlogs of regeneration needs, all of which were ultimately the causes of inefficiencies in germplasm management. The report also showed that of the 6 million accessions held in the world's genebanks, a significant proportion were duplicates. These accessions are held mainly in seed storage facilities suitable for medium- to long-term storage and the report showed that countries in Europe held a large proportion of the collections for long-term storage.

The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GPA), launched in 1996, dedicated four of its twenty priority activities to *ex situ* conservation (FAO 1996). The GPA called for a more rational system based on better planning and more collaboration and coordination, while allowing States to maintain sovereign rights over their own plant genetic resources for food and agriculture (PGRFA). This plan would permit reductions in costs and place conservation work on a scientifically sound and financially sustainable foundation. More recently, the International Treaty on Plant Genetic Resources for Food and Agriculture (FAO 2002), which entered into force in June 2004, has created a Multilateral System for access and benefit-sharing of plant genetic resources. Article 16 of the International Treaty on Plant Genetic Resources for Food and Agriculture in particular encourages participation and cooperation in PGRFA Networks. More details on the International Treaty are provided in a separate chapter below (see pages 13-17). The recently established Global Crop Diversity Trust (“the Trust”) has also begun contributing to the development of regional and global crop-specific strategies aimed at more effective arrangements for *ex situ* conservation (www.croptrust.org). Priority is given to those crops or groups of crops which are included within the Multilateral System under the ITPGRFA. As the Trust and AEGIS have very similar objectives with regard to efficient and effective conservation of crop genetic resources, AEGIS will seek to collaborate with the Trust to further these objectives.

In addition to the above-mentioned global agreements, there are also various regional and sub-regional plant genetic resources initiatives around the world that aim to encourage greater collaboration among countries. They promote and facilitate the greater sharing of conservation responsibilities, by developing joint activities that help to reduce duplication and hence costs, improve the quality of conservation and promote rational conservation systems at the regional level. Within the European region, covering geographically-defined Europe, which includes the Caucasus countries, Israel, the Russian Federation and Turkey, the European Cooperative Programme for Plant Genetic Resources (ECPGR) provides a viable basis for collaboration on crop genetic resources. Within this framework, the ideas and opportunities have developed which have the potential to create a more rational system for conservation and use of PGRFA in Europe. This new concept will permit better integration among the existing institutions which are involved in conservation and use of PGRFA. This Discussion Paper describes a possible mechanism to achieve this integration.

According to the CBD, it is a national responsibility of each country to ensure the rational conservation and sustainable use of plant genetic resources. This responsibility is usually delegated to a national genebank or run by programmes which involve collaboration with other public sector institutions and relevant partners within the country. The national genebanks have frequently been the leaders in driving the establishment of broader national genetic resources programmes, mainly by responding to the need for linkages between conservation and user communities of specific crops. Almost all European countries have a national genetic resources programme in place (IPGRI 2006). National programmes and regional networks are widely considered to be the appropriate platform for implementation of the relevant international agreements such as the GPA, the ITPGRFA and the relevant objectives of the CBD.

Problem and opportunity analysis

According to FAO and IPGRI estimates, more than 500 genebanks and other germplasm collections are scattered over more than 40 European countries. Collectively, these genebanks and other collections contain about 2 million accessions, approximately one-third of global

holdings (FAO WIEWS 2005). This material is the total of *ex situ* conserved crop genetic resources in Europe which has been reported to the FAO. The purpose of these collections is long-term conservation and to ensure the availability of plant genetic resources for present and future generations.

The conservation of Europe's plant genetic resources is still fragmented, largely because it is still mainly based on individual national programmes. Calls for an integrated approach to plant conservation efforts have repeatedly been launched in Europe over the last 35 years (FAO 1980; Hardon *et al.* 1992; Gass and Begemann 1999; Hardon 1999; Frison *et al.* 2003; von Bothmer 2006). Considering that genetic diversity for most crop species crosses national borders and that conservation and effective use in plant breeding programmes is facilitated when the entire gene pool is considered, the aim for a closer collaboration has always seemed to be a logical goal shared and acknowledged by national programmes.

As early as 1968, a Genebank Committee was formed by EUCARPIA (the European Association for Research on Plant Breeding), proposing a regional network for Europe with four sub-regional genebanks, focusing on the main agroclimatic zones. Four genebanks were actually established in Izmir, Turkey (1964), Bari, Italy (1969), Braunschweig, Germany (1970) and in Lund, Sweden (1979). Of these, the Nordic Gene Bank, based in Sweden, has successfully established and maintained a sub-regional role, taking responsibility for storing material and information on plants of interest for agriculture and horticulture for the five Nordic countries (Kjellqvist and Blixt 1991). A similar role never really materialized in other European genebanks.

We can quote some examples of successful sub-regional collaboration. One is the Dutch-German Potato Collection, which became operational in 1974. In 1984 it expanded to include other crops which could also be handled through division of labour between the institutes and make best use of the available expertise and interests in the Netherlands and in Germany (Bommer 1991). In another example, the genebanks of CGN, the Netherlands, and at Warwick HRI, Wellesbourne, United Kingdom, have an agreement to share the tasks of conservation of carrot and lettuce, by each taking the conservation responsibility for one species on behalf of the other institution. For the *Allium* crops, some informal safety duplication has been carried out between the Czech Republic, Germany, Poland, Spain and the Nordic Gene Bank in the course of emergency actions and within the first Gen Res Project. Such sharing of responsibilities has been possible because of the enthusiasm and commitment of the scientists within these institutions and networks.

Looked at in retrospect, the (sub-)regional collaborative germplasm conservation concept, although scientifically sound, seems not to have been realistic during a period in which the spirit of political integration was still in its infancy in Europe. The soundness of the concept of integration has continued to be expressed by PGR experts over many years. During the ninth ECPGR Steering Committee meeting in 2003 in Turkey it was affirmed that conserving and exchanging crop germplasm in Europe could be rationalized and improved by sharing the work between institutions. The need for collaboration was also considered obvious from an economic perspective. These objectives were reaffirmed during the Tenth Steering Committee Meeting in Riga, Latvia in September 2006 and the Steering Committee made additional funds available to continue the establishment of AEGIS to work towards the development of a European rational conservation system.

We still consider that there is rather a low level of coordination and collaboration on conservation activities throughout Europe. There seem to be ample opportunities for improving this situation, particularly in terms of a more rational regional integrated conservation approach, as well as with regard to the practical availability of germplasm, based on the following considerations:

- The European Region offers a variety of environments and climatic conditions stretching from the arctic to the tropical zone. A conservation system that is not based on sharing information and germplasm, and that does not take advantage of the opportunity to grow germplasm where it is biologically, environmentally and economically the most adequate location for regeneration, characterization, evaluation and research, fails in cooperating effectively.
- Differences in environment, history and cultural tradition have led the different countries to follow different lines of specialization, and to develop know-how in different fields of expertise and crops. The opportunities can only be used efficiently and this mosaic of knowledge and experience can only fully be built on if specific conservation functions are increasingly delegated to the most suitable “operators”, and when the best environmental and scientific conditions for each of the crops can be exploited. Finding the best site for the job should result in a better use of prevailing specializations in terms of crops or conservation functions such as regeneration, documentation, taxonomic research and cryopreservation.
- Considering that sharing of conservation tasks as well as of collections and the consequent coordinated management of such genetic resources collections in Europe remains rare (see also Gass and Begemann 1999), problems related for example to insufficient funds for appropriate maintenance, regeneration backlogs or low levels of characterization are currently addressed mainly on the basis of national or local priorities and possibilities. An increasingly regional integrated approach would allow priorities to be defined, responsibilities and resources to be shared on a regional level, thus avoiding or reducing gaps in the system or the duplication of efforts.
- The quality standards for conservation as currently applied vary considerably between countries and even within countries. This was identified as a constraint by several ECPGR Crop Working Groups in their attempts to define preferred or acceptable conservation standards (Frese *et al.* 2004; Boller *et al.* 2005). The frequent disparity of the standards in use tends to reduce trust in the institutions with low or ill-defined standards, and thus hampers effective collaboration. A general improvement of the quality of operations across the collaborating institutions would be expected to result from a regionally integrated system. Regional strengths could be shared and weaknesses eliminated by the process of raising standards and establishing them across the network.
- The same germplasm accessions are often conserved in several locations, as a result of exchanges among genebanks over the years. There is also a wide perception that it is better to conserve every accession locally, rather than relying on a distant provider, even when the accession was originally introduced from outside. This approach has led to a rather high level of duplication among and within collections, with estimates that less than 35% of the stored accessions worldwide may be unique (Plucknett *et al.* 1987; FAO 1998), while the rest are duplicates. This situation also applies to European genebanks, with levels of duplication surpassing 70% for *Avena* samples identified by the accession name (Germeier *et al.* 2003) or reaching about 60% in the case of three large collections of *Lactuca* (van Hintum and Boukema 1999). The cost of conservation of the same accession in several locations is high, especially for material which needs to be maintained in the field (i.e. as vegetatively propagated crops), as tissue in *in vitro* storage or even as seeds conserved in medium-term conditions and thus needing frequent regeneration. On the other hand, the cost and effort required to identify duplicates is also rather high (van Hintum and Knüpffer 1995; Knüpffer *et al.* 1997; Lund *et al.* 2003). This may lead to situations in which it is cheaper to conserve some duplicates rather than to identify and eliminate them, in particular for seed-conserved germplasm.

A considerable and continuing improvement in documentation standards, data exchange and data access, including the development of the National Inventories for Plant Genetic Resources that provide data to the European catalogue EURISCO and the European Central Crop Databases, has been a well-recognized achievement of ECPGR. The establishment of such a regional documentation system is considered an essential step towards the making of better informed decisions and the formulation of recommendations regarding the management of national collections (e.g. priority setting, rationalization, and safety-duplication).

ECPGR provides an effective framework for collaboration, making it possible to develop and undertake collaborative projects (for example, several genetic resources projects funded under Council Regulations (EC) No1467/94 and No 870/2004, such as the projects on *Allium*, Barley, *Beta*, *Brassica* and *Prunus*, were developed within the context of ECPGR Working Groups), to involve Working Groups in responding to occasional emergency situations and to develop new ideas and concepts. Examples of responses to emergency situations are the regeneration of endangered carrot accessions of the Vavilov Institute, partial rescue of the Cambridge *Phaseolus* collection and partial reconstruction of the Albanian forage collection which was lost during civil unrest. On the other hand, since the early stages of ECPGR, it has been clear that progress towards closer integration of conservation management was entirely dependent on the willingness of the participating countries and institutions to take part. In order to move forward, it will be necessary to introduce a process for policy discussion, priority-setting and decision-making. In this way the sound recommendations and expressions of goodwill generated so far by the “ECPGR laboratory” can be translated into decisions which will affect genebanks’ modes of operation at the regional level, thus providing the foundation for the establishment of a truly integrated European Genebank System. It is quite clear that regionally integrated conservation cannot be carried out in a policy vacuum (Hardon *et al.* 1992).

The conservation responsibilities under the International Treaty are to be implemented by individual countries, in cooperation with other Contracting Parties, directly or through FAO and other relevant international organizations. International cooperation with respect to the identified activities is expected to maintain and strengthen institutional arrangements that are supportive of the multilateral system. Thus, the AEGIS aim to establish a rational integrated European genebank system is in full agreement with the intentions of the Treaty and clearly can be achieved only through the implementation of the relevant Articles in the Treaty as summarized below (pages 13-17). This means that the establishment of AEGIS is a direct contribution to the implementation of the Treaty at the national as well as the regional and global levels.

The European Union (EU) currently comprises 27 member states. Additional European (non-EU member) countries have bilateral agreements with the EU. The goal of setting up a European Genebank Integrated System is clearly in accordance with the spirit and the principles of the European integration process. The vast majority of the 2 million accessions that are conserved in European genebanks are located in the EU member states (FAO WIEWS 2005). Therefore, the EU policies, institutions and programmes have the opportunity to play a major role in implementation by assisting with the provision of the necessary policy framework and by contributing to the operation of such a system.

It is felt that the time has come to take a step further towards sharing efforts, capacity and responsibilities. In this Strategic Framework Paper it is argued that the purpose of conservation and use of plant genetic resources in Europe could be accomplished through the establishment of a European Genebank Integrated System (AEGIS). This will enable the plant genetic resources existing in Europe as a whole to be managed in the most rational way, leading to functional benefits for the users of the germplasm. We believe that this process

can and should take place in full accordance with the national responsibility of individual countries for the conservation and sustainable use of plant genetic resources.

Goal

The goal of AEGIS is to create a European Genebank Integrated System for plant genetic resources for food and agriculture, aimed at conserving the genetically unique and important accessions for Europe and making them available for breeding and research. Such material will be safely conserved under conditions that ensure genetic integrity and viability in the long term.

The European Genebank Integrated System will allow all germplasm accessions and their related information registered to AEGIS to be readily available and easily accessible to users (see Box 1). *Ex situ* conservation of germplasm will be carried out according to common, agreed quality standards, independently of where the germplasm is physically located, and will be carried out in such a way that it will facilitate close linkages with *in situ* conservation, and will facilitate the use of and research into the germplasm. It is intended to develop AEGIS within the existing legal framework of the International Treaty and, where necessary, to extend its scope according to the spirit and intentions of the Treaty. Whenever possible, it is planned to use the Treaty's mechanisms, procedures and instruments and thereby, contribute to its effective implementation.

Box 1. Responsibilities of AEGIS member countries over registered accessions

Following the steps as outlined in Box 3, the AEGIS member country will use its sovereign rights over the germplasm within its borders by identifying those accessions the country is willing and able to include in the European Collection and thus, accepts the following responsibilities for such germplasm in terms of conservation and availability:

- to ensure the long-term conservation and maintenance of the accessions according to agreed quality standards;
- to participate in and / or to facilitate supporting activities such as regeneration, viability testing and others proposed by the respective ECPGR Working Group for the crop/species in question;
- to provide for the safety-duplication of the accessions at another genebank, possibly in a different country and/or to use the Svalbard Arctic Seed Depository facilities;
- to facilitate the access and availability according to agreed international instruments, e.g. ITPGRFA and CBD;
- to document the information on the registered germplasm according to agreed standards, including those of passport, characterization and evaluation data; and
- to keep the above-mentioned information updated and to make it available to EURISCO and whenever possible in the ECPGR Central Crop Databases (ECCDB).

Scope

Membership

Membership in AEGIS will be open to all the countries of the European Region and all the institutions of an AEGIS member country. With respect to the formal acceptance of conservation and supportive responsibilities in the framework of AEGIS it is anticipated

that full participation of a country in the ECPGR will be necessary prior to joining AEGIS, in order to permit the necessary collaboration between countries. The signing of the collective Memorandum of Understanding is regarded as the expression of the willingness and interest of a given country to become a member of AEGIS. Participation in the ECPGR activities is needed in order to:

- be able to use the existing structures of the ECPGR, i.e. the Steering Committee, the Networks, the Crop Working Groups and the ECPGR Secretariat
- be able to benefit from the jointly planned and implemented activities including documentation, characterization and research as well as development of agreed conservation standards and guidelines.

ECPGR has established contacts with 45 countries of the Region plus the European Union (see Box 2). In fact, most of these countries participate in the ECPGR or are in the process of joining.

Box 2. Countries of the European Region

Albania; Armenia; Austria; Azerbaijan; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; European Union; Finland; France; Georgia; Germany; Greece; Hungary; Iceland; Ireland; Israel; Italy; Latvia; Lithuania; Luxembourg; Macedonia FYR; Malta; Moldova; Montenegro; Netherlands; Norway; Poland; Portugal; Romania; Russian Federation; Serbia; Slovakia; Slovenia; Spain; Sweden; Switzerland; Turkey; United Kingdom; Ukraine.

Germplasm to be included in a European Genebank Integrated System

AEGIS focuses primarily on the conservation and use of genetically unique and agronomically and/or historically/culturally important accessions for Europe (i.e. using the concept of Most Appropriate Accession¹) of agricultural and horticultural species and their wild relatives of European origin or such species as have been introduced, are of importance for breeding and research in Europe and that are in the public domain. In addition, secondary criteria that will determine the selection of the European Accession from a set of duplicate (or quasi-duplicate) accessions will be identified by the respective ECPGR Crop Working Groups. These criteria will include aspects such as the comprehensiveness of existing passport data, the number of regeneration cycles, the health status, the existence of characterization and evaluation data, whether the accession is maintained in the country where it was collected or originated, the involvement of local stakeholders in conservation activities, and others. Whereas the primary criteria are intended to discriminate between accessions, i.e. whether or not to be included in the European Collection, the secondary criteria are meant to facilitate the decision-making process on which accession of a group of duplicates to accept for inclusion.

Activities

AEGIS focuses on *ex situ* conservation activities that may take place in genebanks or other germplasm collections. Such conservation activities comprise typically acquisition, storage, safety-duplication, germination testing, regeneration, characterization and evaluation, documentation of accessions and distribution.

¹ The "Most Original Sample" concept was introduced by Frese and van Hintum (1989), indicating an accession of an original seed lot or seed sample that is genetically as close as possible to the original population that it is intended to represent. For AEGIS, the more practical concept of "Most Appropriate Accession" has been adopted.

Box 3. Registration of germplasm accessions to AEGIS and AEGIS establishment process

- Member countries sign a collective Memorandum of Understanding;
- **Establishment of the European Collection:**
 - **ECPGR Crop Working Groups** apply the **Most Appropriate Accession** concept and identify the list of tentative accessions to be accepted and registered as **European Accessions**. These lists are recommended to the respective countries for registration.
 - Through an iterative process between the respective Working Group and the countries concerned, and based on the aforementioned lists provided by the ECPGR Crop Working Group concerned, the member countries identify **accessions** conserved in their country, that they voluntarily are prepared to offer to be registered as part of AEGIS;
 - At the conclusion of this iterative process, in agreement with the WG recommendations, countries register a list of accessions as European Accessions. The registration is concluded when the agreed list is notified to EURISCO through the National Inventory Focal Point and the list of AEGIS accessions is published online. Registered accessions collectively constitute the European Collection and countries that register accessions assume responsibilities for these as specified in the collective Memorandum of Understanding (see Box 1).
- **ECPGR Crop Working Groups**, under the oversight of the Steering Committee, prepare and coordinate implementation of crop conservation workplans and they can delegate (part of) these tasks to **Coordinating European (Lead) Institutions**;
- The **ECPGR National Coordinator** is the representative of each member country in the ECPGR Steering Committee, and consequently in AEGIS and serves besides as focal point for interactions with the ECPGR Crop Working Groups and to help in the implementation of the crop conservation workplans within their country with the participating institutions;
- The **ECPGR Steering Committee** is the governing body of AEGIS.

Description of a European Genebank Integrated System (AEGIS)

Countries in the European Region will become members of AEGIS by signing a **collective Memorandum of Understanding (cMoU)**. This **collective Memorandum of Understanding** will state, among other things, that member countries will use their sovereign rights over genetic resources within their borders to voluntarily include, or retire, specified germplasm accessions in the European regional multilateral system through their registration to AEGIS.

The foundation of AEGIS is formed by the **genetically unique and important accessions for Europe** that exist in the genebanks of the AEGIS member countries. Consequently, the initial requirement for AEGIS will be the identification of these accessions for each crop or crop gene pool, i.e. the **European Accessions**. This responsibility will be assigned to the respective ECPGR Crop Working Group, according to agreed criteria which are based on the application of concepts such as the **Most Appropriate Accession**. The identified accessions (usually a subset of any given national collection that will be proposed by individual countries and subsequently registered by the country, if selected by the Working Group) will form collectively the **European Collection**. Furthermore, AEGIS will provide a platform to individual countries and the European Region to also address conservation related matters and issues, including to assist institutions that hold collections which are threatened, to pay special attention to the facilitation of using conserved germplasm, to share information, knowledge and expertise, to address socioeconomic and cultural heritage aspects as well as to collaborate with PGRFA related organizations and institutions, etc. It should be noted that the application of the MAA concept works “top-down” as well as “bottom-up”, the latter meaning that two or more genebanks could take the initiative to start identifying those accessions they collectively will conserve and which ones could be eliminated from their collections, without upsetting the approach as described in Box 3.

The **ECPGR Crop Working Group (WG)**, or an elected smaller sub-group of members delegated to carry out the responsibilities assigned to the ECPGR Crop Working Group, should represent the collaborating partner genebanks or institutions. With the approval of the Steering Committee, this body will be responsible for the coordination of long-term conservation of AEGIS-registered accessions and will oversee related activities for a given crop or crop gene pool. This will include the preparation of crop conservation workplan(s) and monitoring the implementation of conservation activities identified therein, such as maintenance of germplasm, regeneration, documentation, characterization and evaluation and conducting quality control. Crop WGs can decide to designate one or more **Coordinating European (Lead) Institution(s)** to prepare and coordinate the implementation of annual workplans. These workplans will be implemented by the collaborating institutions as part of their ongoing activities, to be integrated with the AEGIS objectives. The workplans will consist of activities that are of regional importance, including storage/maintenance, safety-duplication, regeneration, characterization, evaluation and management of the information.

Within each member country the **ECPGR National Coordinator** will be the representative for that country within AEGIS, thereby assuming a focal point role. This role will include the coordination of the process of discussing the establishment of and participation in AEGIS with the ministry or ministries responsible for agricultural genetic resources as well as other key stakeholders, both at the technical as well as the political levels. This role will further include the identification and offering of accessions to be registered to AEGIS, ensuring that AEGIS activities agreed upon for implementation by that country are efficiently coordinated

with all participating institutions in the country, for all the crops. S/he will report to the ECPGR Steering Committee of which s/he is a member.

The **ECPGR Steering Committee** constitutes the Governing Body of AEGIS and consequently has the overall responsibility and oversight over the operation/implementation of AEGIS. It will approve the collective Memorandum of Understanding as well as the processes that produce the Terms of Reference (ToRs) of the various bodies, i.e. the ECPGR Steering Committee, the AEGIS Advisory Committee, the ECPGR Working Groups, the Coordinating European (Lead) Institutions and the ECPGR Secretariat. It will also approve the recommended budget for AEGIS and help in securing it from appropriate funding agencies.

General **principles of the European Collection** include the following:

- Free and timely availability of requested and identified accessions to *bona fide* users, in agreed quantity and with acceptable viability and genetic integrity will be guaranteed according to the agreed standards. The actual format of using similar terms for access and benefit-sharing to non-Annex 1 crops as in the Standard Material Transfer Agreement (SMTA) of the ITPGRFA will need to be agreed upon among the AEGIS member countries, in particular agreed terms and conditions for subsequent distribution should be established and followed;
- The actual distribution procedures for non-Annex I crops of identified AEGIS Accessions to users in non-member countries (i.e. outside the System) will have to be agreed upon.
- International guidelines for the conservation of accessions and related activities will be followed/applied and standards will be proposed for each crop genepool by the respective Working Group and accepted, where appropriate, by the Steering Committee;
- Selected genebanks and other participating institutions, in agreement with the ECPGR National Coordinator, will perform all selected activities according to the agreed standards;
- Public domain accession-level information regarding the available passport data following the agreed standards, as well as non-confidential characterization and evaluation data are being made available on the EURISCO Web site through National Focal Points/national inventories and whenever possible to the ECPGR Central Crop Database;
- The participating genebanks and other institutions agree to make relevant research results and information on any European Accession promptly available, when non-confidential and subject to applicable law, to the respective Working Group through appropriate national information systems and/or the Coordinating European (Lead) Institution;
- A safety-duplicate of each European Accession will be stored at one or more collaborating and agreed European genebank(s) or institution(s) and/or at the Svalbard Arctic Seed Depository (FAO 2005);
- For each of the bodies that will assume responsibilities within the organizational framework of AEGIS, detailed terms of reference will be established, through a process to be agreed by the ECPGR Steering Committee.

Benefits of establishing a European Genebank Integrated System

The principal benefits of an integrated genebank system are:

- 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 all the germplasm included in AEGIS;
- Improved security of germplasm through formal commitments and safety-duplication;
- Improved linkages between *ex situ* and *in situ* conservation as well as linkages with users;
- Improved sharing of knowledge and information.

Collaborative effort

Due to the nature of plant genetic diversity (e.g. trans-boundary distribution of genetic diversity and interdependency of countries for genetic resources), the collaboration between countries in the region is regarded as an important undertaking to ensure that the diverse genetic resources of Europe are safely conserved and used for the common benefit of one and all. The sharing of responsibilities for the conservation of plant genetic resources is a prerequisite for efficient and effective use of financial and human resources. Such sharing of responsibilities is needed for the overall conservation activities of genebanks, including acquisition, storage, safety-duplication, germination testing, regeneration, characterization and evaluation, documentation of accessions, distribution, and reduction in redundant duplication among accessions. Furthermore, it allows partners to use opportunities to develop new skills and initiatives, and promotes the possibilities for better use of the plant genetic resources stored in European genebanks and other germplasm collections. In fact, it allows partners to build on each others' strengths and expertise and to eliminate weaknesses. The transparency and flexibility of the system allows for future changes and should also open up new opportunities for the smaller genebanks and other germplasm holding institutions.

Cost efficiency and financial resources

Rationalization of conservation activities, with a clear focus on accessions, is a precondition for achieving cost savings, which in Europe could be considerable. However, during the process of rationalization, there might be additional costs associated with the setting-up of AEGIS for a limited period of time.

In order to ensure the proper set-up of the system, financial resources will be necessary for additional research to support the process of selecting and identifying AEGIS accessions, including with molecular marker tools; for improving documentation; establishing crop standards; and for raising awareness/ communication. Given the very high relevance of AEGIS for the integration policies of the European Union in agriculture, the additional set-up costs will be sought from the various funding opportunities provided at the Community level as well as from other possible sources at the Regional level,

The European Community as a Party to the International Treaty on PGRFA could contribute towards its implementation by providing adequate financial support for the set-

up of AEGIS. The EU Seventh Framework Programme could offer further opportunities for financing the collaborative research activities (calls for project proposals in the “Knowledge-based Bio-economy” area). European Strategy Forum on Research Infrastructures (ESFRI) and other associated platforms could also be explored for funding certain elements of the set-up of AEGIS.

While the system is being set up, each individual country/institution would naturally make a long-term commitment at the national level to cover the running costs of conservation and exchange of AEGIS accessions. The costs of AEGIS coordination are expected to be covered within the existing framework of ECPGR, *i.e.* from the regular and in-kind contributions of the participating countries.

Redundancy

Only genetically unique and important accessions for Europe will be maintained as part of AEGIS. These accessions will in principle be maintained in the same location where they are currently stored. The integrated system will not influence decisions as to whether the individual genebanks continue to maintain identified redundant duplicate accessions at their own cost or discard them. However, if the individual AEGIS member countries decide to remove redundant duplicate accessions from their national collections, cost savings obtained by maintaining a reduced number of accessions could for instance be used to increase other activities that relate to the quality of conservation or utilization.

Quality

After the rationalization process, and by following the AEGIS agreements on quality standards for conservation, which will increase transparency and mutual trust, it is expected that collections will be managed more effectively and efficiently. This will allow funds to be redirected from maintaining large quantities of accessions in storage towards improving the quality of conservation activities. For example, more work can be done on the characterization of a minimum set of descriptors which will increase the value of the germplasm for users. The work may also be extended to include species that have been neglected by researchers or have been underutilized.

Accessions registered to the European Collection will be expected to be maintained at the same quality level across institutes and countries in order to allow trust and confidence in one another to prevail. Thus advantages can be drawn from the diversity of expertise and crops that exist within the Region. Under the supervision of the AEGIS Advisory Committee generic genebank management standards will be developed as well as an effective monitoring system. The respective Crop Working Groups will coordinate the processes of developing crop or crop gene pool specific technical standards for the routine conservation operations.

Regeneration

With regard to regeneration, which is an expensive and frequently problematic undertaking, it is argued that a more rational system can be achieved by sharing the task. Ideally, regeneration should be done in the same environment or in an environment as similar as possible to that in which the accession was originally adapted, *i.e.* collected, bred or where it evolved and developed its distinct characters, so as to avoid changes in the genetic composition of the accession. This can be achieved with a coordinated regeneration plan between the European

crop collections, which can rely on shared use of resources, land and genetic material. The system thereby encourages the local experts, working under the climatic and environmental conditions with which they are most familiar, to regenerate germplasm of high quality.

Improved access

The integrated genebank system will secure facilitated access to all the AEGIS Accessions and ensure that the material is readily available for distribution to users. By establishing a European Collection of genetically unique and economically important germplasm and by establishing transparent and simple access conditions, i.e. the same or similar ones as agreed upon within the framework of the International Treaty, each participating country will have ready access to the entire range of genetic diversity for any species that is being conserved within the system. In fact, AEGIS will add value to the conservation efforts by accelerating or ensuring the implementation of the Treaty, extending the scope of available material, ensuring high quality and “certified” availability of the accessions in the European Collection and by allowing a significant rationalization of conservation activities in Europe. This will also make it easier for other regions to collaborate with Europe.

Improved long-term security

It is argued that the acceptance of long-term conservation responsibilities by countries will contribute to more secure long-term funding through formally established and agreed country commitments. By actively participating in AEGIS it will also be easier to re-allocate already agreed conservation responsibilities to collaborating institutions on the basis of comparative advantage, economic considerations, revised priorities, etc. Furthermore, another advantage is that safety-duplication of accepted unique accessions in the European system will be secured through agreements to store safety-duplicate accessions at a partner genebank in another country or geographical location and/or at the facilities at the Svalbard Arctic Seed Depository.

It is anticipated that through AEGIS, *in situ* conservation efforts might also be strengthened in the system. An important pre-condition will be improved coordination at the national level between the various stakeholders as well as the resolution of a number of legal and administrative matters, such as those related to competency. Discussions are taking place on whether the European Collection concept might eventually be extended to include European populations of wild relatives and European landrace conservation and management sites.

Information and knowledge sharing

It can be argued that information-sharing is the first step in a process of establishing collaboration and ultimately sharing conservation and use responsibilities in a network. The planned approaches and procedures of establishing and operating AEGIS will automatically lead to improved information and knowledge sharing between the participating countries. EURISCO and possibly other information management systems will play an important role and function in this.

The International Treaty and its relationship with AEGIS

With the successful conclusion of the first meeting of its Governing Body in Madrid in June 2006 (<http://www.fao.org/ag/cgrfa/gb1.htm>) it is opportune to analyze the points of convergence between the International Treaty and AEGIS and to identify activities and processes that would create synergies at the European level as well as at the level of individual States with the aim to benefit the implementation of the two initiatives. The areas that seem to be most relevant in this context are *ex situ* conservation (in particular with respect to scope, collaboration and responsibilities), access to conserved genetic resources (including aspects of ownership, rights and legal requirements) as well as benefit-sharing aspects.

Objectives and the major component of the Treaty

The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits arising from their use, in harmony with CBD, as well as its contribution to sustainable agriculture and food security. The Treaty is closely linked to FAO and CBD in attaining its objectives.

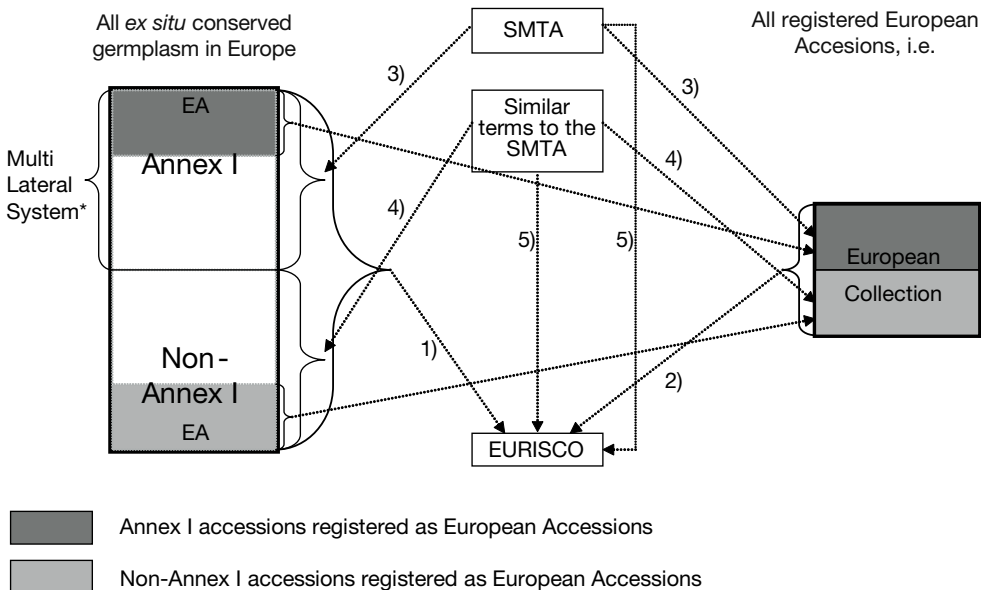
The Treaty establishes a Multilateral System (MLS) which allows for access and benefits sharing on standard multilaterally agreed terms, set out in a Standard Material Transfer Agreement, for PGRFA of crops selected on the basis of their importance for food security and interdependency. These crops (35 crops/genepools and 34 forages species/genera) are listed in Annex I of the Treaty. PGRFA of the Annex I crops that are under “the management and control of the Contracting Parties and in the public domain” will be part of the MLS; the Contracting Parties invite other holders of Annex I PGRFA (e.g. private sector) to include their material in the MLS. The MLS has been established by the Contracting Parties in the common exercise of their sovereign rights over their PGRFA. The MLS includes also Annex I genetic resources that are held by CGIAR and other international institutions.

Conservation

Long-term conservation is one of the important objectives of both the Treaty and AEGIS. The Treaty, in its Article 5, provides for Contracting Parties, subject to national legislation, to promote an integrated approach to the exploration, conservation and sustainable use of PGRFA, including a) surveying and inventorying; b) collecting threatened or potentially useful material; c) promoting on-farm management and *in situ* conservation; d) cooperating in the development of efficient and sustainable *ex situ* conservation system; e) as well as to monitoring the viability and genetic integrity of PGRFA. The activities entailed in points a, d and e above are at the core of the AEGIS mandate and these will be given due attention in this section.

The conservation responsibilities under the Treaty are to be implemented by individual countries, in cooperation with other Contracting Parties, directly or through FAO and other relevant international organizations. International cooperation with respect to the identified activities is expected to maintain and strengthen institutional arrangements that are supportive of the multilateral system. Thus, the AEGIS aim to establish a rational integrated European genebank system is in full agreement with the intentions of the Treaty and, evidently can be achieved only through the implementation of the relevant Articles in the Treaty as summarized above. This means that the establishment of AEGIS is a direct contribution to the implementation of the Treaty at the national as well as the regional and global levels.

Whereas the scope of the Treaty relates to all PGRFA (Article 3), the Contracting Parties have agreed to include in the MLS only major cultivated crop species and their wild relatives as well as a number of predominantly temperate legume and grass forages. On the other hand, AEGIS intends to cover genetically unique as well as economically important accessions of **all** PGRFA species that are under the management and control of its member countries. AEGIS proposes to apply the same conditions for access and benefit-sharing to all PGRFA, whether or not included in Annex I, which in practice could be seen as equivalent to enlarging the scope of the MLS within the European region with respect to the transfer of PGRFA between European countries. Furthermore, AEGIS intends to request participating countries to aim for a **long-term conservation commitment** for the identified accessions with the understanding that such material will be made readily available to other AEGIS participating countries. Fig. 1 provides further details on overlap and differences between the PGRFA as foreseen in the Multilateral System of the Treaty and the expanded “multilateral system” to be operated by AEGIS. In the latter system individual countries are encouraged to treat the non-Annex I accessions as far as possible like Annex I accessions.



- 1) Passport data of all European accessions are sent to EURISCO.
- 2) European Accessions are flagged in EURISCO.
- 3) The Standard Material Transfer Agreement (SMTA) is used for Multilateral System and Annex I European Accessions.
- 4) Similar access and benefit-sharing conditions as for Annex I material will be used for non-Annex I accessions.
- 5) Transactions are recorded in EURISCO.

* Material that is not under governmental control and management is formally not part of the MLS. Accessions that are registered by the maintaining institution as being European Accessions can however be accessed under similar access and benefit-sharing conditions as Annex I material.

Fig. 1. Relationship between IT and AEGIS components.

In the case of AEGIS the question of identifying and deciding on which European accessions will form the European Collections will be matter for the individual countries to decide. Individual countries use an agreed process in identifying the unique and important accessions for the European Collection. Where relevant, this process will be conducted in close consultation with the respective ECPGR Crop Working Groups. The individual countries will register the accessions in the National Inventory through the EURISCO National Focal Point. By doing so countries will exercise their sovereign right to identify accessions that they are prepared to place in the European public domain as part of the European Collection, to indicate their willingness to accept long-term conservation responsibilities for these accessions and to make them readily available to other member countries that participate in AEGIS.

The extension of the scope of the multilateral system for the exchange of germplasm to materials outside Annex I within Europe and the acceptance of long-term conservation responsibilities are the main aspects where AEGIS goes a step further than the Treaty. In the case of AEGIS, more concrete conservation commitments are agreed by the parties in order to allow a rational regional conservation approach to be possible. It is planned to reflect this and other commitments in a Collective Memorandum of Understanding between the individual countries and Bioversity International, as an independent legal entity and to entrust the coordination of the management of the European Collection to ECPGR and its bodies. It should be noted that AEGIS might well provide for a mechanism for countries to collaborate in the most effective way towards the implementation of the Treaty.

Facilitated Access to PGRFA

Important aspects of access to PGRFA that are part of the MLS established under the Treaty as well as within the context of AEGIS include:

- The material being accessed is solely for purpose of utilization and conservation for research, breeding and training for food and agriculture
- Access shall be expeditious, without need for tracking individual accessions, and free of charge
- Access includes all available passport data, relevant management data and other associated non-confidential information
- Recipients shall not claim any “Intellectual property or other rights that limit facilitated access to the plant genetic resources for food and agriculture, or their genetic parts and components, in the form received from the MLS”
- Access to PGRFA under development, including by farmers and breeders, is at the discretion of its developer during the period of its development
- Access to material with intellectual property protection shall be consistent with relevant national legislation as well as with relevant international agreements
- Recipients must continue to make materials accessed under MLS and conserved available under the agreed terms of the ITPGRFA
- Access to in situ material will be made according to national legislation; and
- Facilitated access to registered PGRFA material under the management and control of governments and in the public domain will be ensured through the use of the Standard Material Transfer Agreement of the IT or its adaptation in the case of non-Annex I material.

Where non-Annex I material is concerned some modifications to the SMTA, i.e. an explanatory note in the SMTA, might be required to allow for the fact that non-Annex I material is accessed under similar access and benefit-sharing conditions as Annex I material under governmental control and management.

Benefit-sharing

The benefit-sharing provisions of the MLS are described below. These should equally apply to the European Accessions of AEGIS irrespective of whether or not they belong to species that are included in Annex I. As genetic resources that form part of the MLS are “pooled”, there is no need to negotiate access and benefit-sharing contracts with individual owners. Therefore, the transaction costs will be low and it will benefit farmers, plant breeders as well as researchers, and ultimately also consumers. The benefits must be shared in a pooled and multilateral way and it should be noted that facilitated access to PGRFA and information itself is a major benefit. Non-monetary benefits that arise from the use, including commercial use, shall be shared fairly and equitably through the following mechanisms, a) exchange of information (on material, from research and utilization, on technologies); b) access to and transfer of technology, improved varieties and genetic material; assistance in using technologies; favourable access conditions on IP protected technologies; and c) capacity-building, including education, facilities and research. The sharing of monetary and other benefits of commercialization is based on the following principles:

- The involvement of the public and private sector in collaborative research and technology development activities;
- If a product that incorporates material from MLS is commercialized and its availability to others for further research and breeding is restricted, an equitable share of the benefits will be payable to a financial mechanism;
- If a product is available without restriction to others, payment is voluntary; and
- It is foreseen that benefits arising from the use of PGRFA that are shared under the MLS should flow primarily to farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainably utilize plant genetic resources for food and agriculture.

Implementation process of AEGIS

In order to be able to start implementing AEGIS, it will first be necessary to establish the policy, legal, organizational and administrative framework. This section briefly describes how this can be done, as it may be difficult to imagine how such an evolutionary process could lead to a final “product” designed through a participatory and transparent process. The constraints are that the discussions on the planning as well as on the implementation need to take place at both the technical and the political levels within a country, and that the actual decisions will in many cases not be made by those who are actually involved in developing the framework.

In order to reduce the additional administrative and organizational tasks related to the implementation of AEGIS to a minimum, it is planned to use the existing ECPGR structures wherever possible. In some cases these may have to be strengthened or slightly modified but, in general terms, they seem to be adequate. However, in order to allow the various responsibilities to be implemented through ECPGR it may be necessary to review and revise its goals and objectives and to adjust the Terms of Reference of the various bodies and institutions accordingly. This approach would ideally allow the integrating of the operation of AEGIS, including its budget into ECPGR.

Implementation of AEGIS aims to reach a situation where genetic resources are rationally and cost-effectively maintained at the European level. It is understood that an increased initial cost will need to be incurred in order to allow the rationalization of conservation efforts. This cost can be compared to the “activation energy” which is necessary in a chemical reaction to convert reactants into products. The product (i.e. AEGIS) is expected to be more rational, more efficient and more convenient than the starting situation. The “activation energy” for AEGIS corresponds to several costs: e.g. project planning and awareness raising, clearance of agreements, setting up terms of reference, creating the framework for implementation, identification of European Accessions, organizing and implementing funding and monitoring mechanisms. Ideally, these set-up costs are intended to be raised from appropriate sources, for example the EC and other funding sources.

The important immediate steps in the development and implementation process are as follows:

- Approval of the AEGIS establishment process, including the endorsement of a draft “collective Memorandum of Understanding” and the definition of a financial strategy;
- The ECPGR National coordinators will be in charge of the endorsement of the collective MOU by their individual European country, according to their respective national legal systems;
- Initiating the establishment process:
 - Appointment and/or assignment of responsibilities to the various AEGIS bodies;
 - Definition and agreement of terms and conditions for an AEGIS quality management and monitoring system;
 - Development of a model institutional agreement that includes the detailed technical responsibilities agreed upon with collaborating genebanks and other service providers for any given crop in the European Collection;
 - Identification of potential AEGIS Accessions as part of an “inventory” process at the regional (i.e. by the respective Crop Working Groups) and at the national level (i.e. under the coordination of the National Coordinator), including an indication of at which level the individual accessions will be conserved (i.e. institutional, national, regional and/or global). The level to which the accessions are assigned will determine which sources of funding should be used to ensure their long-term conservation,

i.e. regional and where available global funds should be used to contribute to the conservation of accessions offered to and accepted by AEGIS;

- Each country will send lists of the proposed AEGIS accessions for each crop or group of crops as a proposal to be considered by the respective Crop Working Groups for their decision regarding registration to AEGIS;
- Establishment of the European Collections of unique/important accessions and implementation of the safety-duplication arrangements;
- Definition and implementation of the conservation strategies for the individual crops or crop gene pools of the European Collection, including conservation standards and procedures;
- Provide and publicize facts and figures about the results and benefits achieved through the implementation of the European Genebank Integrated System and consider the establishment of an impact assessment mechanism.

Full implementation of AEGIS will be accomplished once all arrangements including the governance and monitoring of the System are in place.

References

- Boller, B., E. Willner, L. Maggioni and E. Lipman, compilers. 2005. Report of a Working Group on Forages. Eighth meeting, 10-12 April 2003, Linz, Austria. International Plant Genetic Resources Institute, Rome, Italy. (*Appendix I. Description of the regeneration standards used for forage species. Pp. 184-187*).
- Bommer, D.F.R. 1991. The historical development of international collaboration in plant genetic resources. Pp. 3-12 *in* Crop Networks: Searching for New Concepts for Collaborative Genetic Resources Management. Papers of the EUCARPIA/IBPGR symposium held in Wageningen, The Netherlands, 3-6 December 1990 (Th.J.L. van Hintum, L. Frese and P.M. Perret, eds). International Crop Network series No. 4. International Board for Plant Genetic Resources, Rome.
- Bothmer, R. von. 2006. The National Programme of Plant Genetic Resources—development and priorities in Sweden. Pp. 8-11 *in* European Workshop on National Plant Genetic Resources Programmes. Report of an international workshop, 24-26 April 2003, Alnarp, Sweden (IPGRI). International Plant Genetic Resources Institute, Rome, Italy. (*in press*).
- FAO. 1980. FAO/UNDP Governments consultation on the European Cooperative Programme for the Conservation and Exchange of Genetic Resources for Plant Breeding, Geneva, 17–19 December 1979. RER-75/035 Meeting Report. United Nations Development Programme/ Food and Agriculture Organization of the United Nations, Rome, Italy.
- FAO. 1996. Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Food and Agriculture Organization of the United Nations, Rome, Italy.
- FAO. 1998. The state of the world's plant genetic resources for food and agriculture. Food and Agriculture Organization of the United Nations, Rome, Italy.
- FAO. 2002. The International Treaty on Plant Genetic Resources for Food and Agriculture. Food and Agriculture Organization of the United Nations, Rome, Italy.
- FAO. 2005. Information on a proposal to establish a long-term germplasm conservation facility in Svalbard, Norway. Item 11 of the Draft Provisional Agenda. Commission on Genetic Resources for Food and Agriculture, Working Group on Plant Genetic Resources for Food and Agriculture, Third Session, Rome, 26-28 October 2005. CGRFA/WG-PGR-3/05/Inf.11. Food and Agriculture Organization of the United Nations, Rome, Italy.

- FAO WIEWS. 2005. World Information and Early Warning System (WIEWS) on Plant Genetic Resources for Food and Agriculture (PGRFA). (<http://apps3.fao.org/wiews/>).
- Frese, L., C. Germeier, E. Lipman and L. Maggioni, compilers. 2004. Development of a quality concept. Pp. 14-16 *in* Report of a Working Group on *Beta* and World *Beta* Network. Second joint meeting, 23-26 October 2002, Bologna, Italy. International Plant Genetic Resources Institute, Rome, Italy.
- Frese, L. and Th.J.L. van Hintum. 1989. The International Data Base for *Beta*. Appendix III *in* Report of an International *Beta* Genetic Resources Workshop held at the Centre for Genetic Resources, the Netherlands (CGN), Wageningen, the Netherlands 7-10 February 1989. International Crop Network Series No. 3. International Board for Plant Genetic Resources, Rome, Italy.
- Frison, E., M. Mitteau, S. Sharrock and B. Visser. 2003. Sharing responsibilities. Pp. 107-121 *in* A guide to effective management of germplasm collections (J.M.M. Engels and L. Visser, eds). IPGRI Handbooks for Genebanks No. 6. IPGRI, Rome, Italy.
- Gass, T. and F. Begemann. 1999. International efforts to sustain *ex situ* collections: options for a closer cooperation in Europe. Pp. 109-115 *in* Implementation of the Global Plan of Action in Europe – Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Proceedings of the European Symposium, 30 June-3 July 1998, Braunschweig, Germany (T. Gass, L. Frese, F. Begemann and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.
- Germeier, C.U., L. Frese and S. Bücken. 2003. Concepts and data models for treatment of duplicate groups and sharing of responsibilities in genetic resources information systems. *Genetic Resources and Crop Evolution* 50:693-705.
- Hardon, J. 1999. Plant genetic resources conservation in Europe: a retrospective. Pp. 3-7 *in* Implementation of the Global Plan of Action in Europe – Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Proceedings of the European Symposium, 30 June-3 July 1998, Braunschweig, Germany. (T. Gass, L. Frese, F. Begemann and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.
- Hardon, J., P. Perret and R. Vellvé. 1992. Common framework for an integrated EC programme on the conservation of plant genetic resources. GRAIN, Barcelona, Spain.
- Harlan, H.V. and M.L. Martini. 1936. Problems and results in barley breeding. Pp. 303-346 *in* Yearbook of Agriculture, U.S. Department of Agriculture, Washington, D.C.
- Hintum, Th.J.L. van and I. W. Boukema. 1999. Genetic resources of leafy vegetables. Pp. 59-72 *in* EUCARPIA Leafy Vegetables '99, (A. Lebeda and E. Kristková, eds). Proceedings of the EUCARPIA Meeting on Leafy Vegetables Genetics and Breeding, Olomouc, Czech Republic, 8-11 June 1999. Palacký University, Olomouc, Czech Republic.
- Hintum Th.J.L. van and H. Knüpfper. 1995. Duplication within and between germplasm collections. I. Identifying duplication on the basis of passport data. *Genetic Resources and Crop Evolution*. 42:127-133.
- IPGRI. 2006. European Workshop on National Plant Genetic Resources Programmes. Report of an international workshop, 24-26 April 2003, Alnarp, Sweden. International Plant Genetic Resources Institute, Rome, Italy. (http://pgr2006.lippmann.lu/pdf/alnarp_proceedings_final.pdf).
- Kjellqvist, E. and S. Blixt. 1991. Regional gene banks: cooperative programmes. *Biological Journal of the Linnean Society* 43:51-59.
- Knüpfper, H., L. Frese and M.W.M. Jongen. 1997. Using Central Crop Databases: searching for duplicates and gaps. Pp. 59-68 *in* Central Crop Databases: Tools for Plant Genetic

Resources Management (E. Lipman, M.W.M. Jongen, Th.J.L. van Hintum, T. Gass and L. Maggioni, compilers). International Plant Genetic Resources Institute, Rome, Italy/CGN, Wageningen, The Netherlands.

Lund, B., R. Ortiz, I.M. Skovgaard, R. Waugh and S.B. Andersen. 2003. Analysis of potential duplicates in barley gene bank collections using re-sampling of microsatellite data. *Theoretical Applied Genetics* 106:1129-1138.

Plucknett, D.L., N.J.H. Smith, J.T. Williams and N.M. Anishetty. 1987. *Gene banks and the world's food*. Princeton University Press, Princeton, New Jersey.

Appendix I. The elements of AEGIS

Collective Memorandum of Understanding. The document defining the establishment of AEGIS and the terms of cooperation between the member countries. By signing this document, countries join AEGIS and use their sovereign rights over genetic resources within their borders to offer specific accessions to be registered and to become part of the integrated genebank system.

Institutional Model Contract. It may be required to make contractual arrangements that cover details of agreed responsibilities between collaborating genebanks and other institutions that are engaged in the conservation action for a given crop or crop genepool.

ECPGR Crop Working Group. This group contributes to the definition, from a technical and scientific point of view, of the European Collection for a given crop, according to agreed criteria and applying the concept of Most Appropriate Accession. It also oversees all the conservation related activities for a given crop genepool. Delegation of tasks to co-opted institutions/individuals can be considered.

European Accession. Each accession of a given crop genepool offered by a country which is accepted by the ECPGR Crop Working Group and registered by the holding country, through the EURISCO NFP to the NI, for inclusion in the European genebank integration system. These accessions are identified from among the list of accessions offered to be part of AEGIS by the member countries. For each AEGIS accession, the holding European genebank assumes responsibility for long-term conservation and related activities (maintenance of germplasm, regeneration, documentation, characterization and evaluation).

European Collection. The collection of all the European Accessions registered as part of the genebank integration system. These are genetically unique and important accessions for Europe.

Coordinating European (Lead) Institution. Institution selected by the Steering Committee, among those proposed on a consensus basis by the ECPGR Crop Working Group in order to propose conservation workplans to the Steering Committee and/or coordinate their implementation under the guidance of the Steering Committee.

Crop conservation workplans. Workplans consisting of activities that are of regional importance, including storage/maintenance, safety-duplication, regeneration, conducting quality controls, characterization, evaluation and management of the information. These workplans, proposed by the Working Groups and/or by the Coordinating European (Lead) Institutions, and approved by the Steering Committee, will be implemented by the collaborating institutions as part of their ongoing activities, to be integrated with the AEGIS objectives.

ECPGR Central Crop Database (ECCDB). Database containing crop specific accession data information (passport, characterization and evaluation) of germplasm maintained in European collection holdings. This database, usually developed by the respective ECPGR Working Group, is currently managed by an institution which offers this service on behalf of all the ECPGR member countries. The database is maintained according to agreed international documentation standards.

EURISCO. The European Plant Genetic Resources Search Catalogue provides Web-based centralized access to information on plant genetic resources and their location in *ex situ* collections throughout Europe. The EURISCO Web catalogue receives data from the National Inventories using the multi-crop passport standards. EURISCO is hosted at and maintained by Bioversity International on behalf of the Secretariat of the European Cooperative Programme for Plant Genetic Resources (ECPGR).

ECPGR National Coordinator. S/he will be the representative of the country within the Steering Committee and within AEGIS, and will consequently assume a focal point role including the coordination of the AEGIS Accessions registration process and will ensure that AEGIS activities agreed upon for implementation by that country are efficiently coordinated with all participating institutions in the country, for all the crops. This focal point person is also responsible for overseeing the exchange of national germplasm that is part of the AEGIS system as well as for the annual reporting on AEGIS activities in his/her country to the ECPGR Steering Committee.

ECPGR Steering Committee. Maintains the overall responsibility for and oversight of the operation/implementation of AEGIS, approves the collective Memorandum of Understanding, as well as the processes that produce the TORs of the various bodies and functions as the highest authority in cases of dispute.

AEGIS Advisory Committee. Provides guidance, advice and oversight to the ECPGR Secretariat in implementing the agreed programme of work of AEGIS and reports directly to the ECPGR Steering Committee, by whom it is appointed.

ECPGR Secretariat. Assists the ECPGR Steering Committee and the Advisory Committee in monitoring, reporting, communicating and any other responsibility assigned to it by the Steering Committee and/or the Advisory Committee while implementing AEGIS.

Appendix II. Acronyms and abbreviations

| | |
|----------|---|
| AEGIS | A European Genebank Integrated System |
| CBD | Convention on Biological Diversity |
| CGIAR | Consultative Group on International Agricultural Research |
| cMoU | Collective Memorandum of Understanding |
| ECCDB | ECPGR Central Crop Database |
| ECPGR | European Cooperative Programme for Plant Genetic Resources |
| EUCARPIA | European Association for Research on Plant Breeding |
| EURISCO | European Plant Genetic Resources Search Catalogue |
| FAO | Food and Agriculture Organization of the United Nations |
| GPA | Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture |
| IARC | International Agricultural Research Centre |
| IBPGR | International Board for Plant Genetic Resources |
| IPGRI | International Plant Genetic Resources Institute |
| ITPGREA | International Treaty on Plant Genetic Resources for Food and Agriculture |
| MAA | Most Appropriate Accession |
| NGO | Non-governmental organization |
| PGR | Plant genetic resources |
| PGRFA | Plant genetic resources for food and agriculture |
| SMTA | Standard Material Transfer Agreement |
| ToRs | Terms of Reference |
| WG | Working Group |
| WIEWS | World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (FAO) |

