

## **AEGIS: a regionally based approach to PGR conservation**

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### **Introduction**

Globally, there are about 1.800 genebanks and/or germplasm collections exist, holding approximately 7.4 million accessions of which an estimated 2 million are unique (FAO, 2010). Of the 3.8 million accessions with status information available, about 700.000 (18%) are crop wild relatives (CWR) and 1.700.000 (44%) landrace accessions, held in respectively 724 and 901 genebanks. In Europe, approximately 625 genebanks and/or germplasm collections have been reported, holding more than 2 million accessions of which 30-40% have been estimated to be unique (FAO,2010). Further, approximately 84.500 accessions of the 1.1 million accessions included in EURISCO, are wild species (including CWR) and 268.840 landrace accessions maintained in respectively 120 and 223 genebanks (EURISCO, 2011).

In the late nineties, the European Cooperative Programme for Plant Genetic Resources (ECPGR) reported difficulties with the maintenance of plant genetic resources, in particular a lack of long-term conservation facilities, insufficient safety-duplication, regeneration backlogs and of inhomogeneous quality of conserved germplasm. Since 1998 the Steering Committee of ECPGR has been discussing options for the sharing of conservation responsibilities between European countries and decided in 2003 to initiate a feasibility study on an European Genebank Integrated System (AEGIS), using four model crops (*Allium*, *Avena*, *Brassica* and *Prunus* spp.), representing different biology and policy related scenarios. In 2006 the Steering Committee decided to formally establish AEGIS as a Programme component on the basis of the outcome of the aforementioned study (ECPGR, 2006).

### **AEGIS**

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 readily available for breeding and research purposes. The identified material, constituting the European Collection, will be safely conserved under well-defined storage or maintenance conditions that will ensure the genetic integrity and viability for the long-term. According to the ECPGR Strategic Framework Policy Guide (ECPGR, 2009) the *ex situ* conservation of germplasm will be carried out according to common, agreed quality standards, wherever the germplasm is physically located, and will be carried out in such a way that it will facilitate close linkages with *in situ* conservation, the use of and research into the conserved germplasm.

AEGIS focuses primarily on the *ex situ* conservation and use of genetically unique and important accessions of PGRFA (following the definition of the International Treaty, as well as medicinal and ornamental species) and their wild relatives of European origin. It also includes other important species introduced and maintained in genebanks of the AEGIS member countries. 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, thereby, contributing to its effective implementation (ECPGR, 2009).

AEGIS will be building on existing organizational bodies of the ECPGR Programme, in particular that of its Steering Committee (for the oversight and provision of funds), the Crop Working Groups (as the principal coordinating technical bodies) and the National Coordinators (as the focal point for all AEGIS related activities in a given country). It is anticipated that the existing European information management systems, in particular EURISCO and the Central Crop Databases, will play a key role in orchestrating the information management at the national and regional level and as such to contribute to global information management systems such as Genesys ([www.genesys-pgr.org/](http://www.genesys-pgr.org/)).

### **Anticipated benefits of establishing AEGIS**

AEGIS has been perceived to provide a number of benefits to participating countries and institutions. However, the establishment of the European Collection and all its supporting components and procedures will take time and only when reaching a critical threshold it will be possible to note or measure these benefits. The perceived benefits include:

- Improved security of germplasm through long-term commitment and systematic safety-duplication;
- Facilitated access to and availability of high quality germplasm and related information;
- Improved and widely agreed minimum quality standards of conserved material;
- Cost efficient conservation activities;
- Reduced duplication of germplasm material within and across collections;
- Improved sharing of knowledge and information;
- Shared responsibilities among European countries and their institutions;
- A direct contribution to the implementation of the International Treaty at the national as well as at the regional level;
- An established European reference system for the effective and efficient conservation and the facilitated use in Europe. This should become attractive for longer-term financial commitments to maintain the system and/or for using the system in jointly agreed projects on priority areas.

### **The key components of AEGIS**

The establishment of AEGIS requires a number of key components. These include:

1. A **Strategic Framework** for the Implementation of AEGIS - A Policy Guide. This is the document that sets out the wider strategy and policies of establishing and operating AEGIS and as such it is the “constitutional” backbone of the integrated system. The document was endorsed by the ECPGR Steering Committee (ECPGR, 2009).
2. **Memorandum of Understanding** (MoU). This is a formal agreement that ECPGR concludes with countries (Members) and institutions (Associate Members) that hold the germplasm or provide services to AEGIS. Membership in AEGIS is open to all the countries of the European Region and all the institutions of an AEGIS member country, i.e. also organizations that can provide conservation and use related activities that complement what genebanks traditionally offer. Full participation of a country in the ECPGR is necessary prior to joining AEGIS, since AEGIS is based on the ECPGR

structures. The signing of the MoU is the expression of the willingness and interest of a given country to become a member of AEGIS and to accept the commitment of long-term conservation of genetically unique and important accessions maintained in its genebank(s) and to make these accessions available under the terms and conditions of the Standard Material Transfer Agreement (SMTA) of the International Treaty. By doing so, the designated accessions of a given country become part of the European Collection. By the end of February 2011, 26 countries had signed the MoU (<http://aegis.cgiar.org/membership.html>).

3. **The European Collection.** This decentralized collection is composed of the selected “European Accessions”, that the countries accept to conserve according to agreed standards and to make readily available. AEGIS will focus primarily on the conservation and use of genetically unique and agronomically and/or historically/culturally important accessions for Europe. The Steering Committee has agreed on so-called selection requirements for the identification of the accessions that eventually will make up the European Collection (see Box I).

### **Box I. Selection requirements for European Accessions**

The following requirements have been agreed by the ECPGR Steering Committee during its Eleventh Meeting in Sarajevo, Bosnia and Herzegovina, September 2008. All European Accessions will need to comply with all requirements:

- a. Material under the management and control of the governments of member countries and their associate members, in the public domain and offered by the associate members for inclusion into AEGIS
- b. Genetically unique within AEGIS, to the best available knowledge (i.e. genetically distinct accessions; assessment based on available data and/or on the recorded history of the accession)
- c. Plant genetic resources for food and agriculture as defined in the International Treaty as well as medicinal and ornamental species
- d. European origin or introduced germplasm that is of actual or potential importance to Europe (for breeding, research, education or for historical and cultural reasons).

Where duplicates or quasi duplicates are identified among accessions, ECPGR Working Groups have the task to select the Most Appropriate Accession (MAA) among them based on crop gene pool specific selection criteria. 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, and others. Whereas the general requirements are intended to discriminate between accessions for inclusion in the European Collection, the selection criteria are meant to facilitate the decision-making process which accession of a group of duplicates to accept for inclusion. Further details on the European Collection and the selection process details can be found on the AEGIS Website ([http://aegis.cgiar.org/european\\_collection.html](http://aegis.cgiar.org/european_collection.html)).

4. **Quality System for AEGIS (AQUAS).** The framework for the quality system is formulated in a Discussion Paper, where a number of underpinning principles have been recognized:
- a. Quality assurance is based on principle that you:
    - Plan - say what you do
    - Do - do what you say
    - Check - let an independent body check that you do what you say
    - Act – Correct and improve what you say you do.
  - b) AQUAS is based on the principle of consensus.
  - c) With respect to the technical standards, agreement has to be reached through a well-defined process on what the “lowest” acceptable standards are, i.e. standards that will ensure long-term and secure conservation, genetic integrity, identity and availability of the accessions. Such standards have been coined by the Steering Committee as the “agreed minimum standards”.
  - e) Capacity building is a central activity in building and operating the virtual European genebank system at an appropriate level of quality management and thus establishing and operating AQUAS. Capacity building efforts, in particular with regard to training, possibly both from within the genebank or country as well as from outside, will be required to ensure the establishment of widely acceptable standards in all the genebanks hosting European Accessions.
  - f) The AQUAS should be as little bureaucratic as possible, pragmatic rather than doctrinaire, and it should be recognized that different participating collections can achieve agreed minimum standards in different ways. Furthermore, the general principles are more important than over-prescriptive protocols.
  - g) A monitoring system should encourage participants to improve the performance, and thus to strengthen the capacity, rather than to feel being policed. Therefore, an “effective guiding and advisory approach at the AEGIS level” will need to be developed to facilitate compliance of the partners with the collectively agreed management and minimum standards. A system of “record keeping” of the performed activities will have to be developed in a participatory manner. The performance monitoring itself should be conducted by an ECPGR or a completely independent body.

Besides the above mentioned principles, there are the “generic operational standards” (which were prepared in close collaboration with FAO through the revision process of the Genebank Standards), the “operational genebank manual” (for which a template has been designed that will guide the Associate Members in preparing their respective genebank manual) and the “agreed minimum standards (by crop or crop group; they are defined in a process that has just been initiated by the respective Working Groups)”.

5. **EURISCO** (<http://eurisco.ecpgr.org>) is the information portal for the European Collection. Accessions belonging to the European Collection are marked and become clearly identifiable through the catalogue.
6. A dedicated **AEGIS website** (see [http://aegis.cgiar.org/about\\_aegis.html](http://aegis.cgiar.org/about_aegis.html).) has been recently revised and is intended to provide easy access to the various documents, guidelines and other relevant information by the PGRFA community in Europe.

## Achievements

Following the completion of the feasibility study (2004-2008), the results of which are online available ([http://aegis.cgiar.org/documents/crop\\_specific\\_documents.html](http://aegis.cgiar.org/documents/crop_specific_documents.html)), the AEGIS coordinator was appointed in 2008 as part of the ECPGR Secretariat, based at Bioversity International,. An AEGIS Advisory Committee (AC) was also appointed to guide the process of AEGIS implementation

([http://aegis.cgiar.org/structure/governance/advisory\\_committee.html](http://aegis.cgiar.org/structure/governance/advisory_committee.html)).

A Strategic framework policy guide was compiled and endorsed in 2008 by the ECPGR SC. On the basis of this document, the Memorandum of Understanding (MOU) text was developed, endorsed by the SC and sent for signature to all ECPGR member countries in April 2009. AEGIS entered into force in July 2009, after the signature of the 10<sup>th</sup> country and by February 2011 the membership raised to 26 countries with 19 associate member institutions. The principles of a quality system for AEGIS (AQUAS) have been endorsed and published in the form of a discussion paper. A template for the preparation of the genebank operational manual was also endorsed in September 2010 by the AEGIS Advisory Committee. All Associate members are expected to fill in this template and to publish online their operational manuals. Generic genebank standards are in process of being endorsed at the international level in early 2011, in collaboration with FAO. Working Groups need to define crop specific genebank standards. A few groups have already defined minimum standards that are at different levels of completion ([http://aegis.cgiar.org/documents/crop\\_specific\\_documents.html](http://aegis.cgiar.org/documents/crop_specific_documents.html)).

A system of record keeping, reporting and monitoring still needs to be agreed and implemented across Working Groups, before a fully functional quality system can be considered operational. The Working Groups are defining the criteria for selecting the European Accessions. Draft lists are available for a few crops. The first accessions designated as part of the European Collection are expected in the course of 2011.

A Competitive Small Grant Scheme was launched in 2009 with the intention of facilitating the establishment and operation process of AEGIS; three proposals were awarded in 2009 and these should facilitate the assessment of the European collection of umbellifer crops and of pea, as well as to improve the quality of cryopreservation of garlic. More projects will be awarded in 2011 as a result of a second Call.

### **AEGIS and *in situ*/on-farm conservation**

ECPGR has had a traditional focus on *ex situ* conservation, but its objective also includes long-term *in situ* conservation of PGR in Europe". An *in situ* and On-farm Conservation Network has been established in 2000 and a number of outstanding achievements have been realized by the Network. But so far *in situ*/on-farm conserved germplasm has not been considered as part of AEGIS. The recent ECPGR External Review recommended to fully integrate *in situ* and on-farm activities in AEGIS, expanding in a second step the Genebanks' *ex situ* coverage to both *in situ* crop relatives' populations and on farm managed landraces; this will imply to expand EURISCO's structure, in order to include relevant data for the management of the *in situ* and on-farm components. Consequently, the assessment of how this could be implemented has to be undertaken and a number of questions and issues have been identified and are listed Box 2.

### **Box 2: Questions and issues for *in situ* on-farm conservation**

1. What kind of aspects do *in situ* and on-farm “accessions” have to comply with in order to allow their inclusion into AEGIS?
  - a) *To be identified as “genetically unique and important” population/landrace (incl. definition of an in situ/on-farm “accession”!);*
  - b) *To be placed by the respective country into the public domain;*
  - c) *Country to accept long-term conservation responsibility for in situ material;*
  - d) *To be available for distribution (together with relevant information);*
  - e) *To be managed in accordance with to-be-established standards.*
2. What kind of adjustments need to be undertaken in AEGIS?
  - a) A Steering Committee decision on the inclusion of *in situ* and on-farm material is required;
  - b) Scope of the AEGIS MOU will need to be expanded to include *in situ* and on-farm managed germplasm;
  - c) Adjustments of MOU text will be required;
  - d) *In situ* and On-Farm Conservation Network will have to assume technical and coordinating responsibilities;
  - e) Adjustments in EURISCO will be required to allow relevant information to be included.
3. What kind of tools and procedures need to be developed in order to allow quality management?
  - a) Protocol and/or manual of currently followed management procedures by Associate Member Institutions;
  - b) Generic technical management practices/standards for *in situ*/on-farm material;
  - c) Species specific technical standards or requirements, e.g. minimum population size; specific management practices; etc.; and
  - d) Reporting and monitoring procedures.

In conclusion, the *In Situ* and On-Farm Network should now aim to expand AEGIS with *in situ* germplasm and obtain formal agreement of Steering Committee thereof (based on supporting documentation, incl. the benefits and feasibility of implementation of such decision). Similar developments in establishing a European Forest Genetic Resources information system EUFGIS, have been undertaken by the European Forest Genetic Resources Network (EUFORGEN) with respect to the management of identified forest populations and accessions (<http://portal.eufgis.org/>).

## References

**ECPGR 2009.** A Strategic Framework for the Implementation of a European Genebank Integrated System (AEGIS). A Policy Guide. European Cooperative Programme for Plant Genetic Resources (ECPGR). Bioversity International, Rome, Italy.

**ECPGR 2006.** Report of the Steering Committee. Tenth Meeting, 5-8 September 2006, Jurmala, Riga, Latvia. Bioversity International, Rome, Italy.

**EURISCO 2011.** <http://eurisco.ecpgr.org> (accessed 12 February 2011).

**FAO 2010.** The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture. Commission on Genetic Resources for Food and Agriculture. Food and Agricultural Organization of the United Nations, Rome.