

# Report of a Working Group on *Allium*

Seventh Meeting, 6-8 September 2011, Perea, Thessaloniki, Greece  
J. Keller, D. Astley, A. Tsivelikas, J. Engels and E. Lipman







---

# Report of a Working Group on *Allium*

Seventh Meeting, 6-8 September 2011, Perea, Thessaloniki, Greece  
J. Keller, D. Astley, A. Tsivelikas, J. Engels and E. Lipman

**Bioversity International** is part of the Consultative Group on International Agricultural Research, which works to reduce hunger, poverty and environmental degradation in developing countries by generating and sharing relevant agricultural knowledge, technologies and policies. This research, focused on development, is conducted by a Consortium of 15 CGIAR centres working with hundreds of partners worldwide and supported by a multi-donor Fund (<http://www.bioversityinternational.org>; <http://www.cgiar.org>; <http://cgiarconsortium.cgxchange.org>; [www.cgiarfund.org](http://www.cgiarfund.org)). Bioversity has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The organization 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 2010, had been signed by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Burundi, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Ethiopia, Ghana, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mali, Mauritania, Mauritius, 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](mailto:bioversity-publications@cgiar.org) or from Bioversity's Web site ([www.bioversityinternational.org](http://www.bioversityinternational.org)).

**The European Cooperative Programme for Plant Genetic Resources (ECPGR)** is a collaborative programme among most European countries aimed at contributing to national, sub-regional and regional programmes in Europe to rationally and effectively conserve *ex situ* and *in situ* Plant Genetic Resources for Food and Agriculture and increase their utilization. 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. The Coordinating Secretariat is hosted by Bioversity International. 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) 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**

Keller J, Astley D, Tsivelikas A, Engels J, Lipman E. 2011. Report of a Working Group on *Allium*. Seventh Meeting, 6-8 September 2011, Perea, Thessaloniki, Greece. Bioversity International, Rome, Italy.

#### **Cover illustration**

*Allium cepa* on display at the Onion Market in Weimar, Germany. Courtesy of © J. Keller, IPK Gatersleben, Germany.

Acknowledgements to L. Currah for English language editing.

ISBN 978-92-9043-900-4

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

© Bioversity International, 2011

*Bioversity International* is the operating name of the International Plant Genetic Resources Institute (IPGRI).

## CONTENTS

<b>SUMMARY REPORT OF THE MEETING</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>1</b>
<b>Update on ECPGR and AEGIS</b> .....	<b>1</b>
<b>Chairman’s report</b> .....	<b>3</b>
<b>European <i>Allium</i> Database</b> .....	<b>4</b>
<b>AEGIS – Seed-propagated <i>Allium</i></b> .....	<b>6</b>
Method to establish the list of candidate European Accessions for seed-propagated <i>Allium</i> landraces, using leek as an exemplar .....	6
Method to establish the list of European Accessions for seed-propagated wild <i>Allium</i> taxa .....	7
Method to establish the list of European Accessions for cultivars .....	7
Status of landrace conservation .....	7
Safety-duplication of seed-propagated material .....	8
<b>AEGIS – Vegetatively propagated <i>Allium</i></b> .....	<b>9</b>
Report on the results of the EURALLIVEG project .....	9
Report on the AEGIS-funded project on “Cryopreservation of young inflorescence bases in bolting garlic for germplasm storage” .....	10
Future development for vegetatively propagated material .....	10
Discussion and agreement on the establishment of the European Accessions of vegetatively propagated <i>Allium</i> .....	11
<b>AEGIS – Crop-specific quality standards for conservation</b> .....	<b>12</b>
Formalization of standards for vegetatively propagated crops .....	12
<b>Wider collaboration within the <i>Allium</i> Working Group</b> .....	<b>12</b>
<b>Visit to the Greek Gene Bank and tour of the Department of Aromatic and Medicinal Plants on the NAGREF campus</b> .....	<b>13</b>
<b>Conclusion and election of the new Chairman</b> .....	<b>13</b>
<b>APPENDICES</b> .....	<b>15</b>
<b>Appendix I. Workplan</b> .....	<b>17</b>
<b>Appendix II. Decision factors for field cultures and cryopreservation of vegetative <i>Allium</i> accessions</b> .....	<b>19</b>
<b>Appendix III. Acronyms and abbreviations</b> .....	<b>20</b>
<b>Appendix IV. Agenda</b> .....	<b>21</b>
<b>Appendix V. List of participants</b> .....	<b>23</b>

Related presentations can be downloaded from  
[http://www.ecpgr.cgiar.org/networks/vegetables/allium/ecpgr\\_allium\\_working\\_group\\_meeting/presentations.html](http://www.ecpgr.cgiar.org/networks/vegetables/allium/ecpgr_allium_working_group_meeting/presentations.html)



## SUMMARY REPORT OF THE MEETING

### Introduction

The seventh meeting of the Working Group on *Allium* of the European Cooperative Programme for Plant Genetic Resources (ECPGR) was held from 6 to 10 September 2011 in Perea, Thessaloniki, Greece.

The meeting was opened by the Chairman of the *Allium* Working Group, Dave Astley, and by Fotios Bletsos, Department of Horticulture of the National Agricultural Research Foundation (NAGREF) in Thermi, Thessaloniki.

Fotios Bletsos described to the participants the present situation of NAGREF through a succinct review of the research activities of the Agricultural Research Center of Northern Greece (ARCGN). The basic and applied research of ARCGN include the development of high-yielding vegetable cultivars using appropriate conventional and molecular breeding techniques, as well as the study of crop physiology interactions with the environment for the development of integrated strategies for the control of biotic and abiotic stresses affecting vegetable crops. F. Bletsos particularly emphasized the activities of the Department of the Greek Gene Bank concerned with the conservation of national plant genetic resources that are threatened with genetic erosion or extinction. He also explained that NAGREF was currently undergoing a merger with three other related organizations in the public sector with the aim of creating a new dynamic public organization, which will combine forces in the management of research, dissemination of the results to stakeholders and certification of farming products.

### Update on ECPGR and AEGIS

Jan Engels, Coordinator of the initiative for “A European Genebank Integrated System” (AEGIS), gave an update on the ECPGR, informing the Group about the status of membership (currently 43 countries) and the structure of the Networks, with the Vegetables Network (VEGNET) covering the largest number of Working Groups, namely 11. The *Allium* Working Group (AWG) is one of the oldest active Working Groups of ECPGR. Its budget for ECPGR’s Phase VIII still includes one pending item concerning an intended project on garlic fingerprinting.

In July 2010 ECPGR underwent an Independent External Review, resulting in 25 recommendations. The Review Panel recommended that the ECPGR take more responsibility for the conservation and use of plant genetic resources for food and agriculture (PGRFA) by establishing more accountability among its membership, exploring the option of obtaining a legal persona and establishing an Executive Committee. These proposals were not immediately accepted by the Steering Committee at its (extraordinary) twelfth meeting in Bratislava, Slovakia, in December 2010, as they would require an increased investment in the Programme. Nonetheless, it decided to nominate an Executive Committee (ExCo) with a Chair and four members to examine the proposals. The Steering Committee also decided to revise the objectives of the ECPGR and tasked the ExCo to prepare an “Options paper” that elaborates on the ECPGR objectives and analyses its legal status, operating structure, hosting arrangements and the overall cost implications. The cancellation of the All Networks Coordinating Groups meeting will allow savings for a Common Fund to finance special actions. Practical achievements were requested, such as the definition of lists of accessions proposed for the European Collection and draft lists of crop-specific standards for conservation.

Jan Engels then presented the “Establishment and operation of the European Collection with an emphasis on vegetatively propagated *Allium*”. AEGIS was developed within the background of the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture, and aims at establishing a virtual “European Collection” through the selection of the often called “Most Appropriate Accessions (MAAs)”<sup>1</sup> which will eventually be flagged as “European Accessions”.<sup>2</sup> AEGIS is a strategic framework based on Memoranda of Understanding (MoUs) with countries and the institutions therein, comprising a quality management system, using the European Plant Genetic Resources Catalogue (or European Internet Search Catalogue, EURISCO), as the information portal and informing the public on its Web site (<http://aegis.cgiar.org/home.html>). Up to now (September 2011) 27 countries have signed the AEGIS MoU.

According to the World Information and Early Warning System (WIEWS) on PGRFA of the Food and Agriculture Organization (FAO), there are approximately 16 400 *Allium* accessions held in 77 genebanks of 32 countries. Vegetative alliums were chosen as one of the four “model crops” of the first phase of AEGIS because of their exemplar characteristics as Non-Annex I, vegetatively propagated crops.

Jan Engels gave an overview of the general principles, selection requirements and criteria for the European Accessions. According to an earlier statement of the AWG (Skierniewice, 2008), the following criteria are essential or useful for *Allium*: molecular fingerprinting results, material with known origin, presence of passport data, health status, morphological characterization data and agronomic evaluation data. Further aspects of AEGIS are the crop-specific standards which are part of the AEGIS Quality System (AQUAS) covering field genebank, *in vitro* culture, cryopreservation and phytosanitary conditions. In the frame of AQUAS, an operational genebank manual will be developed. Some legal considerations were discussed, including the characterization of the collective MoU and the Associate Membership Agreements, the general use of the standard material transfer agreement (SMTA) for material exchange, and the importance of phytosanitary considerations.

The presentation ended with an update on the project proposal to be submitted under the EU Seventh Framework Programme Call for “Plant Genetic Resources Centres” (FP7-INFRASTRUCTURES-2012-1). This project proposal, called “Plant Gene Access” is coordinated by the ECPGR Secretariat. The draft list of Work Packages and their respective leaders was presented. All those interested in participating in the project were invited to approach the relevant Work Package leaders. Background information is available on the AEGIS Web site ([http://aegis.cgiar.org/documents/aegis\\_project\\_proposal.html](http://aegis.cgiar.org/documents/aegis_project_proposal.html)).

### **Discussion**

The Group welcomed the inauguration of an Executive Committee in ECPGR, which is expected to make ECPGR more flexible in the interim stages between the Steering Committee meetings.

---

<sup>1</sup> Most Appropriate Accession (MAA): accession that has been selected from a set of assumed duplicates through the application of the selection criteria that the Working Group concerned had agreed upon in a well-defined and transparent selection process. The identified MAAs will be proposed by the WG concerned to the respective National Coordinators for acceptance as an European Accession.

<sup>2</sup> European Accession: a genetically unique and/or important plant genetic resources accession for Europe that fulfills the selection requirements, that has been identified by the respective Working Group after a selection process, and that subsequently has been designated by the National Coordinator of the maintaining country, to be conserved for the long term according to agreed technical standards and to be made available to any *bona fide* user, that will form part of the European Collection. (Synonym: AEGIS Accession).



It was felt however that by emphasizing *in situ* conservation and utilization in the next phases of ECPGR activities, there was a risk of decreasing awareness of *ex situ* conservation.

The cancellation of the All Networks Coordinating Groups meeting may be useful. However, Dave Astley pointed out that some full Network meetings, e.g. the third VEGNET meeting in Catania (2009), were among the most productive ones in the past, by encouraging using cross-information of the various groups.

The hope was also expressed that the improvement of relationships between ECPGR and the European Commission (EC) could be used to secure more stable funding of the permanent costs incurred in the maintenance of the collections. The pending ECPGR funds for a molecular marker project should be added to the intended molecular analyses to repeat the so far unsuccessful approach to eliminate undesired duplicates of garlic with the aid of molecular markers.

It was noted that the ECPGR Web site had been re-organized and re-designed, including the AWG pages.

## Chairman's report

Dave Astley presented an overview of the activities of the AWG. The *Allium* gene pool is divided into two groups: seed-propagated and vegetatively maintained germplasm. Over the last 10 years, the activities of the AWG were concentrated on the vegetative material, determined by (i) the choice of vegetative *Allium* as an AEGIS model crop ([http://aegis.cgiar.org/documents/crop\\_specific\\_documents.html](http://aegis.cgiar.org/documents/crop_specific_documents.html)), (ii) the EURALLIVEG project ("Vegetative *Allium*, Europe's Core Collection, Safe and Sound" – <http://euralliveg.ipk-gatersleben.de/home.php>), financed under the EU Council Regulation No. 870/2004, and (iii) the successful AEGIS project application on "Cryopreservation of young inflorescence bases in bolting garlic for germplasm storage" ([http://aegis.cgiar.org/documents/aegis\\_grant\\_scheme/first\\_call.html](http://aegis.cgiar.org/documents/aegis_grant_scheme/first_call.html)). The success of the vegetative *Allium* subgroup has now led to the need to develop further activities in the seed-propagated *Allium* gene pool.

### Discussion

In the course of the discussion about safety-duplicates as a prerequisite to flagging accessions in EURISCO as European Accessions, the question arose whether deposition in the Svalbard Seed Vault may count as a valid safety-duplicate in this context. Jan Engels pointed out that, after several discussions with the Global Crop Diversity Trust and the responsible officer for Svalbard in Norway, Svalbard storage may be accepted as such a safety-duplicate site.

The country quota system currently practised by ECPGR to achieve the objectives within Networks and Crop Working Groups was discussed. So far country quotas are allocated based on the level of national contributions in order to reach an acceptable balance between the countries. The national programmes prioritize their quota commitments to Networks and Working Groups based on national interest. The system limits the representation of the lower quota nations to few Working Groups, which in turn limits the attendance numbers at some Working Groups. The low representation at some Groups does not mean the crops are not important in a majority of national programmes, but merely reflects the availability of quota. For the current *Allium* Working Group meeting the Chairman received responses from 50% of the national programme members. Presumably the 50% of National Coordinators that did not respond are sufficiently interested in *Allium* to nominate AWG representatives, but do not have sufficient quota places to permit attendance at meetings.

It was also noted that, given the increasing workload of genebank staff, providing inputs in kind to support ECPGR and in the future AEGIS will become more difficult and there is an urgent need to establish ECPGR on its own financial basis. It was recognized that some national programmes provide funds to their Working Group members in support of inputs in kind, while in other national programmes there is no recognition of the work required for inputs-in-kind to ECPGR in their allocation of National Programme budgets.

The Steering Committee appear to consider Working Group meetings as unproductive and expensive. In contrast the AWG members support the organization of meetings, which are the only source for direct negotiations between the crop genetic resources scientists and provide for the development of cooperative contacts and creation of new ideas. The Chairman pointed out that the interactions between members needed to be reinforced between the meetings, where action plans for the Working Group are developed, and that the role of National Coordinators in reviewing the workplans of the crop groups and in providing national support should also be reinforced.

Finally the present Chairman, Dave Astley, announced his intention to resign as the Chairman during the course of the meeting, and based on ECPGR protocol an election of a new Chair would be organized as the penultimate action of the meeting.

## European *Allium* Database

Dave Astley, who was also the Database Manager, described the present status of the European *Allium* Database (EADB). He reported that the responses to the data update request, which he sent to the collection holders in February 2010, were very disappointing. Only four collection curators responded. In 2007, the EADB contained data for 14 035 accessions from 37 institutes in 23 countries, whereas only data for 9877 accessions from 45 institutes in 30 countries were found in EURISCO in March 2011. However, Jan Engels had mentioned 16 400 accessions from 77 genebanks in 32 countries. Differences were mainly due to the different treatment of the data of non-available material (e.g. safety-duplicates) which were provided in some cases and by some collections, in other cases not.

The future implementation and maintenance of the EADB was discussed, and the general conclusion was that it is necessary to continue the development and management of this database.

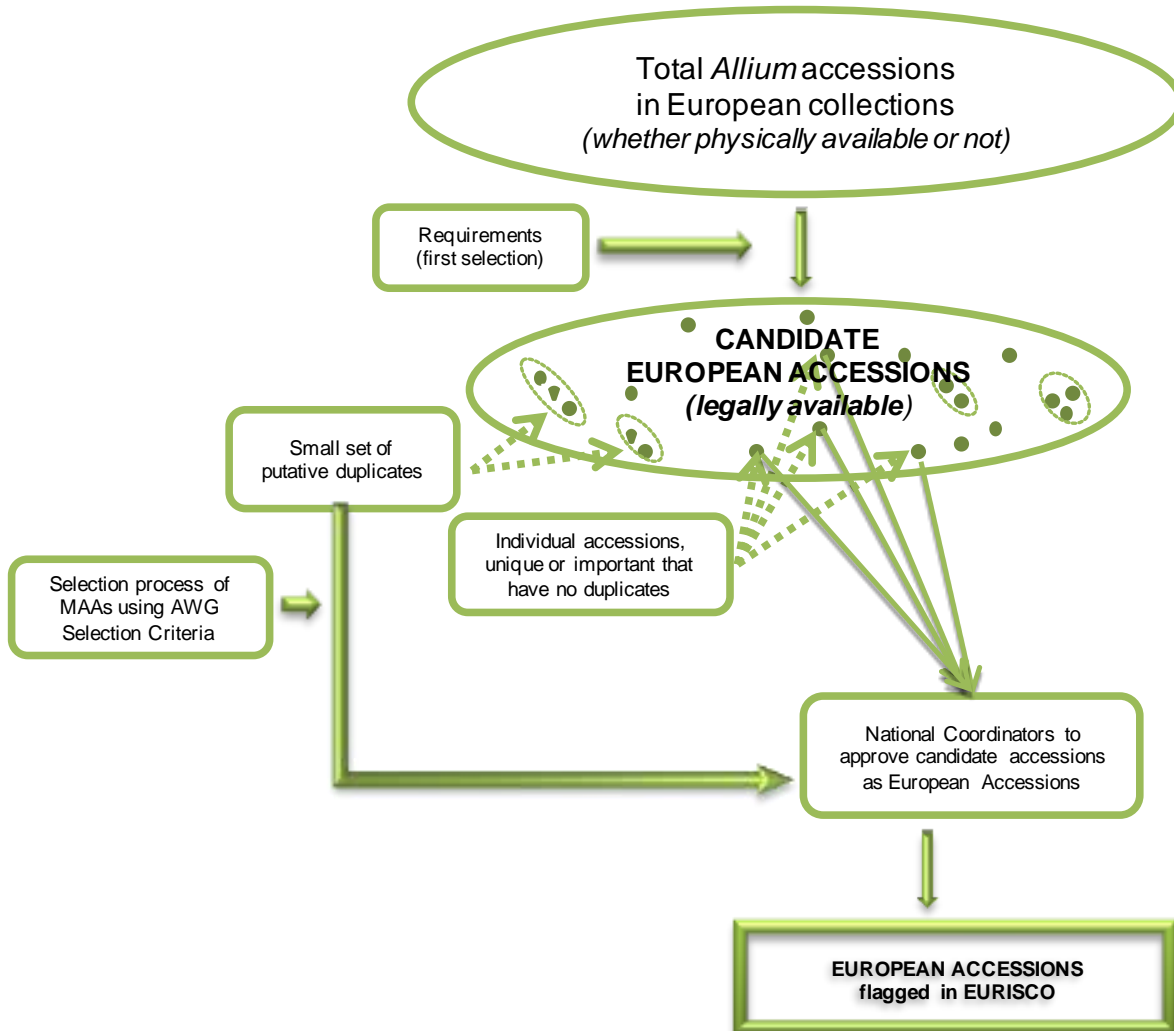
### *Recommendations*

- *The experience of the development of EADB 2011 showed that some national programmes include only data of available (sufficient seed or vegetative propagules) accessions in EURISCO and the EADB. In order to develop candidate European Accessions, the AWG agreed in Catania to develop a European Allium Database containing data for all Allium material irrespective of availability for internal AWG use. To facilitate the identification of European Accessions it is essential that national programmes provide data sets for all their accessions.*

### *Action point*

- *With the resignation of the present Chairman, who acted as the Database Manager, the EADB needs to be transferred to another host institution. The new Chairman of the AWG needs to find out whether it is possible to host the EADB at his own institute (Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben). The transfer will be implemented **by January 2012.***

The European *Allium* Database provides the foundation for the selection of European Accessions. The Group discussed the various options and situations and produced a general diagram for the selection process as shown in Figure 1.

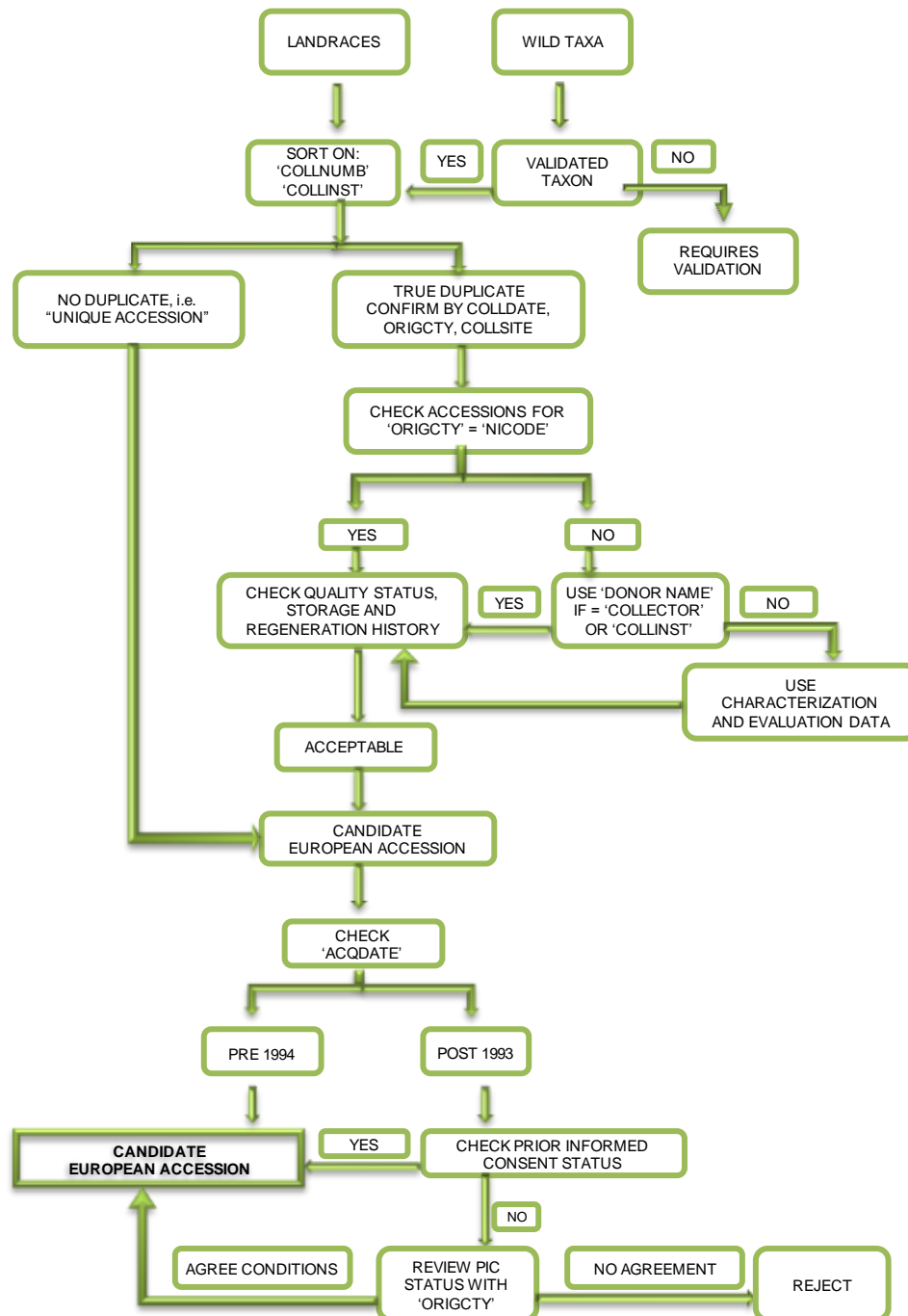


**Figure 1.** Flow diagram of the general selection process for European Accessions. There are two cases: individual accessions, unique or important, that do not have duplicates may be included directly; duplicate groups need to be selected using the AWG selection criteria.

## AEGIS – Seed-propagated *Allium*

### **Method to establish the list of candidate European Accessions for seed-propagated *Allium* landraces, using leek as an exemplar**

The AWG discussed the flow diagram for the selection of candidate European Accessions developed by the AEGIS *Brassica* “model crop” group. This flow diagram was adapted for the selection of European Accessions of leek landraces (see Figure 2).



**Figure 2.** Flow diagram for selection of candidate European Accessions in landraces and wild *Allium* taxa.

### **Method to establish the list of European Accessions for seed-propagated wild Allium taxa**

There are about 700 species of *Allium*. The AWG agreed that it is not a priority, and maybe not necessary to define candidate European Accessions for all *Allium* taxa, and therefore agreed to target subgroups for the identification of candidate European Accessions. The AWG members agreed that the same work flow system used for landraces could be applied to wild taxa, with the additional criterion that the material has to be taxonomically validated.

#### **Action points**

- *AWG members will identify candidate European Accessions of seed-propagated landraces and wild taxa of Allium ampeloprasum in their collections using the Allium flow diagram for landraces and wild taxa.*
- *Lists of crop wild relatives will be developed firstly for the onion and the leek/garlic alliances, secondly for minor Allium crops in use and in development, and circulated to AWG members. The alliances will be defined on the level of the respective taxonomic section to which the crops and their wild relatives belong. Action: Joachim Keller and Chris Kik.*
- *The EADB will be used to identify putative duplicate accessions of these taxa using the flow diagram.*

### **Method to establish the list of European Accessions for cultivars**

The AWG adapted the *Brassica* flow diagram for the selection of European Accessions for cultivars of leek (Figure 3). The Database Manager demonstrated the selection of European Accessions of leek cultivars in the data set for the *Allium ampeloprasum* complex extracted from the EADB using the UK leek collection as an exemplar.

### **Status of landrace conservation**

Landraces of *Allium* crops have been collected in many of the ECPGR national programmes. The AWG agreed that it is not clear whether these recorded accessions represent all existing landraces within the national programmes.

#### **Action points**

- *The AWG Chairman will nominate **by end of December 2011** a subgroup of AWG members mandated to work on landrace conservation issues as indicated below.*
- *AWG members will send their information and comments on the conservation status of landraces in their national programme to the Allium WG Chair **by February 2012**.*
- *The subgroup will analyse this information in consultation with the other AWG members and present a report **by May 2012**.*
- *The subgroup will use the landrace report to advise National Programmes on the collection or on-farm conservation of this material **by July 2012**.*

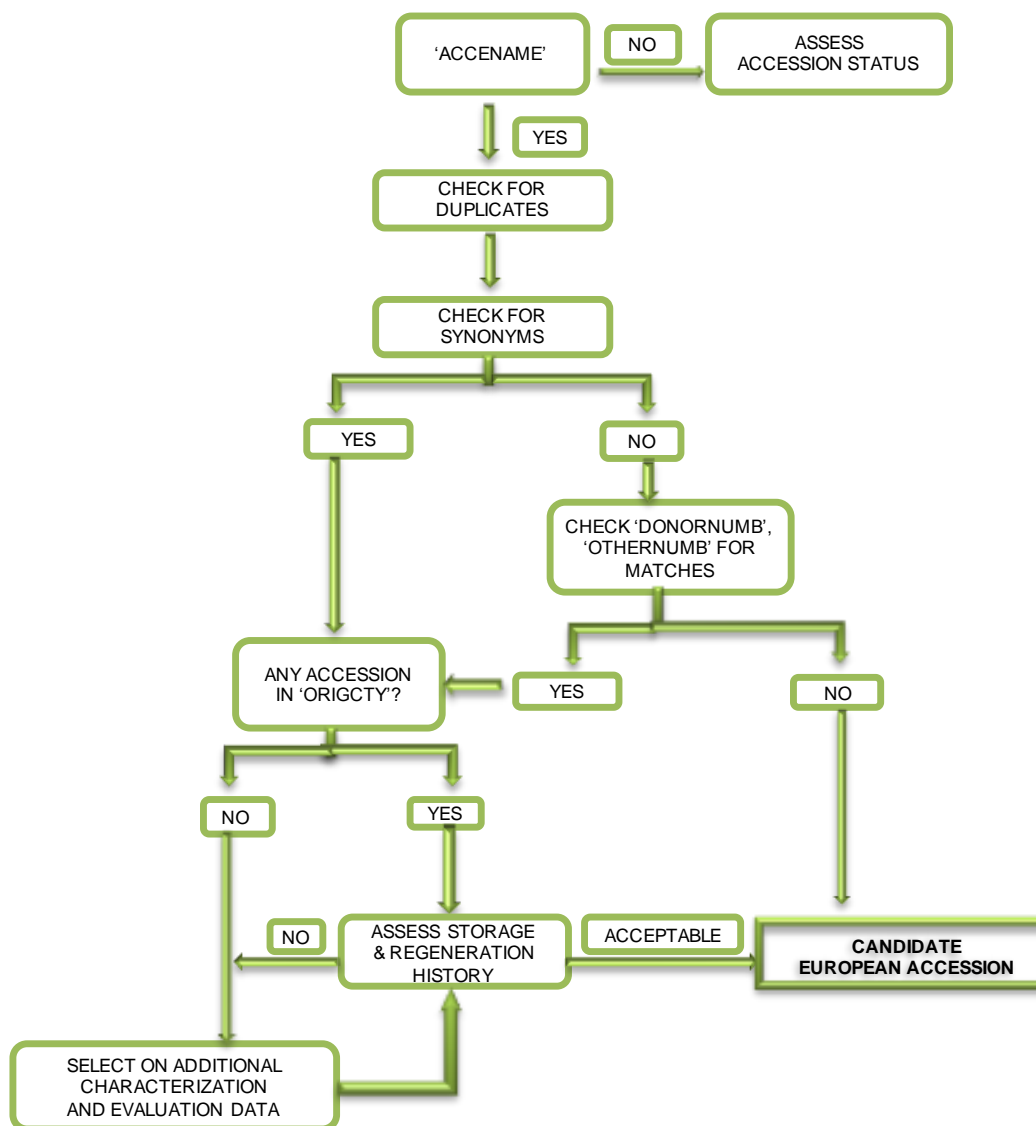


Figure 3. Flow diagram for selection of candidate European Accessions of cultivars.

### ***Safety-duplication of seed-propagated material***

The Chairman reported on the results of a survey of AWG members on the status of safety-duplication within their collections. He informed the Group that four institutes had offered facilities for black box safety storage, namely the Centro de Investigación y Tecnología Agroalimentaria (CITA) in Zaragoza, Spain, Crop Research Institute (CRI), Prague, Czech Republic, Norwegian Institute for Agricultural and Environmental Research, Grimstad, and Banco Português de Germoplasma Vegetal (BPGV), Braga, Portugal.

### ***Recommendations***

- *AWG members will inform the AWG Chair on the level of safety-duplication on a regular annual basis.*
- *The AWG Chair will provide updates of genebanks willing to act as black box safety storage to Allium WG members as their status changes.*

## AEGIS – Vegetatively propagated *Allium*

### **Report on the results of the EURALLIVEG project**

J. Keller, Coordinator of the EURALLIVEG project (“Vegetative *Allium*, Europe’s Core Collection, Safe and Sound” – <http://euralliveg.ipk-gatersleben.de/home.php>) financed under Council Regulation No. 870/2004 by DG AGRI, reported on the results, achievements and problems of the project. This highly integrative project created for the first time a cryobank of 220 well-characterized garlic accessions and their safety-duplicates, situated in three collaborating countries. A Consignment Agreement has been signed by the three partner genebanks affiliated in CRI Prague, Czech Republic, IPK Gatersleben, Germany, and the Institute for Horticulture, Skierniewice, Poland. This agreement provides the legal basis of the Tripartite Cryobank. This bank is seen as being an initiating structure open to be joined by other cryopreservation groups to form a network of European *Allium* cryobanks.

### **Recommendation**

- *Other institutions are invited and can join the Tripartite Cryobank.*

### **Status of European cryopreserved garlic accessions**

The material introduced in cryopreservation fulfils the criteria of candidate European Accessions and the information related to this material has been sent to the EADB Manager. The list of candidate European Accessions is ready to be sent to the respective National Coordinators to be approved as European Accessions and flagged in EURISCO.

### **Action point**

- *The Chairman of the AWG will send the lists of the garlic accessions included in the Tripartite Cryobank to the National Coordinators for approval and, if accepted, will request flagging them as European Accessions in EURISCO.*

The report on the EURALLIVEG project also included problems and difficulties encountered in the course of the project implementation. Due to technical problems in the external assistance laboratory the molecular duplicate screening of garlic and shallot using single nucleotide polymorphism (SNP) markers failed completely. Therefore the characterization of the candidate European Accessions was done on the basis of passport and characterization data only. In addition to these characters, the ability to regenerate from cryopreservation needed to be used as selection criterion for building the cryo-collection. It was found that one part of the germplasm, mainly the non-bolting types, is not as reactive as the bolting genotypes, resulting in a lower representation of these types in the collection. Some delay in virus elimination was caused by the weak growth of *in vitro* plantlets, their tendency to fall into dormancy and the high persistence of allexi viruses in meristem cultures. A set of 25 accessions was designated as the “backbone” collection, which should be used to demonstrate the feasibility of a sequence of all procedures of the characterization, virus elimination and cryopreservation. This goal was reached in four accessions, confirming the general suitability of this scheme but showing also that this sequence would need more time than expected because of the slow growth of *in vitro* plants, mainly in the virus elimination phase.

### **Recommendations**

- *As a conclusion from the observed slow growth of some genotypes, mainly of a non-bolting character, the *in vitro* multiplication of donor material, performed in order to get sufficient material for cryopreservation, should be shortened and a field multiplication period introduced,*

*with the duration depending on the number of cloves per bulb, which is a genotype-dependent character.*

- *Confirming earlier experience, it is recommended to prioritize material according to its importance (e.g. samples in the European Collection), limit the complete elimination of all five viruses (OYDV, LYSV, GCLV, LSLV and allexi viruses) to the prioritized material and to treat all other material only for the elimination of the two most harmful potyviruses (OYDV, LYSV).*

### **Training in virus elimination**

In response to the recommendation of the AWG meeting in Catania, J. Keller, the Vice-Chair had asked targeted laboratories already working on this matter, if they were prepared to be active in such a training programme. Results of the questionnaire action carried out in 2010 were presented in the meeting.

#### **Action point**

- *The Chairman will distribute the result of this survey to the WG members **by the end of 2011** asking for candidate nominations for such training in virus elimination.*
- *WG members will provide their requests for training and nominations **by April 2012**.*
- *The requests for training will be analysed in order to calculate the costs and, based on numbers, whether it will be necessary to take the next step and ask one of the labs to offer a course. If several individuals require training, sources of funds will be investigated in order to expedite the AWG training objective. **(Action: Chair, in consultation with ECPGR Coordinator, by May 2012).***

### **Report on the AEGIS-funded project on “Cryopreservation of young inflorescence bases in bolting garlic for germplasm storage”**

J. Keller reported on the project to test the feasibility of cryopreservation of young inflorescence bases in bolting garlic under European conditions, which was one of the three approved project proposals in the first call of the Small Competitive AEGIS Grant Scheme ([http://aegis.cgiar.org/documents/aegis\\_grant\\_scheme.html](http://aegis.cgiar.org/documents/aegis_grant_scheme.html)).

The project was coordinated by the German genebank and implemented by three partners, the Polish, Portuguese and German genebanks. The suitability of the method using young inflorescence bases was demonstrated. The method is simple and regeneration rates are high. An additional advantage is the tendency to regenerate with multiple shoots, which shortens the micropropagation phase after cryopreservation.

#### **Recommendation**

- *In order to further increase efficiency of introducing material into cryopreservation, this method extends the functional period of activity by using bulbils/bulbs during winter and young inflorescences in summer. The AWG recommends the use of young inflorescence bases to extend the work period for the cryopreservation of garlic.*

### **Future development for vegetatively propagated material**

The proposals for future activities are mainly based on the achievements of the EURALLIVEG project.

#### **Molecular characterization**

Following the conclusion of the Catania meeting and as a consequence of some preliminary data of the EURALLIVEG project, the SNP technology is still seen as the best tool for molecular characterization of garlic material. A new molecular characterization project using the SNP technology was discussed. The proposed project will cover the collections from the



EURALLIVEG partner institutions and all other European garlic collections including Portugal, Spain, Russian Federation and as many smaller collections as possible, such as Latvia.

#### **Recommendation**

- *The AWG members will investigate opportunities to finance the garlic molecular characterization project that is estimated to cost around € 220 000 covering 2000 European Accessions and including sampling of material, preparation of DNA, SNP analysis and data evaluation for duplicate identification. The AWG funds (€ 9800) identified in the VEGNET budget table for Phase VIII for the analysis of a smaller set of garlic accessions could productively be utilized in the proposed large-scale molecular screening project.*

#### **Action points**

- *The ECPGR Secretariat is asked to contact the National Coordinator in Spain to clarify the availability of the garlic material in Córdoba for inclusion in a new garlic molecular characterization project using the SNP technology along with the collaboration of other garlic experts in European projects.*
- *In addition, the ECPGR Secretariat is asked to contact the National Coordinator in the Russian Federation to clarify the availability of the garlic material in the N.I. Vavilov Research Institute for Plant Industry (VIR) for inclusion in the above project along with the collaboration of other garlic experts in European projects.*
- *The AWG Chairman will send a circular to all European crop genebanks requesting current data on garlic and statements of interest to collaborate in a new genotyping project for garlic. The aim is to cover all the European garlic genetic resources as completely as possible.*

### **Discussion and agreement on the establishment of the European Accessions of vegetatively propagated Allium**

#### **The cryopreserved collection**

The sustainability of the Tripartite Cryobank of garlic is an important factor to ensure the maintenance of garlic genetic resources in the long term. Whereas the storage in the three locations is safe as long as there is at least one skilled person present in each institute to provide the minimal inputs required for re-filling the cryopreservation storage tanks and recovering plant material on request, additional development requires higher labour input.

#### **Recommendation**

- *As part of the selection process of European Accessions, the AWG recognized the need for adequate staffing in order to continue the development of the European vegetatively propagated Allium collections in cryopreservation.*

#### **Safety-duplication of non-cryopreserved vegetative material**

Only a limited proportion of the non-cryopreserved vegetatively propagated material is safety-duplicated.

#### **Action points**

- *The AWG Chairman will send a circular to all shallot collection holders asking about their willingness to keep shallot safety-duplicates and, in case of agreement, how many accessions the respective collection would be willing to receive.*
- *On the basis of the information received in the previous step, the AWG Chairman will circulate a distribution schedule to start the practical implementation of this safety-duplication action after confirmation by the AWG members.*

In this context the sampling of seeds of shallot accessions was discussed, with the conclusion that seed samples of shallots cannot figure as safety-duplicates because of the nature of shallot as a clonal plant with outbreeding mating system. However, seed maintenance has its own value as additional gene reserve of the shallot genepool and seeds should, therefore, be stored as additional samples under the standard seed storage conditions.

A question arose concerning the possibility to include material obtained from botanic gardens, which does not have exact data of origin, into the candidate European Accessions list. Jan Engels concluded that the lack of (good) passport data should not prevent such accessions from being included in the candidate European Accession list, although the lack of such information increases the risk of duplicates entering the system.

## **AEGIS – Crop-specific quality standards for conservation**

### ***Formalization of standards for vegetatively propagated crops***

The experience gained in the EURALLIVEG project led to the conclusions that for vegetatively propagated material both the local conditions and the genotypic characteristics need to be considered, and that it is not possible to use a single protocol to prescribe procedures for the different locations and accessions. Therefore it is necessary to elaborate decision trees to optimize the logistics of maintenance. This is true for field maintenance as well as for cryopreservation. *In vitro* storage is not seen as an independent strategy because of the weak performance of *Allium in vitro* cultures in the long term.

A preliminary set of factors determining the solutions to be adopted, organized in such a “decision tree”, was presented by J. Keller and is included as Appendix 2.

#### ***Action point***

- *The list of factors to determine the structure of the decision tree will be distributed to the collection curators for discussion and agreement. It will then be used to establish a schedule for field culture and cryopreservation for inclusion in the Allium genebank standards.*

## **Wider collaboration within the *Allium* Working Group**

The opportunities to enhance the collaboration between AWG members were discussed. Where national programmes have the capacity to carry out specialist tasks, they could offer their expertise and infrastructure to assist other national programmes under mutually beneficial agreements, either through financial payments or inputs in kind. These agreements would enhance the efficiency of our activities and provide mutual benefit, e.g. by taking advantage of lower labour costs in some of the European countries for routine technical procedures.

#### ***Recommendation***

- *The Chair requested AWG members to report on services and facilities that they would be willing to provide to other AWG members as part of the conservation of European Accessions, such as regeneration, germination tests and characterization.*

## **Visit to the Greek Gene Bank and tour of the Department of Aromatic and Medicinal Plants on the NAGREF campus**

Athanasios Tsivelikas described the current status of the Greek Gene Bank to the participants, with special emphasis on the activities of the Department of the Greek Gene Bank concerning the assessment of genetic diversity of indigenous plant genetic resources through characterization and evaluation, the conservation and documentation status of the collected material, and the conservation as a field planting of about 270 grapevine cultivars of local and foreign origin. The overall goal of the Gene Bank is the sustainable use of these landraces and their wild relatives in breeding as well as in alternative farming systems. He noted that both technical and staff resources need to be increased in future. The new genebank building was seen from the outside only, as some technical amendments were still necessary to allow official delivery for usage from the Greek Gene Bank.

Paschalina Chatzopoulou gave an interesting introduction on the maintenance and use of local medicinal plants maintained in the Department of Aromatic and Medicinal Plants. In addition, the participants were given the opportunity to enjoy a guided tour of the field planting collection of aromatic and medicinal plants maintained by the Department.

## **Conclusion and election of the new Chairman**

Dave Astley was involved from the start of *Allium* activities in the ECPGR and then became the Chairman of the *Allium* Working Group permanently from its first meeting in 1984. Dave thanked all the members of the Working Group for their interest and support through the years.

Joachim Keller then presented some nicely illustrated highlights of the work of Dave Astley in ECPGR and various international projects. He underlined the open and constructive atmosphere in the Group, which was also mentioned by others during the meeting and which is based for a great part on the collegial and experienced leadership of Dave. Joachim thanked Dave for his great dedication and commitment to plant genetic resources in general, and *Allium* especially, through all the years and wished him the best of health, initiative and well-being in his further life.

Finally Joachim Keller was elected as the new Chairman of the *Allium* Working Group. He invited Teresa Kotlińska to join him as the new Vice-Chair. He emphasized in his concluding words that it will be necessary to prepare young and active members to follow in the footsteps of the older generation in order to enable the *Allium* Working Group to fulfil its tasks in future.

The evening saw the members in good company in a restaurant in Thessaloniki. We all thank the Greek team for their excellent organization of the meeting and for the cordial atmosphere which encouraged our work. Special thanks are due to Athanasios Tsivelikas for his very active support at all stages of the meeting and his valuable contributions to the report. The success of the meeting reiterated the value of Working Group meetings in fostering good relations between scientists all over Europe



**APPENDICES**

<b>Appendix I. Workplan.....</b>	<b>17</b>
<b>Appendix II. Decision factors for field cultures and cryopreservation of vegetative <i>Allium</i> accessions .....</b>	<b>19</b>
<b>Appendix III. Acronyms and abbreviations .....</b>	<b>20</b>
<b>Appendix IV. Agenda.....</b>	<b>21</b>
<b>Appendix V. List of participants.....</b>	<b>23</b>



## Appendix I. Workplan

(Agreed at the seventh meeting of the *Allium* Working Group, September 2011)

Action	Carried out by	Date by when action should be completed
<b>European <i>Allium</i> Database</b>		
Find out whether the EADB can be hosted at IPK and organize the transfer.	Chairman (Joachim Keller)	January 2012
<b>AEGIS – seed-propagated <i>Allium</i></b>		
<b>Method to establish the list of European Accessions for seed-propagated wild <i>Allium</i> taxa</b>		
Identify candidate European Accessions of seed-propagated landraces and wild taxa of <i>Allium ampeloprasum</i> in their collections using the <i>Allium</i> flow diagram for landraces and wild taxa.	All WG members	Ongoing
Develop lists of crop wild relatives firstly for the onion and the leek/garlic alliances, secondly for minor <i>Allium</i> crops in use and in development, and circulate the lists to AWG members. The alliances will be defined on the level of the respective taxonomic section to which the crops and their wild relatives belong.	Joachim Keller and Chris Kik	January 2012
Use the EADB to identify putative duplicate accessions of these taxa using the flow diagram.	All WG members	Ongoing
<b>Status of landrace conservation</b>		
Nominate a subgroup of AWG members mandated to work on landrace conservation issues as indicated below.	Chairman (Joachim Keller)	End December 2011
Send information and comments on the conservation status of landraces in their national programme to the <i>Allium</i> WG Chair.	AWG members	February 2012
Analyse this information in consultation with the other AWG members and present a report.	AWG subgroup (nominated above)	May 2012
Use the landrace report to advise National Programmes on the collection or on-farm conservation of this material.	AWG subgroup (nominated above)	July 2012
<b>AEGIS – vegetatively propagated <i>Allium</i></b>		
<b>Status of European cryopreserved garlic accessions</b>		
Send the lists of the garlic accessions included in the Tripartite Cryobank to the National Coordinators for approval and, if accepted, request flagging them as European Accessions in EURISCO.	Chairman (Joachim Keller)	December 2011

Action	Carried out by	Date by when action should be completed
<b>Training in virus elimination</b>		
Distribute to the WG members the result of the survey carried out in 2010 asking for candidate nominations for training in virus elimination.	Chairman (Joachim Keller)	By the end of 2011
Send requests for training and nominations to the Chairman.	WG members	April 2012
Analyse the requests for training in order to calculate the costs and, based on numbers, whether it will be necessary to take the next step and ask one of the labs to offer a course. If several individuals require training, sources of funds will be investigated in order to expedite the AWG training objective.	Chairman (Joachim Keller), in consultation with ECPGR Secretariat (Lorenzo Maggioni)	May 2012
<b>Molecular characterization project</b>		
Contact the National Coordinator in Spain to clarify the availability of the garlic material in Córdoba for inclusion in a new garlic molecular characterization project using the SNP technology along with collaboration of garlic experts in European projects.	ECPGR Secretariat (Lorenzo Maggioni)	December 2011
Contact the National Coordinator in the Russian Federation to clarify the availability of the garlic material in VIR for inclusion in the above project along with collaboration of garlic experts in European projects.	ECPGR Secretariat (Lorenzo Maggioni)	December 2011
Send a circular to all European crop genebanks requesting current data on garlic and statements of interest to collaborate in a new genotyping project for garlic. The aim is to cover all the European garlic genetic resources as completely as possible.	Chairman (Joachim Keller)	January 2012
<b>Formalization of standards for vegetatively propagated crops</b>		
Distribute the list of factors to determine the structure of the decision tree to the collection curators for discussion and agreement. It will then be used to establish a schedule for field culture and cryopreservation for inclusion in the <i>Allium</i> genebank standards.	Joachim Keller and all curators	March 2012
<b>Safety-duplication of non-cryopreserved vegetative material</b>		
Send a circular to all shallot collection holders asking about their willingness to keep shallot safety-duplicates and, in case of agreement, how many accessions the respective collection would be willing to receive.	Chairman (Joachim Keller)	December 2011
On the basis of the information received in previous step, circulate a distribution schedule to start the practical implementation of this safety-duplication action after confirmation by the AWG members.	Chairman (Joachim Keller)	March 2012



## Appendix II. Decision factors for field cultures and cryopreservation of vegetative *Allium* accessions

The main decision factors listed below should be used to determine the optimum methods for field cultures and cryopreservation of vegetative *Allium* accessions under the given conditions of the respective collection holder.

### Field culture

- Plot design (e.g. year 2010 at IPK: 397 garlic plots amongst altogether 800 *Allium* plots arranged in 4 blocks at 10 x 20 plots; size per plot 1.5 x 1.5 m; 6 planting sites of 3 cloves each; 54 core collection plots containing 3 rows of 15 cloves each)
- Number of cloves/bulbs per accession (e.g. at IPK: core collection 45 cloves, other material 18 cloves)
- Turnover (annual, bi-annual or longer) (e.g. at IPK: core collection annual, other material quadrennial)
- Distinction between autumn- and spring-planted types (winter or summer garlic) or not (e.g. at IPK: no distinction, all planting in autumn; reserve stored over winter on shelves in case of winter loss)
- Planting period(s) – harvest period(s)
- Additional seeds stored if any (shallot) (e.g. at IPK: yes for shallots)
- Reasons for vegetative maintenance
  - No seeds
  - Reproduction too complicated
- Field work – soil management (which and when)
- Phytosanitary treatments (which, where and when)
- Proportion of virus-free material (which material, measures for elimination, free-keeping, detection)
- Characterization measures (which and when)
- Bulb/bulbil storage (where, how long, conditions?)
- Yearly average of field loss rate

### Cryopreservation

- Presence of bulbils
- Size of bulbils (large bulbils easier than small ones)
- Presence of inflorescences
- Need of phytosanitary treatment
- Number of cloves per bulb
- Vigour of the plant
- Tendency to fall into dormancy
- Availability of donor material
- Capacity of pre-multiplication in the field

### Appendix III. Acronyms and abbreviations

AEGIS	A European Genebank Integrated System
AQUAS	AEGIS Quality System
ARCNG	Agricultural Research Center of Northern Greece
AWG	<i>Allium</i> Working Group ( <i>ECPGR</i> )
BPGV	Banco Português de Germoplasma Vegetal (Portuguese Plant Genebank)
CBD	Convention on Biological Diversity
CGIAR	Consultative Group on International Agricultural Research
CGN	Centre for Genetic Resources, The Netherlands
CIFA	Centro de Investigación y Fomento Agrario (Agricultural Research and Training Institute), Córdoba, Spain
CRI	Crop Research Institute, Prague-Ruzyně, Czech Republic
EADB	European <i>Allium</i> Database
EC	European Commission
ECPGR	European Cooperative Programme for Plant Genetic Resources
EU	European Union
EURISCO	European Internet Search Catalogue
ExCo	Executive Committee
FAO	Food and Agriculture Organization of the United Nations
GCLV	Garlic common latent virus
IPK	Leibniz Institute of Plant Genetics and Crop Plant Research, Gatersleben, Germany
LYSV	Leek yellow stripe virus
MAA	Most Appropriate Accession ( <i>for AEGIS</i> )
MoU	Memorandum of Understanding
NAGREF	National Agricultural Research Foundation, Themi, Thessaloniki, Greece
NC	National Coordinator ( <i>ECPGR</i> )
NCG	Network Coordinating Group ( <i>ECPGR</i> )
OYDV	Onion yellow dwarf virus
PGR	Plant genetic resources
PGRFA	Plant genetic resources for food and agriculture
SC	Steering Committee ( <i>ECPGR</i> )
SLV	Shallot latent virus
SMTA	Standard Material Transfer Agreement
SNP	Single nucleotide polymorphism
VEGNET	Vegetables Network ( <i>ECPGR</i> )
VIR	N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, Russian Federation
WG	Working Group
WIEWS	World Information and Early Warning System ( <i>of the FAO</i> )

---

## Appendix IV. Agenda

### *Seventh Meeting of the ECPGR Working Group on Allium 6-8 September 2011, Perea, Thessaloniki, Greece*

---

#### Monday, 5 September

Arrival of participants

---

#### Tuesday, 6 September

##### 8:30–10:30 Introduction

- Opening and welcome address
- ECPGR update (*J. Engels, on behalf of ECPGR Secretariat*)
- AEGIS update (*J. Engels*)
- Report of the Chairperson
- Introduction of participants

10:30–11:00 *Coffee break*

##### 11:00–12:30 **European Allium Database** (*D. Astley*)

- Recommendations from AWG-VEGNET meeting, Catania
- Current status
- Future

12:30–14:00 *Lunch*

##### 14:00–15:30 **AEGIS – Seed-propagated Allium**

- Selection of European Accessions – primary and secondary criteria (*D. Astley*)
- Method to establish the list of European Accessions using leek as an exemplar (*D. Astley*)

15:30–16:00 *Coffee break*

##### 16:00–17:30 **AEGIS – Seed-propagated Allium (continued)**

- Discussion on the development of the list of European Accessions for wild taxa using *Allium ampeloprasum* (*D. Astley*)
- Landraces, current status in national collections and need for collection (*D. Astley*)
- Development of the list of European Accessions for landraces
- Safety-duplication of seed-propagated material (*D. Astley*)

**Wednesday, 7 September**

---

- 9:00–10:30     **AEGIS – Vegetatively propagated *Allium***
- Report on results of the EURALLIVEG project (*J. Keller*)
    - Cryopreservation
    - Virus elimination
    - Safety-duplication
  - Report on the AEGIS project “Cryopreservation of young inflorescence bases in bolting garlic for germplasm storage” (*J. Keller*)
  - Future development for vegetatively propagated material, project proposals (*J. Keller*)
  - Discussion and agreement on the establishment of the European Accessions of vegetatively propagated *Allium* (*J. Keller*)
- 10:30–11:00     *Coffee break*
- 11:00–12:00     **AEGIS – Crop-specific quality standards for conservation**
- Formalization of vegetatively propagated crops’ standards (*J. Keller*)
  - Proposal for seed-propagated crops’ standards (*D. Astley*)
- 12:00–12:30     **Wider collaboration within the AWG**
- 12:30–14:00     *Lunch*
- 14:00–15:30     **Discussions on workplans for remainder of Phase VIII**
- 15:30–16:00     *Coffee break*
- 16:00–17:30     **Recommendations and action points from the discussion**  
**Any other business**

**Thursday, 8 September**

---

- Morning*         *Visit to the Greek Gene Bank and tour of the Department of Aromatic and Medicinal Plants on the NAGREF campus.*  
*Visit to a small-scale traditional farm producing local foods and sampling of some of the products.*
- Lunch*
- 15:00–17:30     **Conclusion**
- Presentation and adoption of the recommendations
  - Election of Chair and Vice-Chair
  - Closing remarks
- 20.00             *Social dinner*

**Friday, 9 September**

---

Departure of participants

## Appendix V. List of participants

### *Seventh Meeting of the ECPGR Working Group on Allium 6-8 September 2011, Perea, Thessaloniki, Greece*

#### **Working Group members**

Helena Stavéliková  
Crop Research Institute (CRI)  
Šlechtitelů 11  
78371 Olomouc-Holice  
**Czech Republic**  
Email: stavelikova@genobanka.cz

Kristiina Antonius  
(*representing Terhi Suojala-Ahlfors*)  
MTT Agrifood Research Finland, MTT/BEL  
31600 Jokioinen  
**Finland**  
Email: kristiina.antonius@mtt.fi

Joachim Keller  
Genebank Department,  
Leibniz Institute of Plant Genetics and Crop  
Plant Research (IPK)  
Corrensstrasse 3  
06466 Gatersleben  
**Germany**  
Email: keller@ipk-gatersleben.de

Ekaterini Traka-Mavrora  
National Agricultural Research Foundation  
(NAGREF), Greek Gene Bank  
Department of Horticulture  
57001 Thermi, Thessaloniki  
**Greece**  
Email1: traka@nagref.gr  
Email2: kgeggb@otenet.gr

László Holly  
Research Centre for Agrobiodiversity  
Külsömezö 15  
2766 Tápiószele  
**Hungary**  
Email: lholly@rcat.hu

Vito Miccolis  
Dipartimento di Scienze dei Sistemi Culturali e  
dell'Ambiente (DISCOFA),  
Università degli studi della Basilicata  
Viale dell'Ateneo Lucano, 12  
85100 Potenza  
**Italy**  
Email: vito.miccolis@unibas.it

Līga Lepse  
Pure Horticultural Research Station  
Abavas iela 2  
3124 Pure, Tukuma nov.  
**Latvia**  
Email: liga.lepse@puresdis.lv

Rukije Agic  
St. Cyrill and Methodius University, Institute  
of Agriculture  
Bul. Aleksandar Makedonski bb  
1000 Skopje  
**Macedonia FYR**  
Email1: rukieagic@yahoo.com  
Email2: r.agic@zeminst.edu.mk

Chris Kik  
Centre for Genetic Resources, The Netherlands  
(CGN)  
PO Box 16  
6700 AA Wageningen  
**The Netherlands**  
Email: chris.kik@wur.nl

Ingunn Molund Vågen  
The Norwegian Institute for Agricultural and  
Environmental Research,  
Bioforsk Øst Landvik  
Reddalsveien 215  
4886 Grimstad  
**Norway**  
Email: ingunn.vaagen@bioforsk.no

Teresa Kotlińska  
Plant Genetic Resources of Vegetable Crops  
Laboratory  
Institute of Horticulture  
Konstytucji 3 Maja 1/3  
96-100 Skierniewice  
**Poland**  
Email1: tkotlin@iwarz.pl  
Email2: tkotlin@inwarz.skierniewice.pl

Ana Maria Barata da Silva  
(representing *Aida Virginia Goncalves Reis*)  
Banco Português de Germoplasma Vegetal,  
Instituto Nacional de Recursos Biológicos  
(INRB)  
Quinta de S. José - S. Pedro de Merlim  
4700-859 Braga

**Portugal**

Email: ana.barata@inrb.pt

Cristina Mallor Gimenez  
Banco de Germoplasma de Hortícolas,  
Centro de Investigación y Tecnología  
Agroalimentaria (CITA),  
Gobierno de Aragón  
Avda. Montañana 930  
50059 Zaragoza  
Spain  
Email: cmallor@aragon.es

Dave Astley  
Genetic Resources Unit  
University of Warwick  
Wellesbourne Campus  
Warwick CV35 9EF  
**United Kingdom**  
Email: dave.astley@warwick.ac.uk

**Observers**

Fotios Bletsos  
National Agricultural Research Foundation  
(NAGREF)  
Department of Horticulture  
57001 Thessaloniki  
Greece  
Email: fbletsos@nagref.gr

Marta Olas-Sochacka  
Plant Genetic Resources of Vegetable Crops  
Laboratory  
Institute of Horticulture  
Konstytucji 3 Maja 1/3  
96-100 - Skierniewice  
Poland  
Email1: molas82@interia.pl  
Email2: molas@iwarz.pl

Parthenopi Ralli  
National Agricultural Research Foundation  
(NAGREF)  
Department of Greek Gene Bank  
57001 Thessaloniki  
Greece  
Email: kgeggb@otenet.gr

Stelios Samaras  
c/o National Agricultural Research  
Foundation (NAGREF)  
57001 Thessaloniki  
Greece  
Email: stelsam@hotmail.com

Nikos Stavropoulos  
c/o National Agricultural Research  
Foundation (NAGREF)  
57001 Thessaloniki  
Greece  
Email: nstavr43@otenet.gr

Dimitris Tzanoudakis  
University of Patras  
Department of Biology,  
Division of Plant Biology  
26500 Patras  
Greece  
Email: tzanoyd@upatras.gr

Athanasios Tsivelikas  
National Agricultural Research Foundation  
(NAGREF)  
Department of Horticulture  
57001 Thessaloniki  
Greece  
Email: tsivel@agro.auth.gr

**ECPGR Secretariat**

Jan Engels  
AEGIS Coordinator  
Regional Office for Europe  
**Bioversity International**  
Via dei Tre Denari 472/a  
00057 Maccarese (Fiumicino)  
Italy  
Email: j.engels@cgiar.org



