FROM: Progress report of the AEGIS model crop: *Allium*
July 2008

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2. Establishing selection criteria for the identification of the Most Appropriate Accessions (MAAs)

The process for evaluating the selection criteria was initiated at the first EURALLIVEG project meeting in April 2007. The meeting was attended by Jan Engels, where he presented the draft selection criteria for identifying MAAs. The project partners reviewed the selection criteria in the context of the objectives of the EURALLIVEG project and concluded the following:

Primary Criteria

1. In the public domain (i.e. Annex I material that is in the Multi-lateral System and non-Annex I material designated to AEGIS by governments or any other holder)

***Allium* is a non-Annex 1 genus, but EURALLIVEG partners, their collections all being in the public domain, agreed to use the sMTA for any transfer of material.**

2. Genetically unique (i.e. genetically distinct accessions; assessment based on available data and/or on the recorded history of the accession)

For clonal crops, such as garlic, this is the key criterion.

3. Agronomically (including research material) and/or historically/culturally important

The AEGIS members agreed with the relevance of this criterion.

4. Plant Genetic Resources, including medicinal and ornamental species, and crop wild relatives (i.e. excluding forest genetic resources; non-plant agro-biodiversity species, etc.)

The AEGIS members agreed with the relevance of this criterion.

5. European origin or introduced germplasm that is of actual or potential (breeding/research) importance to Europe

Garlic and shallot originated in Central and southwest Asia. Both crops are of significant importance to European agriculture, commerce and health.

Comments on draft priority selection criteria

We did not find the draft priority selection criteria of particular relevance to the objectives of the working group in considering the development of MAAs for vegetatively propagated material.

Recommended secondary selection criteria

1. Maintained in "country of origin"

Garlic and shallot originated in Central and southwest Asia. At the accession level no selection pressure is applied in vegetative maintenance, therefore, the country of origin is not critical.

2. A known origin (collected and/or bred; pedigree data!?)

Having a known origin is generally a useful characteristic because origin is an indicator of certain characteristics (e.g. daylength requirements). In some circumstances material with no passport data is maintained because of special characteristics making it of high importance.

3. Comprehensiveness of passport information

Passport data are extremely useful, the value increasing with quality and volume.

4. Number of regeneration/multiplication cycles

Garlic and shallot have to be grown annually making this criterion of no relevance.

5. Health status (i.e. is the germplasm disease free?)

The health status of vegetatively propagated germplasm is an extremely important criterion.

6. Existence of morphological/molecular characterization data

In the context of vegetative material and the objectives of the AEGIS *Allium* group, the use of morphological and molecular characterisation is essential.

7. Existence of (agronomical) evaluation data

This is useful, but not essential.

8. Validated accession name (particularly relevant for perennial clonal crops, where the same name can be attributed to different accessions; history of individual accessions is important; special attention to be paid to synonyms and homonyms)

The validation of accession name is of limited use for garlic and shallot.

<u>General observations and comments on the process of developing the criteria and lessons learnt for other crops</u>

The method we have developed would be relevant to other vegetatively propagated crops.

3. Establishing the list of MAAs

The procedure followed and lessons learned

As described in the introduction the objectives of the ECPGR *Allium* working group and the EURALLVEG project are identical. In support of EURALLIVEG, the European *Allium* Database was rebuilt in 2007. It contained 3251 accessions of garlic in 18 countries including Israel and Russia. The EURALLIVEG partner collections (Czech Republic, France, Germany, Italy, NordGen and Poland) contained 1549 garlic accessions.
Our discussions have covered the economic implications of implementing the AEGIS cryobank proposal and in part therefore the establishment of MAAs.

Currently in EURALLIVEG there are three institutions involved in the cryopreservation of garlic, namely the Czech Republic, Germany and Poland (Tripartite Model CGP). We are aware that other institutions/countries (NordGen and Portugal) are interested in developing cryopreservation capabilities. The expertise in cryopreservation developed in EURALLIVEG is available to assist in the establishment of other cryo programmes and we would hope in the future to expand the cryopreservation network. AEGIS *Allium* assumes that the initial costs of any new programme developments will be the responsibility of national programmes and the NordGen.

The AEGIS *Allium* model would require coordination funds for the development, management and administration (database management and funds for meetings) of a cryo-network including the identification of duplicates by molecular analysis, identification of MAAs, integrated collection management (safety duplicate systems), quality assurance training, cleaning of material from pathogens, cryo training and establishment of network-wide protocols, etc.

Molecular fingerprinting is the main criterion to be used in the selection of garlic and shallot MAAs. The EURALLIVEG project (2007-2011) will provide significant information and technical expertise in the development of MAAs for a European collection of garlic and shallot based on the results of the molecular analysis. A significant limitation is that EURALLIVEG involves only a proportion of European collection curators. The AEGIS *Allium* group propose that the molecular method and analysis resulting from EURALLIVEG will provide the tools for screening other ECPGR garlic and shallot collections to identify unique MAAs.

We considered the cost implications (potential cost savings and additional costs) of the implementation of AEGIS for vegetative alliums.

In our discussions there was the assumption that national programmes will support the routine financial inputs for the maintenance of European cryobanks including facilities, equipment, consumables and staff.

There are two major cost implications (molecular fingerprinting and the preparation and transfer of MAA accessions into cryopreservation) in the development of a European cryobank systems for garlic and shallot. The

AEGIS *Allium* group coined the phrase "Activation energy" to describe the financial inputs required to provide the labour necessary to introduce newly identified MAA accessions into cryopreservation. This "Activation energy" will be an additional cost for each cryobank. However, once material is cryopreserved the maintenance costs per accession are almost negligible. Additionally there is potentially a reduction in field maintenance costs available to national programmes.

The AEGIS *Allium* group has developed a 3 step work plan towards the creation of a European garlic collection in cryopreservation, whereby each phase will require some financial inputs in order to achieve total success.

The first step is the current EURALLIVEG project. The fingerprinting (SNP) of 1600 garlic and 550 shallot accessions will be carried out to identify MAAs. The Tripartite Cryobanks (Czech Republic, Germany & Poland) have labour resources sufficient to cryopreserve 200 garlic accessions. Therefore, any number of garlic MAAs identified over this 200 limit for garlic and the total of shallot MAAs will require additional labour inputs (Activation energy) to achieve complete cryopreservation of even the EURALLIVEG MAAs.

The second step is outlined in the ECPGR *Allium* Working Group project proposal for ECPGR Phase VIII to extend the fingerprinting of garlic collections to those in Portugal and Spain. The funds available in Phase VIII will only permit the fingerprinting of a proportion of both collections. Therefore at its most successful this will provide indications of the extent of unique genotypes in these 2 collections. Additional funding will be required to fully screen the collections in order to identify MAAs. The national programmes will have to develope their own cryo capability or agree with their material being transferred to a cryobank in a 2nd country. As in step 1 additional labour inputs (Activation energy) will be required to achieve complete cryopreservation of the MAAs in these 2 national programmes.

The third step looks to the future, although almost anything is achievable if the relevant funds became available. In the longer term it will be possible to further extend fingerprinting of other ECPGR garlic and shallot collections (Bulgaria, Greece, Hungary, Israel, Lithuania, Macedonia, Romania, Russia, Slovakia, Turkey and Ukraine) providing the funding can be found. As with steps 1 and 2 above, the Activation energy funding will be required to transfer any MAAs identified into cryopreservation.

Once MAAs (unique genotypes) have been identified we will inform National Coordinators of our recommended list of MAAs and European safety duplicates. Furthermore, we will identify a group of MAAs being the most frequently ordered accessions and request the national programmes to ensure that these accessions be maintained additionally in field culture as an active collection to ensure quick delivery. In AEGIS terms this work plan will reduce the field maintenance costs for the national programmes to this limited number of frequently used accessions, which could provide a significant financial saving. The non-MAA accessions in a national programme will be genotypic duplicates of MAAs and European safety duplicates in European

cryobanks. Each national programme can then decide whether they wish to maintain these other national accessions in the field culture or to discard them to maximize cost saving.

There is a potential additional cost factor derived from needs to clean the plants from viruses, which is dependent on the level of actual quarantine requirements.