species. A function of environmental parameters predicting the presence of a species is built from a calibration dataset comprising observed presence/absence or abundance records of the species and environmental data at the observation sites. Data from collecting campaigns by plant breeders can supply valuable information for niche modelling. Spatial projections of niche models obtained by the means of GIS software can be used for organizing collecting campaigns. Niche models predicting the probability of presence of a species can also be useful for the selection of core collections. Such models help to delineate geographically isolated areas of presence of the species that should be sampled separately for selecting a core collection. In each isolated area of presence, accessions can be clustered according to the predicted probability of presence of the species in collecting sites, and accessions can then be selected from each cluster. Niche models can also help to optimize *in situ* conservation networks. The efficiency of niche modelling depends on the coverage by calibration data of the range of environmental situations suitable for a species. Gathering information from different Europe-wide collections would therefore be an efficient means for setting up relevant niche models for the improvement of genetic resource collection and conservation.

Discussion

H. Knüpffer suggested that, in addition to EURISCO, the Global Biodiversity Information Facility (GBIF) can also offer coordinates of collecting points of herbarium specimens (millions of records). GBIF will most probably yield more information regarding forage species distribution. The GBIF portal (http://www.gbif.net) also includes a functionality for niche modelling based on search results.

Current minimum standards for regeneration

Inputs were requested from each WG member for an update on the use of regeneration standards.

Wilhelm Graiss (Austria). The protocol is: 3 accessions per species per year, 40 plants per accession, isolation distance more than 100 m, 40 cm between plants. Post-harvest practices are: drying at 38°C with silica gel to reach a moisture content of 3-5%.

An Ghesquiere (Belgium). Regeneration, except for breeding, has been stopped since a long time. The protocol is: 81 plants per accession, isolation distance 15 m, unbalanced bulk harvesting.

B. Đurić (Bosnia and Herzegovina). The team was trained by P. Marum. The genebank is scheduled to open next month (May 2010). No regeneration has been carried out so far.

M. Ševčíková (Czech Republic). The protocol for grasses is: isolation plots with triticale as the barrier crop, isolation distance 30 m, 49 plants per accessions, unbalanced bulk harvesting. Post-harvest practices are: drying in a room; combined threshing and cleaning. The final drying depends on the genebank in Prague, to which samples are sent for long-term conservation.

D. Fasoula (Cyprus). *Medicago* and *Vigna* are characterized during regeneration.

R. Aavola (Estonia). For grasses the protocol is: 49 plants per accession, isolation distance 30 m (sometimes less), winter rye as barrier crop. For legumes, the protocol is: minimum isolation distance 150 m, several harvests as unbalanced bulk. Post-harvest practices are:

manual threshing, mechanized seed cleaning drying room. The seed moisture content is kept below 7%. Germination tests are performed. But the regeneration capacity is very limited, raising the risk of material loss.

J.-P. Sampoux (France). The protocol for legumes is: field cages or isolation plots according to standards, use of pollinators, isolation distance 100 m. For grasses and triticale, the isolation distance is 30 m. At least 100 plants are used per accession. The material is harvested several times as unbalanced bulk. Drying and threshing are mechanized. Moisture content is not checked, but germination tests are performed.

E. Willner (Germany). The protocol is: isolation distance 30 m, 49 plants per accession, manual harvesting as unbalanced bulk. Various agronomic and morphological traits are scored. For legumes isolation, there are ten cabins in the greenhouse and isolation tents in the field; bumblebees are used. The number of plants was increased from 50 to 100 for red clover and alfalfa. Post-harvest practices are: mechanized threshing and cleaning of seeds, use of drying room. The seed moisture content is kept below 8%. Germination tests are performed and thousand-grain-weight (TGW) is determined. The sample is split into three parts for safe, base and active collections.

S. Barth (Ireland). Plants at low germination are regenerated using the following protocol: isolation distance 30 m, 100 plants per accession.

V. Negri (Italy). Regeneration is avoided as much as possible. Instead, very large samples are collected and stored in base conditions at -20°C.

Cabinets were tried for storage, but they did not work properly in the high-temperature local conditions; they were also expensive to maintain. The system was therefore changed; big plastic containers (3.5 m cubes) open at the top are used for grasses. Regeneration of legumes was undertaken recently using the following protocol: isolation distance of 30 m, 200 plants per accession (*Medicago*), bulk harvesting. Drying equipment is used. Seed moisture content is 6%.

S. Kratovalieva (Macedonia FYR). The protocol is: isolation distance not less than 30 m, 30 cm between plants. For legumes, the protocol is: cages, pollinator bees, 49 plants per accession (7 rows with 7 plants). The time of flowering is scored. Harvesting, threshing and cleaning are manual, drying is mechanized. The final moisture content is not less than 6% (legumes not less than 7%). Standards are those acceptable for base and active (bulk) collections.

P. Marum (Norway). The isolation distance is 50 m.

W. Majtkowski (Poland). The protocol is: 30 plants per accession, isolation distance 30 m. Post-harvest practices are: use of drying room, mechanized cleaning. The final moisture content is 6%.

Z. Tomić (Serbia): The protocol is: isolation distance 30 m, 50 plants per accession.

V. Meglič (Slovenia). The protocol is: cages and one or two isolation fields, 35-42 plants per accession in cages with bumble bees, bulk harvesting. A drying room is used, and viability is checked. Part of the sample is stored for the working collection (+4°C) and part at -20°C for long-term storage.

F. González (Spain). The genebank only works with legumes. The protocol is: 500 plants per accession, use of drying room, manual cleaning.

B. Boller (Switzerland). The protocol is: isolation distance 30 m, 100 plants per accession.

Hüseyin Özpinar (Turkey). The protocol for grasses is: isolation distance more than 60 m, not less than 30 plants per accession, bulk harvesting. The greenhouse is used for drying; threshing is manual or with machines. For legumes, the protocol is: isolation cones, same number of plants as for grasses, unbalanced bulk harvesting. Post-harvest practices are the same as for grasses. Genebank standards are then followed.

I. Thomas (United Kingdom). Due to financial cuts, it is unlikely that isolation space can be used in the future.

Discussion

It was concluded that almost all national programmes were following the agreed standards.

Regarding the number of plants per accession, B. Boller highlighted the need to avoid using very few plants for regeneration. When individual plants were harvested for 20 accessions of *Lolium multiflorum*, the yield from the biggest plant was 2-3 times higher than that of the average plant. Therefore, bulk harvesting of 100 plants is as efficient as harvesting 30 plants individually (this has been published[8]). If only 50 plants are used, it is better to prune the three largest plants, in order to remove the excess seed produced by them.

On-farm/*in situ* conservation

Development of an in situ *database inventory – towards a Swiss solution for forages*

B. Boller

A concept for *in situ* conservation of forage plants was developed based on previous project results. Forage germplasm maintained *in situ* should reflect the high genetic variation within the site. Sampling diverse habitats increases chances of retrieving extreme trait values. Diversity of habitats can be assessed by classification of vegetation. Grassland plant alliance and biogeographical region are basic criteria for selecting sites to be inventoried. Five to nine sites should be selected for describing (and perhaps eventually protecting) each alliance in each biogeographical region. The "Northern Foothills of the Alps" were investigated in a pilot project.

A database was developed to allocate vegetation and site characterization data. It is based on and integrated in the national *ex situ* inventory (http://www.bdn.ch).

The concepts were developed by the national "Working Group on forages" of the Swiss Commission for the Conservation of Cultivated Plants (SCPC). Input data were derived from farmer questionnaires, GPS and other site data, and botanical surveys. The "accession" is defined as the population of plant genotypes of a given species occurring at a given site. For each site, two lists are stored in the database: one list of site data and one list of species

[8] Boller B, Peter-Schmid MKI, Tresch E, Tanner P, Schubiger FX. 2009. Ecotypes of Italian ryegrass from Swiss permanent grassland outperform current recommended cultivars. Euphytica 170:53-65.