Austria

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1. Introduction

Despite its small area covering 83.858 km\textsuperscript{2}, Austria maintains an extraordinary high biodiversity including a plenty of autochthonous plant species. Geographically, Austria is divided into three different landscape areas (1) the Alps with the Central Alps of Tirol, the Higher and Lower Tauern, the Northern/Southern Chalk Alps and the Vienna Woods, (2) the Bohemian Mountain Massive and (3) the adjacent lowlands of the foothills of the Alps and the Vienna Basin. The climatic conditions of the country are determined by the alpine as well as by the continental and the pannonian climate. More than 60 \% of the country is taken over by the alpine area, 49 \% are covered with woodlands. These geographic and climatic circumstances influencing the microclimatic conditions deliver the basis for the development of a small-scale structured, agricultural landscape in Austria.

Altogether seven stakeholders from gene banks, public research organizations, NGOs and commercial breeding companies were interviewed using the guideline-based interview technique. P. Freudenthaler agreed to be the country key person for Austria. He prepared a list of organizations which were visited from August 02–04, 2011. The persons interviewed were: gene bank - P. Freudenthaler, Linz; Dr. M. Gantar, Klosterneuburg; research organization - Dr. F. Regner, Klosterneuburg; Dr. B. Krautzer, Irdning; Dr. W. Graiss, Irdning; agro-NGO - Dr. B. Kajtna (on 06 September, phone interview), Schiltern; breeding company - R. Frech-Emmelmann, St. Leonhard. Interviews lasted around 1-2 hours per meeting. On the basis of the conducted interviews this report was written which also includes a preliminary SWOT (strength, weakness, opportunity and threat) analysis and action points concerning the conservation and use of PGR in Austria.

2. Stakeholder interviews

2.1 Gene Bank

The Austrian Agency for Health and Food Safety (AGES) operates a gene bank of agricultural crops including medicinal and aromatic plants. AGES co-operates with the nature conservation agency of “Oberösterreich” in the field of conservation of endangered wild plant species. It supports the production of rarely grown crops as well as the use of seeds certified for organic agriculture by operating information portals. AGES also manages the National Inventory and by doing so acts as a single point of contact for users of the Austrian genetic resources conservation network. The network consists of several specialized, small-scale gene banks within the domain of (a) the Tyrolean Government, (b) the Agricultural Experimental Center, Steiermark and (c) Haidegg, respectively, (d) the Agricultural College
Appendix I

Warth, (e) the Chamber of Agriculture, Kärnten, (f) the Higher Federal College and Federal Office and Research Centre for Viticulture and Pomiculture, Klosterneuburg, and (f) the Horticulture Research and Education Centre, Schönbrunn. The Agricultural and Education Center Raumberg-Gumpenstein (e) focuses on the management of inter- and intraspecific diversity of fodder crops / grassland species in the natural habitat. A comprehensive collection of vegetable crops is managed by the agro-NGO Arche Noah. The associations “Hortus” as well as “ARGE Streuobst” maintain fruit genetic resources collections.

Altogether Austrian gene banks manage 11616 accessions. Austria contributes to the conservation of unique landraces, former breeder’s varieties and populations of autochthonous grasses, legumes and herbs as well as fruits and grapevine.

Stakeholder of three gene banks in Austria were interviewed, namely the AGES in Linz, and experts of the Department of Viticulture and the Department of Fruit Genetic Resources of the Federal Office and Research Centre for Viticulture and Pomiculture.

Capacity and current stat
AGES manages the gene bank with a total of 6 persons. AGES operates the Austrian genetic resources information system and it represents Austria at the European level (ECPGR program, expert meetings at the European Commission). At Klosterneuburg 1.8 and at Irdning 0.75 person years are available for gene bank work. The collection management is strongly supported by the respective research groups. The gene bank at AGES has good storage conditions. The entire interviewed gene bank managers organize the systematic characterisation of their collections. Characterisation is an ongoing work and not completed.

Access and information
The accessions are freely available. In the case of fruit genetic resources only disease free material can be sent to users. Users can search for passport data in the National Inventory for specific material either via EURISCO or the AGES homepage and order accessions via email. There is no special tool on the AGES web page for ordering accessions on-line. Characterisation and evaluation data are recorded in databases and are partially available in the information system managed by AGES. The improvement of the information systems was seen as an important task.

Cooperation
The gene banks operated by the governmental sector are integrated in research organisations facilitating the cooperation between the collection managers and researchers. The gene banks also cooperate with breeding companies and agro-NGOs at the national level. The intensity of cooperation depends on the crop group (lesser in fruit and grapevine, more in agricultural crops and vegetables). There is also a significant cooperation between the gene banks with counterparts at the European level. The intensity of cooperation at the European level in the field of conservation of crop wild relatives depends on the crop group and takes place in the fruit genetic resources domain.

Policy and constraints
A national strategy paper dealing with conservation and sustainable use of genetic resources exists. The agricultural policy addresses the need to conserve landraces and CWR but the implementation of in situ and on farm conservation actions still meets difficulties in practice. The effect of the EC GENRES program on the conservation and use of PGR at the national level was considered minimal.
Trends
The molecular characterization of genetic resources will gain importance as it will inform on the allelic diversity held in gene banks. Crop productions systems with higher inter- and intra-specific variation are considered an important means to adapt agriculture to the global changes. Gene bank as provider of species and within species genetic diversity will play a significant role in this context. Despite of this, the work of gene banks is not acknowledged by the public and hence not sufficiently supported and funded by the policy. There is a strong need for improved public relation work. The governmental PGR sector should better help the general public to understand that gene banks follow long-term strategic objectives while researchers in the public and private breeding sector exploit PGR and work at the short- to mid-term operative level. Both activities are equally indispensable and important.

The interest in the identification of duplicates (at the European level) will raise in fruit crops genetic resources management as it will allow national priority setting and a more rational collection management. The lack of (funds) was seen as an obstacle towards a better coordinated fruit genetic resources program.

2.2 Public Research
The number of public plant breeding research groups is limited in Austria. Research and education is mainly performed at the University of Natural Resources and Life Science, Department of Crop Sciences in Vienna and Tulln. The Institute of Botany of the Veterinarian University, Vienna, is engaged in breeding research and conservation of medicinal plant species.

The visited Higher Federal Teaching and Science Agency of the Austrian Life Ministry, Institute for Plant Production and Cultural Landscape in Raumberg-Gumpenstein focuses on applied research. Projects on the manufacturing of seed mixtures adapted to the climatic conditions of high altitude Alpine regions are of particular interest with regard to the conservation and use of crop wild relatives. The genetic resources used in mixtures are collected in the region, tested, reproduced by farmers, by combining components improved mixtures are created and used in the area of origin for the establishment of grassland. The institute aims at the maintenance and promotion of the typical regional genetic diversity of grassland plant species. The research work is partly performed within the framework of European research projects.

The Higher Federal Teaching Agency and Federal Office for Viticulture, Klosterneuburg, focuses on applied research and on grapevine as the single crop species.

Capacity and state
The number of persons (including temporary project staff) dealing with breeding research is approximately 3 persons at Raumberg-Gumpenstein, 1 person at Klosterneuburg.

The Austrian PGR related research and development program covers a wide range of activities: maintenance breeding, management of genetic resources in situ, on-farm and ex situ, characterisation and evaluation of crop wild relatives, official duties conferred by law such as the maintenance of landraces, as well as variety breeding. A central theme of all research activities consists in the development and promotion of regional products based on regional genetic resources. In grassland research, the number species used ranges from 70 to
80. Within each species several regional provenances are deployed in grassland production. The use of autochthonous germplasm in Austrian grassland projects is therefore exceptionally high. Grapevine research is focussed on the development of new varieties and the utilization of genetic resources in this context. The search for autochthonous genotypes is an ongoing process and the identification and verification of provenances as well as resistance breeding research an important task. The grapevine germplasm is systematically characterised and evaluated on the basis of internationally agreed standard descriptor lists and the data are documented in a database. Grapevine landraces and crop wild relatives are used in –omics research projects.

**Access and information**
Access to accessions of grassland species and grapevine accessions is possible and is often organised on a bilateral basis. Passport data on grassland genetic resources are documented in a database and are partly available via the National Inventory and EURISCO, respectively. Characterisation and evaluation data are not recorded in a database as the trait expression very much depends on the site and the data are therefore not comparable. In addition it is not clear how information systems will develop in future. Germplasm for grassland research and development projects is sporadically searched in EURISCO, the National Inventory or in GBIS of the IPK gene bank. Grapevine data, though not accessible online, are in principle public. Information on grapevine genetic resources are searched for by Austrian breeding researchers in all available online data bases such as the “German Grapevine Genebank” or at the EU level via the information systems created within the framework of the EC GENRES program.

**Cooperation**
The grassland research is integrated in European projects. The institute is involved in teaching and cooperates intensively with farmers at the regional level as training and education in cultivation and harvesting techniques is an indispensible component of the innovative grassland genetic resources management approach. The successful deployment of improved material in semi-natural grassland on regional climatic conditions requires the establishment of new infrastructures. These include authorities, farmers and companies as cooperating partners. The grapevine research work is integral part of national and international networks.

**Policy and constraints**
Currently there is no expert program specifically promoting the investigation of crop wild relatives and landraces, a strategy paper exists though. The possibility for financial support of research is implicit in national and EC research programs. The EC GENRES program had no effect on grassland research. In contrast, this same program strongly promoted the conservation of grapevine genetic resources.

**Trends**
The research activities changed from classical breeding of varieties for commercial grassland farmers to selection and use of autochthonous grassland seed sources. As the regional seed sources have no variety protection companies are not engaged in this kind of innovative approach to the conservation and utilisation of plant genetic resources. With respect to the high altitude alpine regions this trend will continue as the support scheme will direct the agricultural production towards conservation and enhancement of biodiversity in future.
In grapevine research the themes did not very much change over the past 20 years while the methodologies and techniques available to researchers have strongly changed. The main obstacles towards a broader use of landraces and crop wild relatives in grapevine breeding are the legal and regulatory framework conditions. Increasing the genetic diversity in viticulture is not an explicit breeding aim. Breeding for quality remains an important objective. A trend towards the use of classical, old varieties and the establishment of regional niche products can be clearly recognised.

2.3 Non-governmental organisations
Arche Noah is the most important agro-NGO in Austria with a branch in Germany. It has approximately 7000 members. Arche Noah is split into the association Arche Noah and the Arche Noah Schaugarten GmbH (= limited liability company). A number of smaller agro-initiatives exist in Austria such as two associations promoting the production and marketing of the “Wachauer Marille” and the “Steierische Kürbiskernöl”, respectively.

Capacity and state
Arche Noah employs 19 persons on a permanent basis as well as 10 persons on part-time temporary positions and is supported on average by 15 practisers every year. The organisation operates a well characterized gene bank collection of mainly vegetable crops and fruit species. Arche Noah was established 21 years ago. During the first 10-years-phase the members collected crops and cultivars grown since 20-30 years. Priority was given to the integration of the collected material into the Arche Noah gene bank during the second phase. The members collect germplasm as well as describe the material according to standard descriptor lists. Arche Noah is also very active in public relation work, capacity building in the field of seed production knowledge and skills as well as in agrobiodiversity policy with a focus on seed legislation. An agro-NGO umbrella organisation does not exist for vegetable but only for fruit genetic resources in Austria. Arche Noah is member of this ARGE Streuobst (= work community orchards) organisation.

Access and information
Arche Noah developed a cultivar catalogue which can be used to purchase seeds online. The passport, characterisation and evaluation data are documented in an internal database. A part of the data can be accessed online either via the online seed catalogue and/or via the National Inventory.

Cooperation
The association maintains working relationships with governmental gene banks, public research institutes, commercial plant breeders and agro-NGOs at the national and international level. In addition it cooperates with farmers and the food retailing.

Policy and constraints
There is no national expert program promoting the in situ and on farm conservation in Austria. Governmental agencies do not financially support the work of agro-NGOs. The EC GENRES program benefited the work of Arche Noah. The dynamic adaptation of cultivars is impaired by long reproduction intervals of accessions kept in the Arche Noah gene bank and by genetic bottlenecks due to small population sizes. Arche Noah tries to operate with sufficiently large population sizes but the available capacities are sometimes a limiting factor.
**Trends**
The demand for regional products based on landraces and growing interest in biodiversity and sustainability aspects is a significant trend which will back landraces’ maintenance measures.

**2.4 Commercial Breeding**
In Austria two main categories of breeding companies exist: (i) companies that are actually marketing companies selling seeds of foreign companies and (ii) companies which run breeding programs partly based on local varieties. The ReinSaat company was visited which belongs to the latter category.

**Capacity and state**
ReinSaat employs 18 persons of which 1.5 persons work as breeders. The company is part of an open network with partners in Germany, Switzerland and the United Kingdom. The company is too small and therefore cannot finance pre-breeding activities in the sense of wide crosses. The company is mainly engaged in breeding of vegetables, e.g. *Capsicum, Brassica*, and *Daucus*, and uses landraces as source populations but no crop wild relatives. Landrace have been acquired from gene banks but are not used and marketed as improved landraces. They rather serve as donors of individuals that fit into the elite breeding pool. Landrace are often distinguished by colours or shapes and can be used to demonstrate cultivar diversity. The breeding program aims at the increase of crop genetic diversity in production systems. The use of genetic diversity in the breeding program is restricted by the cash flow as all expenditures have to remain within the financial limits. On the other hand the company profited from the use of landraces.

**Access and information**
The company orders genetic resources from governmental and agro-NGO gene banks, and also uses material recommended by clients or farmers. Clients can order and purchase seed produced by ReinSaat via a webpage.

**Cooperation**
The company cooperates with gene banks, research institutes, breeders associations, as well as clients at the national and European level. The company is embedded in an informal network with good relationships with e.g. with German and Swiss institutions and with companies in Slovenia, Hungary or the Czech Republic. The ECPGR program was known.

**Policy and constraints**
The cooperation between research institutes and the company is very limited. The EC GENRES program was experienced as very complicated with regard to project proposal submission and administration. EC research programs were considered of no direct value to the company. The usage of landraces conserved in gene banks is limited by a lack of genetic integrity of the samples and a lack of descriptive data.

**Trends**
There is an increasing demand for diversity and quality, i.e. better taste. Taste must also be combined with an acceptable yield. This is a clear trend. There is increasing interest in the public research sector with regard to breeding for better taste, higher stress tolerance and higher regional crop diversity. The number of crop species managed by the company has increased over the past 10 years.
3. **SWOT analysis and the actions needed concerning PGR management in Austria**

### 3.1 SWOT analysis

#### Strengths
- Country with considerable diversity autochthonous landraces and crop wild relatives
- Task-sharing within a network of decentralised PGR holding is organised and supported by a central information system
- NGOs are active as seed savers and sellers, are esteemed by the public and are strong in the creation of political awareness about the value of PGR
- People and policy support the production of regional products
- Good communication and cooperation between all stakeholder groups including nature conservation agencies

#### Weaknesses
- There is no official governmental expert program on PGR conservation and use
- No or limited online access to characterisation and evaluation data
- Limited capacities in plant breeding research and for pre-breeding approaches, respectively
- Limited number of regional plant breeding programs (and breeding pools)
- Limited capacities for public awareness raising on the ecological and economical rational of PGR activities in the governmental sector

#### Opportunities
- Research programs and projects at the EU level
- EC regulations promoting plant genetic diversity
- National agricultural policy promoting regional production systems and products

#### Threats
- Dominant, international seed companies
- Limited and decreasing budget available for regional PGR conservation and utilisation programs

### 3.2 Recommended actions

**Genebanks**

The PGR management system is well organized, functioning, integrates all stakeholder groups and partly deploys a complementary conservation strategy. The PGR system would benefit from a national expert program for PGRFA detailing action needs, task-sharing and cooperation between stakeholders, the task timing and the costs frame related to specific actions. The national gene bank system can be strengthened through the further development of the National Inventory towards a system allowing the documentation and public online access to all characterisation and evaluation data linked with accessions.
Public research
Public breeding research covers a wide range of topics although the number of persons active in breeding research is small as compared to the larger EU countries. There are several research and development activities which are focussed on the regional agricultural production systems and specific regional products. This is a unique selling point of Austrian public breeding research. A significant fraction of consumers and policy makers are in favor of organic farming and regional products which is a chance for the genetic enhancement and use of local landrace. As the staff capacities are limited there is no systematic evaluation programm respectively systematic documentation of evaluation data in the National Inventory. As Austrian plant breeding research is already integrated in European collaborative projects joining of systematic evaluation programmes in partner countries can be a means of generating more information on the use value of Austrian genetic resources holdings.

NGOs
Arche Noah is integral part of the Austrian genebank system although the association is funded by its members mainly in Austria and Germany. This is a unique paradigm within the EU showing how governmental and non-governmental organisations can cooperate for the benefit of all national partners. It also shows that strengths and weaknesses can be two sides of a coin. There is a risk that with the demographic change the public interest in crop and cultivar diversity will cease and reduce the financial means of Arche Noah. The activities of Arche Noah are focused on the utilization of underutilized species, landraces and former breeder’s varieties and by doing so Arche Noah completes the governmental PGR conservation and use system. The participation of agro-NGOs such as Arche Noah in national and internationally funded research and development programs should therefore be facilitated by the governmental sector.

Breeding companies
Only a few commercial seed companies exist in Austria. Most of them sell seeds for foreign companies and only few run breeding programs focussed on the regional needs. The use of landraces and CWR by the private Austrian plant breeding sector is therefore rather limited. The use of Austrian landraces and CWR in commercial breeding program may be promoted through improved (crop specific) communication between all stakeholder groups in Austria. The agricultural policy in Austria as well at the EU level can backup regional breeding programs by further promoting the production of regional products based on traditionally grown crops and landraces.

4. References
Austria (2010): Fourth National Report, Convention on Biological Diversity, Austria