Bulgaria

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1. Introduction

Bulgaria covers an area of 111,910 km². Geographically, Bulgaria is subdivided into two different large-scale areas: on the one hand, the northern part determined by the Danube delta and adjacent lowlands and on the other hand the south area of the country covered by mountain massifs and large plateaus. In the East, Bulgaria borders the Black Sea coast. Bulgaria has a continental climate with a cold winter and a hot warm summer. The ecogeographic diversity is thus high as is the number of plant species occurring in the country.

The former state owned land was re-privatized in the early 1990s resulting in a highly fragmented agriculture and a high number of small-scale farms. In the northern part, however, wheat, corn and sugar beet are mainly produced on large farms. Vegetable, fruit and grapevine production is located in the Danube delta and in central Bulgaria where also roses and lavender are produced (Iliev et al., 1995; Ermann and Ilieva, 2006).

Altogether six stakeholders from gene banks, public research organizations, NGOs as well as commercial breeders were interviewed using the guideline-based interview technique. Prof. L.I. Krasteva agreed to be the country key person and consultant for Bulgaria. She prepared a list of organizations which were visited from September 20–23, 2011. The persons interviewed were: gene bank – Prof. L.I. Krasteva, Sadovo; Prof. V. Petkova, Plovdiv; research organization – Dr. Ts. Mikovsky, Troyan; agro-NGO – Mr. I. Sulinadjiev, Plovdiv; breeding company – Prof. A. Katova, Pleven, Prof. G. Georgiev, Pavlikeni; Prof. V. Petkova, Plovdiv. 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 Bulgaria.

2. Stakeholder interviews

2.1 Gene Bank

The Institute of Plant Genetic Resources „Konstantin Malkov“ (IPGR), Sadovo, is operating the national gene bank which holds about 1,400 plant species of Bulgarian and foreign origin. The institute is responsible for the long-term storage and documentation, collection, characterization and evaluation of genetic resources of agricultural and horticultural crops and their wild relatives, with a priority on genetic resources of Bulgarian origin. The gene bank maintains a highly diverse germplasm holding. It comprises a total number of the 57684
accessions maintained under medium- and long-term controlled storage conditions. In addition, living collections of landraces and CWR are kept in the botanical garden. The gene bank cooperates closely with the “Maritsa” Vegetable Crops Research Institute (MVCRI) which also belongs to the Bulgarian Agricultural Academy. Each breeder maintains, expands and enriches working collections of genetic resources of the vegetable crops he/she is responsible for. There is very close cooperation and exchange of genetic material between MVCRI and IPGR. Working collections of the breeders in MVCRI include mainly samples from the gene bank, as well as materials collected personally in different areas of the country, or provided by fellow breeders from other countries and foreign genebanks.

Capacity and state

A total number of 48 persons including eighteen scientists work at the IPGR. The research and development work at the MVCRI is performed by 125 persons including eleven plant breeding scientists. MVCRI has eight different research laboratories working in close cooperation with the plant breeding scientists in the field of variety breeding. IPGR is responsible for the program on conservation and sustainable use of plant genetic resources. This program covers two main areas: (i) Regulation for in situ conservation including monitoring are not yet available except for those CWR species that fall within the responsibility of nature reserves or the Natura 2000 protected area network. (ii) Regulations for ex situ management are available as well as approaches for the management of local vegetables, spices, and fruit crops on-farm. Collecting of landraces and CWR still continues with the aims of identifying additional diversity useful for agriculture and to conserve it before it is lost. Although the larger fraction of the diversity of many crops has probably been collected, some important “small” crops have been neglected. The major crop groups conserved at IPGR are: cereal, grain legumes, vegetables, fodder legumes as well as grasses. In terms of working collection size the top five crops held at MVCRI are tomato, pepper, cucumber, onion, potato and cabbage. CWR are well represented in the Bulgarian gene bank and on an exceptional level (25 %) as compared to other European countries. This fact is mainly due to the high proportion of forages as well as ornamental and medicinal species in the gene bank. Depending on the crop group the collections have been characterised more or less intensively. Characterisation is a continuing work performed routinely while the evaluation is more specific and depends on the availability of additional project funds. In particular old vegetable landraces are well characterised and assessed. Altogether both institutes invest about nine person months into national and international cooperation in the field of landraces and CWR. If more capacities would be available the IPGR will increase characterisation and genetic investigations; if capacities would be reduced IPGR will reduce work on foreign accession but will not reduce regeneration of germplasm. Under improved financial conditions MVCRI would intensify cooperation with local farmers and producers, increase the assessment of foreign varieties, increase characterisation activities including the application of modern technologies and organise collecting expeditions. If the conditions were less favourable, work on specific vegetable crops would be stopped.

Access and information

Users can search online for accession kept by the national gene bank via EURISCO. Both institutes provide the contact details of staff members on a webpage allowing users to contact crop experts personally. The national gene bank is accessed and used by all stakeholder groups, even by farmers. There is an intensive exchange of material between the gene bank and public research institutes as well as public breeding institutes. Foreign public breeding research institutes and genebanks also order and receive material. With regard to the top five
crops the percentage of accessions per crop holding sent by IPGR to users ranged between 10 to 30% in 2010. The proportion of CWR and landraces ranged between 2 to 10%.

Concerning the top five vegetable crops kept by MVCRI the percentage ranged between 1 to 20% for landraces in 2011 while the requests for CWR was very limited (1.1%, tomato).

The characterisation and evaluation data are systematically recorded by the collection curators or the crop specific breeding scientist in individual databases. A central information system combining all passport, characterisation and evaluation data does not yet exist.

**Cooperation**

Both institutes closely cooperate with breeders in Bulgaria. The national gene bank also cooperates with agro-NGOs.

**Policy and constraints**

The national agrobiodiversity policy supports the on-farm management of landraces to some extent. Financial means for PGR projects can be raised through funds of a national action plan. An expert program that specifically mentions the value of landraces and CWR as a source for breeding does not exist, though. If a national expert program for PGR would exist, IPGR and MVCRI will strengthen the cooperation at the national level, introduce modern methods for germplasm evaluation, make a national inventory of CWR and landraces and create a comprehensive Bulgarian PGR information and quality management system.

Increased capacities for vegetable seed production would benefit farmers who demand more seeds than MVCRI can currently produce. Both interview partners knew the GENRES program and would like to join project groups. The major constraints to genebanking are limited availability of funds, even for the technical infrastructure, but also for precise phenotyping of the germplasm.

**Trend**

The increased regeneration and distribution of accessions, the improvement of the interaction between the *ex situ, in situ* and on-farm conservation sector, improved legislative framework for CWR and landrace conservation, an even more active use of CWR and landraces in breeding, and the development of a central PGR information system better meeting the needs of breeding research and variety breeding will be the major trends in genebanking from the Bulgarian perspective.

### 2.2 Public Research

Genetic resources of grasses and fodder crops play a prominent role in the Bulgarian breeding research. The task is shared between the Research Institute of Mountain Stockbreeding and Agriculture (RIMSA), Troyan, which also combines research activities with training of students, the Institute of Forage Crops (IFC), Pleven, conducting variety breeding of fodder plants like alfalfa, forage pea and forage grasses and the Soybean Experimental Station (SES), Pavlikeni. There seems to be a continuous intersection between public breeding research and public breeding. IFC and SES are therefore described in chapter 2.4. The main task of all entities is on the development of new varieties.

**Capacity and state**

Five of the ten persons working at RIMSA are engaged in plant genetic resources activities. RIMSA performs applied research and contributes to the development of new varieties of legumes and grasses adapted to mountainous production conditions. The institute also
maintains a germplasm collection of old fruit trees. At present, *Trifolium* species sampled at 64 locations in Bulgaria are being investigated. Breeding for productivity, quality and abiotic stress tolerance are the main research themes. Landraces and CWR are systematically characterised and evaluated, and within the framework of a bilateral research project the material is also genotyped. The characterisation and evaluation data are kept in excel files.

**Access and information**

For forage crops research a working collection was built up using accessions maintained in the national gene bank. Additional material was ordered from the Vavilov-Institute. Characterisation and evaluation data are published in journals.

**Cooperation**

The institute does not cooperate with agro-NGOs, farmers and breeding companies (in the sense of private companies). It cooperates, however, with gene banks.

**Policy and constraints**

The government provides a national strategy allowing fund raising for work on CWR and landraces. The EC GENRES program was not known. The participation of the institute in EC research projects was seen as a chance for the development of plant genetic resources use systems better meeting the sustainability criteria. The most crucial constraints are the limited availability of funds, limited expert capacities, insufficient technical infrastructure and limited stock of evaluation data. More genetic information on the source material is needed as it would facilitate the variety improvement.

**Trend**

During the past 10 years the research focus remained steady with one exception: there is a stronger engagement in drought resistance research. Bulgaria is rich of CWR of forage crops, legumes, and grasses specifically adapted to very different ecological conditions of the country. The locations of the occurrences in the country are well known. In future more information of the value of genotypes will become available. Due to the high ecogeographic diversity Bulgaria is a good place for the assessment of CWR with respect to their usage for agriculture in the Balkan region.

**2.3 Non-governmental organizations**

The Secretary of the Agricultural Chamber (Plovdiv) was interviewed as a representative of agro-NGOs. This association is one of the 14 NGOs integrated in the Council of the Bulgarian Agricultural Organizations, Sofia. Most agro-NGOs in Bulgaria are active in the field of extensive farming and in the promotion of the use of a broad spectrum of crops (tomato, pepper, green bean, peas, and cabbage) and their local varieties. The Agricultural Chamber mainly works on honorary basis and functions as an umbrella organization supporting farmers in the establishment of local markets. This agro-NGO is also acting as a consultant in the field of organic farming, as well as in conservation and sustainable use of local populations of crops. The work covers a wide variety of topics dealing with education and training in agricultural cultivation techniques, harvesting methods or plant protection application techniques. The Chamber mediates between farmers and the administrative agencies of the state. The work is solely financed and supported by the members of the association.
Capacity and state
Fifteen persons work for the Chamber of which one person is employed while the remaining persons collaborate on a voluntary basis. The agro-NGO works with grapevine, green beans, rice, potato, tomato and pepper and collects germplasm sporadically. The members multiply and exchange the material and sell the products on the market. The information on traits and the usage of the collected material is not recorded in a database but kept as farmer’s knowledge and spread among the members.

Information
The information on the material is disseminated during agricultural fairs.

Cooperation
The agro-NGO deliberate on various matters with other NGOs in the country and cooperates non-commercially with all other stakeholder groups in the country in particular with the gene bank.

Policy
There is no national expert program which specifically mentions the value of landraces and CWR. The GENRES program was known but up to now a participation in a project was not possible. The major constraint in the agro-NGO’s work is the limited availability of funds and that members are mostly volunteers. Projects have been initiated to improve the attractiveness of the organisation.

Trend
The need to expand the Chamber by including more organisations was expressed. There is a need to attract and involve younger and/or larger farmers in the association.

2.4 Breeding Sector
Due to historical reasons, the variety breeding sector in Bulgaria is often integrated in public research institutes. Variety breeding is performed by the „Maritsa“ Vegetable Crops Research Institute, Plovdiv (MVCRI), the Institute of Forage Crops (IFC), Pleven and the Soybean Experimental Station (SES), Pavlikeni.

Capacity and state
The staff capacity of MVCRI was already described in chapter 2.1. The commercial breeding activities concentrate on tomato, pepper, cucumber, onion, potato and cabbage which are the vegetables of great economic importance for the domestic market. Tolerance and resistance to biotic and abiotic stress factor, nutritional quality, yield and suitability of varieties for organic production systems are the main breeding targets. The IFC has 80 staff members of which four persons are permanently employed as forage breeders. They are supported by two PhD students. Three persons out of the 24 staff members of the SES are charged with variety breeding. IFC and SES are public research institutes and part of the Agricultural Academy.

Landrace and CWR are both included in the breeding programs of vegetable, and forage crops. In vegetable breeding they are the main basic sources because they possess properties esteemed by the domestic markets. Therefore the percentage of accessions distributed by the gene bank is identical with the percentage of accessions used in the variety breeding. In the breeding of grasses, alfalfa and vetch CWR and landraces are very important. The use of CWR in grass breeding was higher than 90%, the use of landraces in alfalfa approximately
15% (landraces), and vetch 100% (landraces). In soybean breeding the creation of novel genetic variation through interspecific crosses proved difficult and the attempt to use related species was ceased. The amount of genetic variation available to the breeding programs of the top five vegetable crops, and forage crops was considered enough as the Bulgarian agriculture is still rich in local varieties and populations. The insufficient genetic variation within the breeding material was considered a limiting factor in soybean breeding. The use of CWR in the variety breeding has though not financially benefited the breeding program of MVCRI, IFC and SEC during the past ten years.

Access
MVCRI acquires material from breeders working in other national and international institutes and gene banks. IFC and SES get access to landrace and CWR accessions via the national gene bank as the main source, through exchange between colleagues and collecting expeditions in the country and abroad.

Cooperation
The cooperation between MVCRI, IFC and SES breeders with the gene bank and researchers is very tight for the reasons already mentioned. There is no cooperation between VCRI, IFC and SES and agro-NGOs. ECPGR working groups were known to all three breeders who had no contacts with the groups to date.

Policy and constraints
MVCRI invests three person months per year in public-private-partnership programs such as SeedNet. The GENRES program was not known as was the EC research framework program to MVCRI while IFC and SES knew GENRES and even participated in EC-funded projects. The potential of EC research programs for breeding of grasses, red clover and vetch was pointed out. As the major constraints in genebanking insufficient gene bank storage capacities and funding for the technical research infrastructure were identified. The still insufficient participation of the Bulgarian PGR community in European networks and EC-funded projects was seen as a constraint to breeders in the country.

Trend
MVCRI, IFC and SES did not employ pre-breeders during the past 25 years and the breeding program with regard to the crop assets was only insignificantly changed or adjusted to streamline the breeding process. *Agropyron* breeding was started at IFC as a new program in 1995. The breeding aims changed in reaction to the appearance of new diseases and to the growing markets for vegetables grown in organic agriculture. The set of breeding aims remained stable in the case of forage crops. The increasing use of modern technologies and approaches in plant breeding, a more intensive cooperation with the research sector and NGOs, i.e. more networking, and the creation of a common information system for PGR as a rich source of information for breeders was seen as the three major trends in future. The conservation of biodiversity will receive more public and political attention.

3. **SWOT analysis and actions needed concerning PGR management in Bulgaria**

3.1 **SWOT analysis**
**Strengths**
- Country with considerable diversity of crop varieties, landraces and CWR adapted to a high diversity of regional climatic conditions
- Central national gene bank with a clear mandate maintains systematically characterized collections
- Close cooperation between the gene bank, research institute and variety breeders
- Breeders use domestic landraces and CWR on a large scale
- Sufficient genetic variation available to most of the crop specific breeding programs
- Agro-NGOs act as extension service and promote the use of domestic varieties and landraces in the agriculture production

**Weaknesses**
- A comprehensive national program on the conservation and sustainable use of PGR does not exist
- Status of working collections is unclear
- A central genebank information system combining passport, characterisation and evaluation data does not exist
- The use of landraces and CWR has not financially benefited the variety breeders
- Insufficient cooperation between the research and variety breeding sector and the agro-NGOs

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<th>Opportunities</th>
<th>Threats</th>
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<td>- More demand for seeds of domestic varieties and landraces than can be satisfied by the breeders</td>
<td>- Limited availability of funds, even for the needed renewal / modernisation of the technical research infrastructure</td>
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<td>- The cooperation between the public research / breeding sector with agro-NGOs and farmers can be strengthened</td>
<td>- Shortage of younger people in agricultural research organisations due to less attractive salaries</td>
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<td>- Use of the EC council regulation for conservation varieties will support the establishment of markets for domestic landrace and traditionally grown varieties</td>
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<tr>
<td>- Bulgaria with its high ecogeographic diversity and extreme production conditions is a valuable EU partner in climate change mitigation research projects</td>
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<tr>
<td>- Forage crops and legume breeding programs address the needs of agricultural productions systems better meeting the sustainability criteria</td>
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3.2 Recommended actions

Genebanks
The national Bulgarian gene bank has a clear mandate and functions as central research infrastructure within the network of research institutes of the Agricultural Academy. The development and adoption of a national expert program for conservation and sustainable use of PGR would strengthen the position of the gene bank within the Bulgarian research sector and streamline task-sharing and sharing of responsibilities, in particular in the field of long-term ex situ conservation of germplasm. A rich diversity of CWR, landraces and varieties bred for the domestic markets exists in situ and on-farm. Landraces are still grown and a diversity of useful CWR exists in their natural habitats. Bulgaria has therefore excellent conditions which can be used to organise and establish ex situ, in situ and on-farm conservation actions complementing each other. The establishment of a comprehensive information system offering online access to passport, characterisation and evaluation data on the resources kept ex and in situ and managed on-farm would improve the visibility of the gene bank at the European and international level and increase the chance for fund raising.

Public research
The public breeding research links the gene bank with the variety breeders facilitating the exchange of ideas and material between stakeholder groups. The public research institutes can intensify the contact to agro-NGOs and farmers in the country. The participation of the public research sector in the EC research projects would strengthen the ongoing work in the field of PGR evaluation, genetic investigation and utilization. Bulgaria is a rather new EU member state and researchers only started to build up experiences in EC project fund raising. The flow of information from the EC to the individual researcher can be improved by the establishment of a national, agricultural EC advisory agency.

NGOs
Agro-NGOs maintain contacts with farmers and organize farmers’ networks in the entire country. In Bulgaria, agro-NGOs function like agricultural extension services which can campaign for a more diverse diet based on domestic varieties / landraces and by doing so raise the consumers’ interest in a higher diversity of vegetable products. Agro-NGOs can also promote the maintenance or development of regional agricultural production systems better meeting the sustainability criteria. This in turn would trigger a diversified production and promote the use of domestic landraces and CWR in breeding. To achieve this aim the communication between the agro-NGOs, the gene bank and researchers should be facilitated by the establishment of a communication platform such as an advisory board for a national PGR expert program.

Breeding
Several institutes use landraces and CWR for breeding of improved varieties. Strikingly, the institutes do not generate financial benefit from the use of landrace and CWR. This observation requires an investigation by national authorities. An improved reintermediation of profits generated by variety licences and the production and marketing of commercial seeds to the institutes may help resolving frequently addressed problems such as limited funds for the maintenance and improvement of the technical research infrastructure, the shortage of experts and the limited willingness of professionals, in particular younger people, to work in public agricultural research institutes.
4. References
