

# National Seed Genebank with New Equipment and Intelligent Information System

*Author(s):* доц. д-р Николая Велчева, ИРГР Садово; доц. д-р Гертана Дешева, Институт по растителни генетични ресурси – Садово

*Date:* 11.10.2022 *Issue:* 10/2022



The Institute of Plant Genetic Resources at the Agricultural Academy is the national coordinator for the conservation of the diversity of cultivated plants and their wild relatives within the framework of the European Cooperative Programme for Plant Genetic Resources (ECPGR).



# Gen Bank Bulgaria

The National Genebank is located on the premises of the Institute. It was established in 1984 with the financial support of FAO and with the primary task of acting as a central depository for plant germplasm in the country, including: local populations and primitive cultivars, rare and endangered species of the Bulgarian flora, breeding varieties and lines of different geographical origin. Today, the National Genebank provides safe storage of seed accessions of over 600 plant species and regulated exchange of germplasm within the international genebank system.

At the beginning of 2022, a joint Chinese–Bulgarian molecular biology laboratory for the study of the genetic resources of agricultural crops was established in the National Genebank. Its main objective is to promote the transfer of technologies and equipment from the Chinese to the Bulgarian side and to provide the opportunity for full-scale implementation of scientific research. The equipment was granted free of charge to the Genebank by the Heilongjiang Academy of Agricultural Sciences, the Institute of Grassland and Fodder Crops (Center for Scientific and Technical Cooperation in Agriculture between China and Russia) and is valued at 893,300 yuan. The establishment of the laboratory will enable the implementation of joint analyses of the genetic diversity of the collected plant resources, the development of molecular identification maps, the discovery of functional markers, etc., which in turn will provide a sound basis for more comprehensive research, conservation and use of plant genetic resources and for providing a rich source material for breeders in both countries.

The commissioning of the laboratory is forthcoming; it will provide a high-level platform for conducting scientific research and for better service to local agricultural science and production. It will also provide opportunities for training of specialists and technical staff. The results of the joint research will lay the foundation for joint applications by the two parties in major national and international projects.



The collection preserved in the Genebank in Sadovo is the largest in Southeast Europe, maintaining over 63,000 seed accessions of wild and cultivated plant species. The National Register for Plant Genetic Resources is part of the European online catalogue EURISCO (<http://eurisco.ecpgr.org>).



More than two million accessions conserved *ex situ* in about 400 institutes are represented in EURISCO. The main objective is to ensure free access to information on the conserved plant gene pool for the scientific community and, in particular, for researchers and breeders working towards the sustainable conservation of global agrobiodiversity and the achievement of food security.

The National Genebank participates in the virtual integrated genebank system – AEGIS (<http://aegis.cgiar.org>), which brings together the European Collection of Plant Genetic Resources with a “unique” local origin.

The Information Centre for Documentation of Plant Genetic Resources was established in 1982. Its activities follow the international FAO/Bioversity standards, in accordance with the priorities for free access to the conserved gene pool and the maintenance of a global system for non-monetary exchange of germplasm.

Initially, documentation was carried out using catalogues and field notebooks. Gradually, electronic databases were introduced and combined into a National Register – a database in *Microsoft Access*.

Since 2020, work has begun on the development of an integrated national network for plant genetic resources with specialized software serving the Genebank, the Information Centre and the curators of crop groups. The intelligent information system aims to improve the management of all processes related to the conservation, study and use of the conserved plant gene pool. For the implementation of the application, a team from the Department of “Computer Systems” of Plovdiv University and the Institute of Information and Communication Technologies (Bulgarian Academy of Sciences) uses the Java programming language, implemented on the Vaadin platform for Java, and the new database is MySQL.

Based on the analysis of the existing National Register of Plant Genetic Resources and the EURISCO documentation standard, a concept and analytical model of an ontology, called GenBankOntology, was developed. The main elements of the ontology are the taxonomic description of accessions and the EURISCO descriptors. The possibility has been provided for curators of crops to supplement the passport data with evaluation and characterization information.

The information system includes a database model, a system interface model and an execution model. The application database has been implemented and a large part of the data from the National Register has been transferred. Data migration scripts were used for this purpose. A first version of GenBankSystem has been developed, including the implementation of the Central Register module, which is the core of the system. The GenBankSystem database consists of 30 tables. The system has been implemented with convenient and easy

management of the resources in the database. Different levels of access are allowed, which makes management flexible.

The system provides different users with access to the main functionalities for storage and management of plant genetic resources. The model is designed for the implementation of blockchain technology, which will be used in the functionality for the security of records and the exchange of germplasm between various national and international organizations.

A server infrastructure has been implemented, hosting the ontology and the relational database of the Genebank information system. The implementation of the documentation system is applicable both for supporting the work of the Genebank, the Information Centre and the curators, and for external users through the developed interface, in execution of the signed International Treaty on Plant Genetic Resources for Food and Agriculture and the Nagoya Protocol, which regulates fair access to the gene pool and the sharing of benefits arising from its use.

Modern “smart” technologies are entering agriculture with increasing strength. In this respect, broad challenges are emerging, and work on such projects creates new horizons for the research team of the Institute. The National Information System for Plant Genetic Resources builds a “knowledge bank” and represents a platform for communication and cooperation between biodiversity researchers, breeders and other stakeholders. The established server infrastructure “GenBank – Plant Genetic Resources” will be used for the purposes of the National Research Programme “Intelligent Plant Production”. The overall objective of the Programme is to conduct fundamental and applied scientific research to develop models for diagnostics and forecasting through digital methods for farm management in crop production and to ensure a sustainable and efficient food system (<https://nnp-ir.bg/>).

45 ГОДИНИ

## ИНСТИТУТ ПО РАСТИТЕЛНИ ГЕНЕТИЧНИ РЕСУРСИ – САДОВО



*110 години земеделска наука в Бидово*

