

Description of monitoring and data collection actions in the Western Balkan countries and the Republic of Moldova

Albania

Data collection on environmental status and biodiversity in Albania is performed by universities and non-governmental organizations (NGOs). The main academic institutions dealing with research in the field of biodiversity are: University of Tirana, University of Gjirokastra, University of Vlora, University of Shkodra, University of Elbasan, University of Korça, and the Museum of Natural Sciences. There are several fields that are well covered by the data collection from academic institutions, but there are several other areas which are still not covered at all. Biodiversity data collections from NGOs are sporadic and mainly conducted within the scope of internationally funded projects, but these often have a considerably limited scope when compared to universities. It is foreign researchers and scientists that often play an important and pivotal role in data production in Albania (VI National Report to UNCBD of Albania).

The Faculty of Mathematics and Natural Sciences of the University of Tirana collects biodiversity information related to: vascular plants, algae, aquatic and terrestrial invertebrates, freshwater fish and to a lesser degree mammals, lichens, fungi and microorganisms. The same categories are similarly covered by other universities in Albania but to considerably lesser degree.

The biodiversity data collection covered by NGOs mainly pertains to large carnivores and birds. Protection and Preservation of Natural Environment in Albania (PPNEA) has been active during the last years in monitoring lynx and other large carnivores protected by law. The NGO "Society for Protection of Birds and Mammals" has mainly collected biodiversity data on species levels for birds. The NGO "Hydra" is involved in research dealing with monitoring of certain fish species in the Adriatic and Ionian Seas. It also carries out research related to natural lakes, specifically targeting to mollusks and crustacean populations, and mostly from a cultivation perspective. It is also involved in the management of coastal lagoons.

During the last two years, researchers from Albania and Macedonia have investigated algae, water plants, and snails, as well as water insects and insect larvae in Ohër Lake within the Niva Ohrid Project financed by the Norwegian Ministry of Foreign Affairs.

In terms of data collection, most of the identified institutions responsible for collecting data do not use any software solutions for field data collection. However, basic software solutions for Geographic Information Systems (GIS) reference are used by all institutions. Some NGOs also use the Spatial Monitoring and Reporting Tool (SMART) conservation software in their field collection and monitoring activities.

Collected field data is stored in different formats but mostly in excel databases. Some institutions also use Access based databases or even their own software solutions, such as BIONNA, which uses Biocase software. In only a few cases are data stored in text files.

The National Environmental Agency (NEA), with its 12 constituent departments, has facilities located all around Albania, and is the institutional agency responsible for implementing the decrees of the Ministry of Environment. It is responsible for the creation and maintenance of the environmental monitoring information system.

The old Law on Nature Protection No. 8934 (2002), stipulates the need for the creation of a National System of Environmental Data which shall be open for public scrutiny and use, and which shall be created by a separate law. Because this system was not created, in the current Law on Environment Protection a whole chapter is dedicated to environmental information issues and NEA is the responsible authority for the Environmental Information System (EIS). Other public authorities are obliged by this law to cooperate with NEA in ensuring the proper functioning of this system.

During the period 2014-2016 and in the present time, there are several other initiatives aiming at the establishment of information systems related to biodiversity and environmental data.

The Biodiversity National Network of Albania (BIONNA) database has been launched during 2016 within the Natura 2000 project. BIONNA aggregates primary biodiversity data, i.e., occurrences of plants and animals recorded in Albania. BIONNA has been developed for the monitoring of nature and of wild flora and fauna. The software for running BIONNA is currently hosted outside of Albania and currently 15,000 occurrence records of some of 900 species are registered in this database. Presently, all registered species belong to the two largest Kingdoms of organisms (plants and animals) while other groups are not represented. For the registered species, details such as: geographical coordinates, date of observation, number of individuals observed, bibliography, references and other information are provided. However, not all these details apply or are present for all species in the database. All data stored in the database is available and freely downloadable in Excel format.

The Law on Agriculture and Rural Development No 9817 /2007 mentions in Article 22 that the Agency of Payments creates and maintains, among others, the registers of livestock. Databases are to be kept electronically. All data created in accordance with this law are free except data which is assessed as personal or which is determined to be a business secret.

The Law on Forests and Forest Service 9385 (2005 and amendments) dedicates its Article 16 to the National Cadaster of Forests. This Cadaster is an official register which stores collected data about the way forests are governed and about periodic changes in the forest and pasture fund. The Agency of Environment and Forests, in cooperation with forest management authorities, Forest Police, district and/or local authorities, the Faculty of Forest Sciences, and organizations of forest use, created a database system order to ensure collection, processing and publication of data regarding forests which is necessary for forest monitoring.

Until now Albania developed several national reports related to plant and animal genetic resources for food and agriculture.

German researchers organized the first collecting expedition on Albanian territory in 1941, mainly to study cereals and legumes. The seed samples collected (355 accessions) were sent for conservation to the Institute of Plant Genetics and Crop Plant Research (IPK) in Germany. The information about these accessions is available from the IPK database.

The first organized and government-supported activities related to the conservation and use of PGR in Albania were undertaken during the period 1950-60 by the Agricultural Research Institute of Lushnja. Many local varieties of wheat, barley, oats, maize, legumes, etc., were collected, with

which the first collections of agricultural crops were created. For wheat alone, the 1956 mission collected 13 local varieties of *Triticum turgidum* and 11 local varieties of *Triticum aestivum*. They served to start the breeding program of agricultural crops of Albania. From the collected material, some accessions were selected and for several years they served as the basis of agricultural production.

In the early 1970's, the Agricultural University of Tirana, under the leadership of Professor Përmeti, organized several research and collection missions of autochthonous cultivars. About 220 accessions (accs.) of maize, two accs. of alfalfa, 79 accs. of beans, etc. were collected. In conjunction with this, in the period 1970 – 1980, several collection missions were carried out by the Maize and Rice Institute (MRI) of Shkodra, Agricultural Research Institute (ARI) of Lushnja, the Vegetables and Potato Research Institute (VPRI) of Tirana, the Institute of Tobacco - Cerrik (ITC), and the Fruit Research Institute (FTRI) of Vlora, etc., as partners of a large project on inventory and collecting local varieties and landraces in the country, financed by the Ministry of Agriculture. During these missions more than 2,000 accessions were collected.

During period 1993 to 1996, IBPGR (today-Bioversity International) supported a project “Initial activities for conservation of PGR in the Republic of Albania”, which was implemented by IPK Gatersleben (Germany), the Institute of Plant Germplasm of Bari (Italy), and the Agricultural University of Tirana (AUT). During this period, 6 collecting missions were organized and 14 scientists (German, Italian, American, Polish and Albanian) were actively involved and collected 1,136 accessions from 210 sites in Albania.

During a project supported by Swedish Sida (SEEDNet project, 2005-2011), 630 accessions of 27 genera and 36 species, in 10 districts of Albania, were collected.

FAO supported the project TPC/AL/3401 (2013-2015), where 551 accessions of vegetables, fruit trees and MAPs were collected.

The Institute of Plant Genetic Resources, Agricultural University of Tirana (IPGR), with the Gene Bank, is the leading research institution in the area of plant genetic resources. The institute has trial fields, various laboratories for phenotypic, agronomic and qualitative analysis, an “in-vitro” laboratory, facilities for medium and long-term storage of seed collections (cold chambers with regime 0 to 5°C and -18°C to -20°C), greenhouses, and field collections of fruit trees.

IPGR maintain the Albanian National Inventory of ex-situ base collections, which includes in total 4,105 accessions of about 147 different plant species. Out of these, 3,219 accessions are maintained as seeds under long-term conservation, and the remaining 886 accessions of fruit species are conserved in the field collection (614 accessions by the IPGR and 272 accessions by FTRI Vlora). Seed working collections of about 8,000 accessions of mainly wheat, beans and vegetables, are maintained at ARI Lushnja.

The on-farm conservation of plant genetic resources in Albania is organized only on some farms intending to test varieties for their own production and improved cropping techniques. The reported data indicates that on-farm management activities have been mainly carried out for local vegetables cultivated mainly for family consumption and market sale, in the communities of the Korcha region and the Albanian Alps area. These activities mainly coverten vegetable crops (onion, cabbage, melon, pepper, tomato, pumpkin, lettuce, leek, garlic, and pod beans), leguminous crops (two local bean varieties) and local forage varieties (two local varieties of alfalfa, two local varieties of oat). About 170 farmers were reportedly engaged in these activities during

the last few years. On-farm conservation is organized on a voluntary basis by the farmers themselves.

To conserve and protect the animal breeds from extinction in Albania, over the last fifteen years programs for in-situ conservation have been implemented. The in-situ conservation programs were compiled and implemented as community-based conservation programs. In some cases, subsidies were used as instruments to encourage farmers' economic interest in local breeds at risk of extinction.

For the *ex-situ* conservation, a Cryobank for the conservation of somatic cells was established. The actual Cryobank collects and stores somatic cell samples only for the native breeds of small ruminant, pigs, buffaloes, rabbits, poultry and cattle.

In addition to the Cryobank, the establishment of the gene bank ex-situ in vivo conservation of breeds/ecotypes/populations started with conservation of the native cattle breed “Albanian Prespa cattle”, with five cows and one bull, and sheep breeds “Shkodrane” and “Lara of Polisi” respectively, in a herd of about 60 animals (50 females and ten males) at private farms.

Bosnia and Herzegovina

Although all six BiH reports to the UNCBD highlight significant biodiversity in BiH in terms of genetic diversity, species diversity and ecosystem diversity, there is no exact and up-to-date general or specific data on the status of biodiversity. The systematic collection and analysis of data on biodiversity and the monitoring of biodiversity status is almost non-existent. The monitoring of the status and trends in biological diversity in BiH is conducted partially through various studies and strategies, but there is no continuous ongoing monitoring system that would allow assessment of status and changes in biological diversity in BiH (VI National Report to the UNCBD).

The main sources of data on biodiversity come from studies and publications prepared by various institutions (research, NGO), or are the results of assessments carried out through different projects funded mainly by external donors. Biodiversity monitoring is carried out on an ad hoc basis, mainly to provide data for specific activities of individuals, organizations and business sectors in BiH (e.g. baseline study on birds and bats for development of wind farm projects in the country). Monitoring of certain species and areas is carried out in studies for scientific purposes. However, that information is usually not available to the general public.

According to the current laws on nature protection in the entities of BiH and Brčko Distrikt¹

BD, the two entities of Bosnia and Herzegovina and the district authorities are obliged to establish information systems for nature protection. However, these information systems are not in place. Only RS has introduced a register of protected areas (PAs). Data collected by PAs are submitted to the Institute for Protection of Cultural, Historical and Natural Heritage of RS, which is responsible for updating the register of PAs.

A better situation in terms of monitoring of the status of ecosystems is found in the forestry sector. Results of monitoring on the health status of forests ecosystems, types of ecosystems and their surfaces, as well as pressures (e.g., fires) are presented in the Forest Management Baseline Documents. These documents, prepared in both entities of Bosnia and Herzegovina, have five-year planning periods. Monitoring of certain ecosystems is carried out at certificated forest areas

¹ Self-governing district part of both BiH and

and some protected areas (NP Una, NP Kozara, NP Sutjeska, PL Bijambare) through testing plots and indicator species. However, these reports are not publicly available.

Academic institutions and NGOs are the main data collectors in BiH and they submit reports to the organization that engages their services. These institutions/organizations integrate the received data and use it for preparation of their reports which they submit to the ministry.

As part of the project “Support to Implementation of the Birds and Habitats Directives in Bosnia and Herzegovina”, implemented from 2012 to 2015, a digital database was developed for the nomination of sites in BiH to the Natura 2000 network, based on the ArcGIS platform. Due to absence of agreement between governmental bodies at the state and entity level, at the time of the preparation of this assessment, this data is stored on a digital medium but not integrated into a single, publicly available, and functional system. Natura 2000 data for the territory of RS is included in the Amendments to the RS Spatial Plan to 2025 and forms an integral part of this overarching document.

GISPASS is a multimedia, spatially enabled database that deals with protected and potentially protected areas of RS, managed by the NGO Arbor Magna and publicly accessible at www.arbormagna.webfactional.com.

Flora of Republika Srpska, available at: www.florasrpske.webfactional.com is a comprehensive web application for browsing and visualization of spatial occurrences data of vascular plants in RS, published in Günther Beck-Mannagetta, Karlo Maly and Željka Bjelčić monograph from 1983, Flora Bosnae et Hercegovina. It is managed by the associates of the Faculty of Forestry in Banja Luka.

The Federal Administration for Forestry is responsible for collecting data and maintaining databases on the state and development of forests, ensuring all necessary information for planning, monitoring and reporting. The process of establishing the integrated Forests Information System of FBIH was started in 2007 and continued with support of several projects, however it is still not functional. Digitized data gathered to date is scattered across different institutions (Cantonal PE for forest management, relevant cantonal ministries, academic institutions), and even individual expert databases.

In RS, operational activities on development and maintenance of the information system on publicly owned forests are performed by the Research, Development and Design Centre of the Public Forestry Enterprise "Šume Republike Srpske". The data is not publicly available but in practice they allow access to the database to governmental institutions of RS.

The Center for Ecology and Natural Resources (CEPRES), an initiative of several experts at the Faculty of Natural Sciences and Mathematics - University of Sarajevo, has participated in the implementation of several important projects in the field of biodiversity inventory, evaluation and conservation. Biodiversity data gathered during the realization of these projects (Protected areas of BiH, Emerald network of BiH and Integrated Management of the Sava River Basin) are integrated into a GIS database. The database is only for institutional use.

In 2016, the German Federal Ministry for Economic Cooperation and Development (BMZ) supported an ongoing process including development of BIMR Regional Guidelines and piloting through the Regional Network for Biodiversity Information Management and Reporting (BIMR) project. This was part of the GIZ Open Regional Fund for South-East Europe-Biodiversity (ORF-BD), and was carried out in close dialogue and coordination with relevant stakeholders

and partners². The general concept scheme of a Biodiversity Information System BIS is based on the example of Croatia and their Nature Protection Information System (NPIS). Thematic databases that are most relevant to BIS include species (floristic and faunistic) and habitat databases, nationally designated protected areas, Natura 2000 ecological network, and speleological objects such as pits and cave.

Before the 1990's war and fall of Yugoslavia (1992-1995), inventorying and activities to collect plant genetic resources in the present BiH territory were mainly done at the level of passport descriptors, as a part of the project The Plant Gene Bank of Yugoslavia (1985-1989). This documentation either remained with the head coordinator or was kept in the institutions that participated in the project. A number of documents were destroyed.

In 2004, the regional project "South East European Developing Network on Plant Genetic Resources – SEEDNet" commenced. The main aims were long-term conservation and sustainable utilization of the diversity of plant genetic resources (PGR) within the SEE region through a well-coordinated network of functional national programs. The network activities were comprised of *ex-situ* and *in-situ* conservation, utilization of PGR, and institutional capacity building. Activities were focused on the themes of specific crops, such as : inventorying, collecting, *ex-situ* and on-farm conservation, seed and plant regeneration, characterization and evaluation, and documentation and deriving information .

This project initiated the adoption of the National Programme on PGR in Republika Srpska and the establishment of the Institute for genetic resources with Gene Bank. The Institute is the coordinating body for the implementation of the program and all activities under it. The Gene Bank is fully equipped and is completely operational for the long-term conservation of collected material at – 18°C. The Institute has 20 employees today.

The seed collections of cereals, vegetables, fodder, industrial and medicinal and aromatic plants have already been undertaken and implemented. Seed collections currently have above 1,100 accessions which are placed in long-term storage (mainly cereals, vegetables, and forage crops). The seed collections are divided into active, base, and safety base collections. All collections are conserved following the same procedure as required by Gene Bank Standards for PGR for Food and Agriculture (FAO, 2014). The duplicate safety base collections of 921 accessions of 113 species have been deposited at Svalbard Seed Vault from 2016. All conserved accessions are regularly monitored in terms of their viability and quantity. If viability or quantity decreases, multiplication is undertaken as soon as possible, or recollection where that is possible.

Field collections include accessions of fruit and grapevine. The field collection has, in total, 167 cultivars of apples, 113 cultivars of pears, nine cultivars of plums, 30 cultivars of cherries, and 35 grapevine accessions.

All data about inventoried and collected accessions has been entered into the database. The database was created with the main goal of providing an overview of information on all collected accessions with their basic characteristics and specific features. The data accompanying each accession are in the passport descriptors and collecting forms that are filled in during collection. The database of the gene bank is in an excel format and created following the example of the EURISCO catalog, to facilitate the entry into the European catalog. The total number of accessions with unique accession numbers in data base is 1,015, and 481 accessions in the EURISCO catalog.

² https://balkangreenenergynews.com/wp-content/uploads/2017/08/BiH-Assessment_ENG.pdf

In the Federation of BiH, through the same project, a certain number of old cultivars (almost 500) of cereals are conserved in the Plant Gene Bank at the Faculty of Agriculture and Food Sciences, University of Sarajevo. Through the Operative Program for Plant Genetic Resources in Agriculture in The Federation of Bosnia and Herzegovina (adopted by the Ministry of Agriculture, Water Management and Forestry of FBiH) seven crop specific working groups were established. Coordinators and members of these groups are experts within their specific fields in FBiH. They, together with local people and terrain co-workers, deal with inventory, collection, multiplication, and regeneration, and partially on the characterization and evaluation of PGR.

An ongoing project to enable on-farm conservation and farmer-based seed systems in Bosnia and Herzegovina aims to establish a sustainable farmer seed system. The project is a part of the Balkan-beets project implemented by Arche Noah from Austria. The Institute for Genetic Resources at the University of Banja Luka and Community Seed Bank and Agroecology Initiatives in BiH are the implementing organizations in BiH.

Although numerous activities have been carried out with the aim of inducing plant genetic resources conservation, conservation activities for animal genetic resources (AnGR) in the Republic of Srpska are relatively poor. According to the main legislative act in this field, the Law on Livestock Breeding, several autochthonous breeds of AnGR are mentioned as protected (cattle: Gatačko cattle and Busha; sheep: Vlačićka Pramenka sheep, Podveležska Pramenka sheep and Kupreška Pramenka sheep; Goats: Balkan goat; horses: Bosnian Pony or Bosnian Mountain Horse; pigs: Mangalitsa pig; chicken: Pogrmuša hen or Živičarka).

In-situ conservation takes place mainly at the level of individuals or associations, and a very small number of breeds of AnGR is grown on farms today (for example, Gatačko cattle and Busha cattle in Herzegovina). Based on the information obtained from the RS Ministry of Agriculture, Forestry and Water Management, as well as the RS Institute on Statistics and Agricultural Cooperative, , there is no data about the number of individuals, number of herds, or number of farms breeding this cattle breed or any other specific breed. The only data that RSIS collects is data about cows, pigs, sheep, goats and so on, without any breed determinant. The only program concerning these issues is the Cattle breeding program of the Republic of Srpska 2016-2022 (from 2016), which recognized Gatačko cattle in east Herzegovina as an autochthonous breed of cattle. The aim of the program is to establish a set of selection methods and procedures that result in the genetic improvement of cattle breeds in the RS.

Almost the entire sheep population in Bosnia and Herzegovina is Pramenka sheep (486,000 individuals in Republic of Srpska in 2015). All types of Pramenka are endowed with an excellent ability to survive and reproduce in harsh climatic conditions and on poor pastures, and they are not endangered.

The original Balkan goat has survived, perhaps with some influence of the imported Saanen, Togenburg and Alpine breeds. This breed can be found in the southeastern parts of country.

The majority of the horse population (approximately 70%) in BiH belongs to the autochthonous local breed of Bosnian Mountain Horse (or Bosnian Pony). The remaining 30% are crosses between Bosnian Mountain Horse and Lipizzaner and cold blood horses.

In RS there is no Gene Bank for preserving AnGR or any other type of *ex-situ* or *in vitro* conservation (cryopreservation of blood, tissue, genes, semen, oocyte, embryos, DNA). A positive, but unfortunately sporadic, example is given by the International Association of Bosnian Mountain

Horse Breeders (an international NGO), which conducted the deposition of genetic material (semen) of the Bosnian Pony into the gene bank in Ljubljana (Slovenia).

The *ex-situ in vivo* model of conservation is present for Busha cattle in the Centre for Rural Development and Improvement, in the Developing and Educative Centre “Manjača“, located in Banja Luka. This center is the only institution of this type that conserves any local breed of AnGR in the RS. The main problem with its functioning is in-breeding and genetic drift due to a small population size. Besides this example, there are two stud farms, “Borike“, near Rogatica (breeding of Bosnian Pony), and “Vučijak“, near Prnjavor (Lipizzaner horse). Unfortunately, both of these stud farms have been facing numerous problems for the past few years and are on the brink of closure.

A practical conservation and preservation activity to preserve animal genetic resources and agricultural biodiversity in the FBiH does not exist. Official institutions do not have any specific programs. There are no financial funds available for such activities and no system exists for the conservation of blood, tissues, genes, semen, oocytes, embryos or DNA.

In 2018, the City of Banja Luka started the inventory of genetic resources on the territory of the city. So far, a third of the territory has been inventoried. The Institute for Genetic Resources, as well as the Faculties of Natural Sciences, Mathematics, Forestry and Agriculture participated in the inventory.³

Fish biodiversity⁴ in BiH is a part of the VI report. There are several activities (projects) aimed at researching the biodiversity of fish, primarily in freshwater rivers and lakes (the sea coast of BiH is extremely small). There is no monitoring system. Researchers from several institutions are engaged in research of ichthyofaunal biodiversity (including the Faculty of Natural Sciences and Mathematics Sarajevo, the Faculty of Natural Sciences and Mathematics in Banja Luka, etc.). Research on aquatic genetic resources as a part of agricultural biodiversity for food and agriculture has recently begun through the Genetic Resources Conservation Program Republika Srpska⁵.

Montenegro

A comprehensive system for the collecting and managing of biodiversity data in Montenegro has not been established. Typically, activities on exploration and monitoring biodiversity are carried out only in the framework of different projects implemented by various organizations. There are no widely accepted procedures or systems for standardized collection, structuring, and integration of field biodiversity data. In the framework of different projects implemented in the previous period a significant amount of biodiversity data was collected, but the data is scattered across different institutions/experts, in which it is differently structured/formatted and stored on local computers, which impedes serious analysis and preparation of reports at national or regional level.⁶

³https://igr.unibl.org/?option=btg_novosti&idnovost=107/Inventarizacija/i/evaluacija/biljnih,/zivotinjskih,/sumskih/i/vodnih/genetickih/resursa/na/podrucju/Grada/Banja/Luka/%E2%80%93/prva/faza

⁴ VI Report to the CBD of BiH

⁵ Yearly reports on realization of program on genetic resources in Republika Srpska. Institute of genetic resources, University of Banja Luka <https://igr.unibl.org/>

⁶ National Assessment Of Biodiversity Information Management And Reporting Baseline For Montenegro. 2017. Open Regional Fund for South-East Europe – Biodiversity (ORF-BD) GIZ Country Office in Bosnia and Herzegovina.

Through cooperation with IUCN within the project “Toward Strengthened Conservation Planning in South-Eastern Europe”, supported by MAVA Foundation, the Agency for Nature Conservation and Environment established a web portal for protected areas in 2017. Analytical information is available, such as the number and total area of protected areas, number of nominated managers, management plans, etc. The database is available at: www.prirodainfo.me

Through the GIZ ORF Biodiversity Program – Biodiversity Information Management and Reporting System (BIMR) the following documents were prepared: National Assessment of Biodiversity Information Management and Reporting baseline for Montenegro, Guidelines for biodiversity information management and reporting, and Recommendations on supporting the BIMR in the SEE region. The project enabled creation of a Nature Conservation Information System database in Montenegro. This database uses software tools for the defined database structure (REST WEB services and WEB page). The database structure is based on the Darwin Core standard. One of the developed modules presented on the web page is the List of SEE Endemic Species, available at <http://zastitapriode.me>

The majority of new data on biodiversity collected in the period from 2014 to 2018. It was collected through development of conservation studies for protected areas by the Agency for the protection of Nature and Environment. The Agency for Nature Conservation and Environment conducts regular annual monitoring programs on the status of the environment, an integral part of which is biodiversity monitoring. This includes the inventory and assessment of status of all species and pressures in the researched areas. The areas under monitoring include national parks, parts of the coast, some inland mountainous ecosystems of ecological importance, and potential protected areas. When it comes to specific species, the monitoring covers birds, aquatic insects, malacofauna, herpetofauna, mammals, flora, and fungi in certain sites (mainly national parks or future protected areas).

The main and most significant systematic activities related to the exploration of biodiversity in Montenegro occurred between 2016. and 2018 and was implemented through the project “Establishing NATURA 2000 network”.

The contribution to research of land habitats came from a project funded by The Rufford Foundation. It included exploration of semi-natural grassland ecosystems as potential NATURA 2000 habitats in several sites.

Public Enterprise for National Parks carries out continuous explorations of species within all five national parks. This includes the inventory of species of vascular plants, transect surveys, and mapping of internationally or nationally important, endangered, and endemic species, as well as regular monitoring of birds (on Skadar Lake) and large mammals (Biogradska Gora and Durmitor).

According to the BIMR⁷ project, there are no standardized attributes set for biodiversity surveys. The general level of biodiversity data structuring is poor, with the data mainly being recorded in textual or Excel table formats and stored on local computers. The data is rarely structured and integrated for more efficient database management.

The National Forest Inventory was carried out in late 2010 and included the provision of mapping information using resources like ortho-photo images, remote sensing data, and field sampling. As

⁷ http://zastitapriode.me/doc/Montenegro%20Assessment_ENG.pdf

a result of the Inventory a database of forests at the national level was constructed. The Information system is set in the Institute of Forestry.

The Directorate of Fisheries, in cooperation with The Institute of Marine Biology, launched and now manages the database - the Fishing Information System – which contains various data about marine fisheries, including data on fish stocks, that is regularly recorded and updated

By implementing the National Program and Action Plan on the Conservation and Sustainable Use of Genetic Resources in Agriculture (2008-2013) before 2015, and via the implementation of projects such as SEED-NET, Montenegro had established a system for research and conservation of agro-biodiversity.

The first organized research expedition to investigate plant genetic resources in Montenegro started in 1987 and covered vines, fruits, and wheat. In the period from 2001 to 2006, as part of a short-term project assignment of the Federal Institute for Plant and Genetic Resources, researchers from the Faculty of Agriculture Novi Sad conducted several expeditions to collect wild wheat relatives from the *Aegilops* genus and local wheat populations from a number of localities in Montenegro. The aim of this project was to examine the genetic base of wild relatives and relationships with cultivated varieties based on cytogenetic and molecular study of the of wild relatives' genome.

The situation in this field changed significantly in 2004 when the SEEDNet (South East European Development Network on Plant Genetic Resources) project implementation began. This support significantly strengthened technical and human capacities related for the collection, preservation, and study of plant genetic resources. Thanks to the financial support of the SEEDNet project, a modern gene bank was founded at the Biotechnical Faculty in Podgorica in 2004.

Montenegrin plant gene bank (MGB) has all the equipment necessary for cleaning, drying, and packaging of seeds, the determination of moisture content, and for ensuring cleanliness and health of seeds and labelling of samples. Additionally, it is equipped for long-term storage of seeds (-20°C) and active collections storage (4°C). Furthermore, tissue culture and molecular identification laboratories were established. Activities on inventory, morphological characterization, regeneration, and genetic identification of indigenous species/varieties were significantly revived, and field fruit collections were enhanced. The Montenegrin gene bank includes eight very valuable field collections of fruit trees and *Vitis*: olive, fig, and pomegranate in the Center for Subtropical Cultures in Bar, and plums, pears, apple, cherries, in the Center for Continental Fruit, medicinal and aromatic plants in Bijelo Polje.

The Montenegrin Gene Bank has one of the richest collections of domestic, domesticated and introduced *Vitis* cultivars in the Balkans (this collection is under the auspices of the Centre for Viticulture, Wine and Fruit of the Biotechnical Faculty in Podgorica). It was created from an old collection that was built in the period since 1956 until 1960, and has been successively maintained to date. The old collection had over 500 varieties, but a significant number has been lost. During relocation of collections, carried out in 2002, 408 accessions *Vitis* cultivars were determined.

Montenegro, despite its small size, has a relatively large number of populations / breeds of farm animals. Busha breed is the only autochthonous or local cattle breed in Montenegro.⁸.

⁸ http://agricultural biodiversity.net/balkan/Pogradec/pdf/submitted_Papers/Genetic_diversity_Medugorac.pdf

The highest genetic diversity of all livestock sectors in Montenegro is present in the sheep population. In fact, for many past decades, as well as today, Montenegrin sheep production was mostly based on the rearing of autochthonous breeds, which are very well adapted to local rearing conditions. Today, six autochthonous sheep breeds exist: 'Pivska' or 'Jezeropivska pramenka', 'Ljaba', 'Zuja', and 'Sora', as well as 'Sjenicka' and 'Bardoka'. Some of them have become very small in numbers, and there is a real risk of extinction (such as the Zuja breed).

The Domestic Balkan goat breed makes up about 30% of the total goat population in Montenegro (about 8,000), while the share of the red variety is about 50%.

The Government of Montenegro, through the Ministry of Agriculture and Rural Development, implements the Program for the Preservation of Genetic Diversity of Domestic Animals in Montenegro, which has so far focused on encouraging domestic breeding for species of cattle (Busha) in Ulcinj, sheep (Pramenka) in the countryside of Pivaand on a farm in Pišće, as well as sheep from Zeta (Žuja). The program also assists in the establishment of insurance funds for the purchase of domestic species of livestock for breeding.

The estimated degrees of risk of some autochthonous breeds, as well as their importance, were defined as the priorities for inclusion in the *in-situ* conservation program. The National Program also defined the Biotechnical Faculty as the national focal point institution responsible for implementing the conservation program of farm animal genetic resources. Implementation of the *in-situ* conservation program started in 2008. The *in-situ* conservation program includes farmers who have almost uniform breeds on the farm i.e. they dominantly rear the animals of certain autochthonous breeds.

An *ex-situ* program of conservation of AnGR in Montenegro (national Gene Bank for AnGR) has not been officially established yet. The Department of Livestock Science of the Biotechnical Faculty and its laboratory for molecular genetic research has created a collection of genetic materials over the last five years, for a small gene bank of somatic cells and DNA of most of the Montenegrin autochthonous breeds, which are stored by freezing them in conditions of - 40°C. There are no zoos nor programs for breeding rare and endangered species in isolation or captivity.

North Macedonia

The first step towards establishing a National Biodiversity Information System (NBIS) in the Republic of Macedonia was made in the period 2010-2011, in the framework of the UNDP/GEF/MoEPP Project on protected areas.⁹

Primary biodiversity data collectors in Macedonia are universities, including their scientific institutes, museums, and some NGOs. The Institute of Biology at the Faculty of Natural Sciences and Mathematics at St. Cyril and Methodius University has the highest staff capacities in terms of biodiversity data collection. However, data is used in mainly within the scientific sphere and limited to small groups of scientists. This Institute collects data on fungi, vascular plants, aquatic invertebrates, selected groups of land invertebrates, algae (mainly diatoms), fish, amphibians and reptiles, birds and mammals, as well as on plant communities and habitats.

The Macedonian Natural History Museum in Skopje is the oldest institution specialized in biological science established in the country. It maintains the largest collection of species, and

⁹ https://balkangreenenergynews.com/wp-content/uploads/2017/08/Macedonia-Assessment_ENG.pdf

particularly of animal species. The collection is maintained by custodians of fossils, birds, vertebrates, insects, invertebrates and vascular plants. Data is not public (apart from several scientific papers) and are used mainly for maintenance of the collections.

The National Museum Nikola Nežbovski in Struga holds an interesting collection of flora and fauna.

The Hydrobiological Institute in Ohrid collects specimens primarily from Ohrid lake, but also from other natural lakes (Prespa and Doyran), and some river ecosystems. The research and collection is targeted towards fish fauna, zooplankton, phytoplankton, bottom-dwelling animal species (particularly aquatic snails), and fish parasites. This data is also used for scientific purposes and there is no public access.

A program of measures and activities for the collection of data on the extent of damage to forests is implemented by the Faculty of Forestry at Skopje University. A bylaw regulating details regarding the establishment of the Register is adopted by MAFWE. The Register is not available.

The Macedonian Ecological Society conducts research and monitoring of birds (with emphasis on vultures, birds of prey, and waterfowls), lynx and large carnivores, and plant species.

The first organized activities concerning PGR conservation and utilization in the Republic of Macedonia were undertaken during the period 1969-73, as a segment of a large project for collection of crop populations and landraces in the territory of the former Yugoslavia. Thousands of samples were collected and evaluated in Macedonia, while the seed samples were transferred to various gene banks in the USA. Passport, characterization, and evaluation information about these accessions are available in the GRIN database (Germplasm Resources Information Network) – a program within the U.S. Department of Agriculture.¹⁰ The field collection of fruit crops and grapevine has been gradually enlarged over the years, driven by the hard work of researchers from The Faculty of Agriculture and Food Science and The Agricultural Institute. The majority of the trees planted in 1970s were of foreign origin. The Institute of Southern Crops has created a very small collection of industrial and vegetable crops, while The Scientific Institute of Tobacco only preserves a collection of tobacco, and The Institute of Agriculture in Skopje was preserving a seed collection and a large collection of fruit crops and Vitis. All information regarding the collections was preserved by breeders, often in notebooks for their use only.

In 2003, GTZ supported a project “Initial activities for conservation of agricultural biodiversity in the Republic of Macedonia”, which was implemented by the Faculty of Agriculture and Food Science. The activities for inventorying the PGR and AnGR were carried out in 20 sites in the Maleshevo (13) and Strumica regions (7). Approximately 730 seed samples of local populations were collected and promoted in the Skopje Agricultural Fair in 2003.

Conservation efforts were increased in the period 2004-2010 within the scope of the SEEDNet project. The Institute of Agriculture in Skopje was appointed as the national gene bank. The medicinal and aromatic plants were planted at the Botanical Garden at the Faculty of Natural Sciences, Skopje. Finally, data on 2158 accessions were uploaded to the EURISCO database. After the finalization of SEEDNet support, the gene bank of IA consisted of 2666 accessions in total, out of which 1579 belonged to the seed collection, while the field collection was comprised of

¹⁰ http://seerural.org/wp-content/uploads/2018/09/Agricultural_biodiversity-Study-Macedonia.pdf

603, 439 and 45 accessions of fruit crops, *Vitis*, and MAPs, respectively. All activities were ceased after SEEDNet support termination.

The Department of Genetics and Plant Breeding at the Faculty of Agriculture and Food Science carried out intensive field collecting in the last decade. Currently, the seed collection consists of 5946 accessions of 72 crops, collected from 438 sites in 69 municipalities in Macedonia.

Small GEF projects have also supported the conservation of fruit varieties. Initial activities for preservation of rare pear varieties were implemented by the Business Club' organization from Kriva Palanka. A project for the preservation of the apple variety 'Ciganka' and the pear variety 'Sulija' was implemented by the Aronija Association from Delchevo in 2008, and reinforced in 2012/13. The same association implemented a project in 2006-2007 in the region of Pijanec for the preservation of the autochthonous blue plum variety "Banska". Preservation of autochthonous varieties of apricot (Krupna Skopjanka) and pear (Karamanka) in the vicinity of Markov Manastir (near Skopje) was initiated in 2014-15 by the association Eko Gol Drvo.

The first PGR *in-situ* conservation activity was undertaken in 2007 in collaboration with farmers for on farm conservation of 12 pear landraces and, later on, for other fruit trees, mostly with the projects supported by GEF. The *in-situ* conservation depends on the farmers' needs and decisions only.

Protection programs are running for Busha cattle, Ovchepolian sheep, and Srebra chickens. Farmers' participation and initiatives have been encouraged but are still not sufficient. All three breeding programs are in their early stages, and the outcomes have not yet been assessed.

The current animal gene bank is a public service provided by the Faculty of Agriculture and Food Science and the Faculty of Veterinary medicine, but the ownership of the genetic material maintained in the gene bank is under the auspices of the Republic of North Macedonia. *Ex-situ*, cryo-conservation of genetic material has been done for Busha cattle, Ovchepolian and Karakachanska sheep, and the local goat. For all conserved samples there is limited documented information publicly available.

Moldova

The existing national legislation has provided encouraging mechanisms for research activities in the field of genetics, and biodiversity conservation and monitoring.

The *ex-situ* conservation of native, domestic, or introduced species, including threatened species, is carried out through the collective work of research institutions, botanical gardens, dendrological parks, universities, and personal collections of scientific researchers.

The Botanical Garden (Institute) A. Ciubotaru holds important collections and exhibitions of spontaneous plants, with about 7.5 thousand taxa. The total plant genetic collection is about 11 thousand species, comprised of tropical and subtropical plants (2517), ornamental floral plants (1150), woody plants (2000), non-traditional agricultural plants (350), herbs (300), and aromatic plants (350).¹¹

¹¹ <http://www.gradinobotanica.asm.md/node/31>

The Botanical Garden of the Museum of Ethnography and Natural History displays exhibitions representing main types of forest, steppe, aquatic, and palustric vegetation found in the territory of Moldova, including rare and endangered plants and trees.

The herbarium of the State University of Moldova, the second largest herbarium in the Republic of Moldova, consists of 90 000 plant specimens, including 100 rare plant species.

The scientific reserves “Codrii” and “Plaiul Fagului” own about 400 plant specimens, including 30 species of rare plants.

The existing dendrological parks and gardens in the Republic of Moldova (21 parks with a total area of approximately 300 ha) are under state protection and maintain a collection with rare plant species of alien and autochthonous flora.

The National Program for Vegetable Genetic Resources for Agriculture and Food in Moldova has been developed under the FAO project “Support for Development National Program for Vegetable Genetic Resources for Food and Agriculture in Moldova” (2015-2017). At present, the National Program for Vegetable Genetic Resources for Agriculture and Food in Moldova is undergoing an approval process.¹²

The vegetable agricultural biodiversity of the Republic of Moldova, including their wild relatives, is preserved *ex-situ* in the experimental fields and seed collections maintained by the research institutions: the Institute of Genetics, Physiology and Plant Protection, the Scientific-Practical Institute of Horticulture and Food Technologies, the Institute of Practical Science Phytotechny “Selectia”, and the Institute of Phytotechnology “Porumbeni”.

Moldova was a partner in the regional SEEDNet project and the Institute of Genetics and Plant Physiology participated in it.

In the Catalog of Plant Varieties of the Republic of Moldova (2016), a total of 3016 plant varieties and hybrids of cultivated plants were introduced, of which 198 were new, including cereals – 396 varieties, oilseeds – 295, technical plants – 93 varieties, forage – 36 plants, aromatic and medicinal plants – 36 varieties, vegetable species – 829 varieties, ornamental plants – 64, fruit trees and shrubs – 328 varieties, 36 – vine rootstock, grape varieties – 93 varieties, and vine clones – 161 varieties.¹³

The Gene Bank’s seed collection at the Institute of Genetics, Physiology and Plant Protection maintains genetic material of about 5.4 thousand samples from 34 botanical families, 145 genus and 223 species, including the most important cereal plant varieties (wheat, rye, barley, triticale etc.), corn (over 700 samples), legumes (beans, chickpeas, lentils etc.), vegetables (tomatoes – 820 varieties, peppers – 200 genotypes, eggplants – 60), and aromatic and medicinal (150 species).¹⁴

The collection samples of traditional agricultural plants from peasant households, includes the following varieties: *Zea mays* subsp. *everta*, *Z. mays* ssp. *indurata*, *Z. mays* ssp. *indentata*, *Z. mays* ssp. *semidentata*, *Z. mays* ssp. *saccharata*; *Phaseolus vulgaris*, *Phaseolus coccineus*; *Vicia faba*, *Cicer arietinum*, *Pisum sativum* and *Lathyrus sativus*; *Solanum lycopersicum* and its varieties; other species: *Cucurbita maxima*, *Allium sativum*, *Capsicum annuum*, *Allium cepa*,

¹² <http://maia.gov.md/ro/categorii/proiecte-de-asistent-a-externa-sectorul-agroalimentar>

¹³

¹⁴ <http://igfpp.asm.md/en/node/302>

Cucurbita pepo, *Anthum graveolens*, *Petroselinum crispum*, *Cucumis sativus*, *Solanum melongena*, *Daucus carota*, *Solanum tuberosum*, *Citrullus lanatus*, *Levisticum officinale*, *Cucumis melo* etc.

In the rural households, some species of aromatic and medicinal plants, such as *Ocimum basilicum*, *Thymus vulgaris*, *Calendula officinalis*, *Tagetes officinalis*, and *Mentha sp.* were collected.¹⁵

In total, over 1 100 varieties, 1 500 inbred lines, and 1 400 of mutants of maize are maintained, and over 2 000 hybrid combinations are tested annually in the Institute of Phytotechnology “Porumbeni”.¹⁶

The Scientific and Practical Institute of Horticulture and Food Technologies¹⁷ maintains the National Collection of Microorganisms for the Oenological Industry via the Laboratory “Biotechnology and Microbiology of Wine”. There are 103 strains of *Saccharomyces* of different species such as: *Saccharomyces vini* – 58 strains; *Saccharomyces cerevisiae* – 24 strains; *Saccharomyces bayanus* – 9 strains; *Saccharomyces oviformis* – 5 strains; *Saccharomyces uvarum* – 3 strains stored in the collection; *Saccharomyces steineri* – 2 strains; *Saccharomyces pasteurii* – 1 strain; and *Saccharomyces walk* – 1 strain.

The National Forestry Agency Moldavia maintains the forest seeds. The Seed collection consists of 242 arboretum units and 79 trees for forestry seed production. The total area of the units is 3 924.4 ha.

The genetic stock of farming animals includes breeds developed in the country as well as breeds introduced from abroad.

The Animal Breeding Farm Bardar Zooclub was the first ostrich breeding farm, and over the years it has been developed into a livestock breeding business, so that today it contains a large collection of domestic and exotic animals such as ostrich, horses, pony, goats, sheep, alpaca, kangaroo, pigs, pheasant, swans, pumped, quail, crowned corners, and rabbits, etc.

<http://www.zooclub.md/>

The Scientific and Practical Institute of Biotechnologies in Animal Breeding and Veterinary Medicine undertake research activities on animal breeding. <http://agriculture.cia.md/tevit/>. The total breed variety refers to the following: cattle breeds, such as Baltata cu negru, Simmental, Jersey, Rosie de stepa, Rosie Estona, Holstein, Ayrshire, Charolaise and Hereford; horse breeds such as Orlov, Don, Vladimir of traction, mule, Singe Pur Englezasc, Arabic origin, ahal-techin, poney; pig breeds are represented by: Estoniana de-bacon, Big White, Landrace, Ukrainian steppe White, Tip Moldovenesc de carne, Duroc and Hampshire; – sheep breeds – Karakul, Tigae, Friza, Latona cu cap negru, Suffolk; goat breeds: Saanen, French alpine, Angora; rabbit races: Uriasul alb, Uriasul sur, Chinchilla mare, California; chicken breeds: Leghorn, Git Golas Moldovenesc, Argintie de Adler, Kucino, Rhode Island, Plymouth Rock, New-Hamshire, Cornisch; turkey breeds: Bronzata cu pieptul larg. Alba cu pieptul larg, Bronzata Nord-Caucaziana and Bibilici; goose breeds: Holmogor, Italian white, Cuban and Chinese; duck

¹⁵ <http://lex.justice.md/index.php?action=view&view=doc&lang=1&id=298165>

¹⁶ <http://porumbeni.md/>

¹⁷ <http://Agriculture.Cia.Md/Ispha/Index.html>

breeds: Pekin, Oglinda, Sur Ukraineana, Lesasca; fish species – carpus, carasus, carpus of Asia, polyodon spathula (Walbaum).¹⁸

The Institute of Microbiology and Biotechnology maintains the National Collection of Non-pathogenic Microorganisms, which has stored 28 strains of microorganisms from different systematic groups.¹⁹

Serbia

A national information system for biodiversity (NISB) to implement biodiversity monitoring and biodiversity research is prescribed in the current NBSAP aims. Work in this strategic area has just begun.²⁰

In Serbia, there is a system in place for several years for the monitoring of selected birds and butterfly species. The data is collected that pertains to the trend of changes in population abundance of selected butterfly and bird species from forest and meadow habitats. The change in the population of butterflies indicates the loss, but also changes in the structure of their habitats, due to fragmentation and isolation, as well as other changes in the environment that directly or indirectly affect the change in population structure. This measure is monitored through indicators which relate to the number of populations of selected butterfly species and population growth through time and in different habitats. Changes in the most important types of habits are presented according to CORINE Land Cover and EUNIS.

The number of cultivated agricultural species in the Republic of Serbia exceeds 150. However, it is difficult to estimate overall agro-biodiversity due to the thousands of genotypes, hybrids and cultivars in use.

Conservation of plant genetic resources in Serbia is implemented in two ways: *in-situ* (on farm) and *ex-situ*. Measures of *in-situ* protection are applied to protect autochthonous and old cultivars, or populations of cultivated plants in their natural habitats, through so-called ‘on farm’ conservation, at the holdings and lands of the farmers. There is no legislation regulating genetic resources’ protection or ‘on farm’ conservation efforts. Genetic resources of fruit plants and vines in the Republic of Serbia are usually grown *in-situ* in private orchards and/or in cooperation with state institutions.

National collections are kept within various scientific institutions, for example: The Institute for Field and Vegetable Crops, Novi Sad; the Institute for Forage Crops, Krusevac; the Institute for Small Grains, Kragujevac; the Institute for Vegetables, Smederevska Palanka; the Institute for Potatoes, Guca; the Institute for Fruit Growing, Čačak, as well as in the Faculties of Agriculture of the Universities of Novi Sad and Belgrade. The Institute for Maize Zemun Polje hosted both Serbian and European maize collections. The Plant Gene Bank in Batajnica is a functional part of the Directorate for Nationally Referent Laboratories.

¹⁸ <http://madrm.gov.md/sites/default/files/Raport%20SNDAR%202>

¹⁹ <http://imb.asm.md/index1-0-0-0-ro.htm>

²⁰ VI National report to UNCBD of Republic of Serbia

Because of the laws and bylaws on genetic resources protection, their use has yet not been adopted. Therefore, the matters of conservation, and access to and use of genetic resources are not governed adequately.

The total number of *ex-situ* accessions in Serbia was estimated about 25 000. The most represented species are the economically important crops (maize, wheat, sunflower, barley). The national plant collection is stored in the Plant Gene Bank, and it contains 4 238 accessions of 249 plant species.

One of the world's biggest collections is kept at the Institute for Maize Research in Belgrade, consisting of 5,475 accessions, out of which 2,217 are local, domestic populations and the rest is material bred by the Institute (more than 600 hybrids) and material introduced from around 40 countries.

The Institute for Field and Vegetables, Novi Sad, keeps about 400 genotypes of spring wheat collected from all over the world, 495 barley genotypes, as well as 5,000 sunflower genotypes of various origins, which are used in breeding programs; 800 genotypes of soybean, 60 accessions of grapevine seed; 69 castor oil plant cultivars from 23450 genotypes of sorghum; 39 hemp genotypes.

The largest number of vegetable accessions is conserved *ex-situ* in the National collection (733). The collection is mostly comprised of local populations.

Concerning fruit conservation, the total number of genotypes maintained in Serbia for the *Prunus* species is about 2,400, having in mind that a number of duplicates exist due to synonyms. There is no information for pomes fruit (*Maloideae*) numbers, but a number of autochthonous cultivars, which are conserved *ex-situ*, are higher than 150 (for example, more than 50 local apple genotypes are kept in the Institute for Fruit Research, Čačak). When it comes to pear, the most valuable collection of autochthonous cultivars is comprised of 70 genotypes, and it is situated in Novi Sad (Faculty of Agriculture). Sour cherry, sweet cherry, peach, walnut, apricot, hazel, dewberry, currants and some others are conserved *ex-situ* in the Faculty of Agriculture, Novi Sad and the Institute for Fruit Research, Čačak. The richest collections of grape accessions exist in the Faculty of Agriculture, Belgrade (in the Experimental School Station Radmilovac, with about 550 genotypes), and in the Faculty of Agriculture, Novi Sad (Experimental station in Sremski Karlovci, with more than 200 genotypes), as well as the Center for Fruit Production and Viticulture, Niš (195 grape genotypes).

There are different documentation systems at different stakeholder institutions. The database of 1,300 maize accessions of the Maize Research Institute has been completed, and that institution holds ECPGR database²¹. Data of the complete maize collection have been already uploaded to EURISCO (5475 accessions). Data on the fruit collection will be transferred to EURISCO soon.

For soybean, the database is available from the web site of VIR, concerning 800 accessions from collection of the Institute for Field and Vegetables, Novi Sad.²²

The Republic of Serbia possesses unique breeds of domestic animals created through long-term selection processes conducted by humans and influenced by natural conditions present in particular regions. However, the depopulation of mountainous areas, coupled with the neglect and

²¹ <http://www.mrizp.rs/emdb/default.htm>

²² <http://vir.nw.ru>

abandonment of livestock production in marginal areas, has led to the extinction of many breeds of domestic animals.

The List of genetic reserves of domestic animals, conservation methods of genetic resources of domestic animals and the List of indigenous breeds of domestic animals and endangered indigenous breeds (“Official Gazette of the Republic of Serbia”, Issue 38/10) recognized the following autochthonous breeds of domestic animals in the Republic of Serbia: domestic turkey, domestic duck, Danubian goose, domestic guinea fowl, Serbian High-flyer pigeon, and the Serbian Sarplaninac (Sar Mountain) Sheppard dog. The status of the following breeds is unknown: baljusa (Black-head Pramenka from Metohija), East-Serbian chicken, Novi Pazar goose, as well as non-standardized breeds of dogs used to protect herds (Serbian Sheppard), or those used as working dogs for herd management (pulini). There is support for *in-situ* maintenance.

Regarding *ex-situ* conservation, there is a stock of about 5,000 doses of semen from only two Busha bulls. This action is performed under the private initiative of the Centre for Reproduction and Artificial Insemination from Velika Plana, but is not financially supported by the state. Serbia has no Genbank for animal genetic resources.