Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH,
Rural development through Integrated Forest and Water Resources Management in Southeast Europe (LEIWW)
Antonie Grubisic 5, 1000 Skopje, 
Macedonia

Regional Rural Development Standing Working Group in SEE (SWG)
Bvl. Goce Delcev 18, MRTV Building, 12th Floor, 1000 Skopje, 
Macedonia

The analyses, conclusions and recommendations in this paper represent the opinion of the authors and are not necessarily representative of the position of the Regional Rural Development Standing Working Group in SEE (SWG) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Authors: Ms. Zora Dajic Stevanovic, PhD; Ms. Suzana Djordjevic Milosevic, PhD

Edited by: Ms. Sonja Ivanovska, PhD; Mr. Sreten Andonov, PhD; Ms. Irena Djimrevska, PhD; Mr. Hugo Rivera, PhD; Mr. Helmut Gaugitsch, PhD; Mr. Andreas Bartel, PhD; Mr. Stefan Schindler, PhD

Language proofreading: Mr. Jason Brown and Ms. Jana Vasilevska
Design: Mr. Filip Filipovic

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AE</td>
<td>Agro-Environmental</td>
</tr>
<tr>
<td>AEGIS</td>
<td>European Genebank Integrated System</td>
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<td>AnGR</td>
<td>Animal Genetic Resources</td>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CEFTA</td>
<td>Central European Free Trade Agreement</td>
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<tr>
<td>CSO</td>
<td>Civil Society Organization</td>
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<td>DNA</td>
<td>Deoxyribonucleic Acid</td>
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<tr>
<td>ECCDB</td>
<td>EU Central Database on Crops</td>
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<tr>
<td>ECPGR</td>
<td>The European Cooperative Programme for Plant Genetic Resources</td>
</tr>
<tr>
<td>EPGRIS</td>
<td>Establishment of PGR Information Infrastructure System</td>
</tr>
<tr>
<td>EUR</td>
<td>Euro (currency)</td>
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<tr>
<td>EURISCO</td>
<td>European Search Catalogue</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<tr>
<td>GAO</td>
<td>Gross Agricultural Output</td>
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<tr>
<td>GEF</td>
<td>Global Environmental Facility</td>
</tr>
<tr>
<td>GMO</td>
<td>Genetically Modified Organisms</td>
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<td>GVA</td>
<td>Gross Value Added</td>
</tr>
<tr>
<td>HDL</td>
<td>High Density Lipoprotein</td>
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<tr>
<td>HNVF</td>
<td>High Nature Value Farming</td>
</tr>
<tr>
<td>IBA</td>
<td>Important Bird and Biodiversity Area</td>
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<tr>
<td>IPA</td>
<td>Instrument for Pre Accession Assistance</td>
</tr>
<tr>
<td>IPARD</td>
<td>Instrument for Pre Accession Assistance for Rural Development</td>
</tr>
<tr>
<td>ITPGRFA</td>
<td>International Treaty on Plant Genetic Resources for Food and Agriculture</td>
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<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
</tr>
<tr>
<td>LDLC</td>
<td>Low Density Lipoprotein</td>
</tr>
<tr>
<td>LEADER</td>
<td>LEADER Liaison entre action de développement de l’économie rurale Linkage between actions to develop the rural economy</td>
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<tr>
<td>MAFWM</td>
<td>Ministry of Agriculture, Forestry and Water Management</td>
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<td>NGO</td>
<td>Non Governmental Organization</td>
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<tr>
<td>NPC</td>
<td>National Plant Collection</td>
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<td>PGR</td>
<td>Plant Genetic Resources</td>
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<tr>
<td>RAPD</td>
<td>Random Amplification of Polymorphic DNA</td>
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<tr>
<td>RS</td>
<td>Republic of Serbia</td>
</tr>
<tr>
<td>RSD</td>
<td>Serbian Dinar (currency)</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>SAA</td>
<td>The Stabilization and Association Agreement</td>
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<td>SAVE</td>
<td>Saveguard for Agricultural Varieties in Europe</td>
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<tr>
<td>SEEDNet</td>
<td>South East European Development Network on Plant Genetic Resources</td>
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<tr>
<td>SEK</td>
<td>Swedish Krona (currency)</td>
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<tr>
<td>SIDA</td>
<td>Swedish International Development Cooperation Agency</td>
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<td>SORS</td>
<td>Statistical Office of the Republic of Serbia</td>
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<tr>
<td>SSR</td>
<td>Simple Sequences Repeats</td>
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<tr>
<td>UAA</td>
<td>Utilized Agricultural Area</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children's Fund</td>
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<tr>
<td>UNWTO</td>
<td>World Tourism Organization</td>
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<tr>
<td>UPOV</td>
<td>Union for the Protection of New Varieties of Plants</td>
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<tr>
<td>WB</td>
<td>World Bank</td>
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<tr>
<td>WIEWS</td>
<td>World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture</td>
</tr>
<tr>
<td>WISM-GPA</td>
<td>World Information Sharing Mechanism on GPA</td>
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FOREWORD AND ACKNOWLEDGMENTS

The three-year project “Rural Development through Integrated Forest and Water Resource Management in Southeast Europe (LEIWW)” is jointly implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Standing Working Group for Regional Rural Development (SWG RRD).

The project aims to improve the regional capacities for sustainable management of natural resources for the development of rural areas of Southeast European countries: Albania, Bosnia and Herzegovina, Kosovo*, Macedonia, Montenegro and Serbia.

As part of the EU (pre-) accession process, the countries of Southeast Europe (SEE) are committed to the harmonisation of their strategies, policies and legislation with the acquis communautaire of the EU and to build the conditions and capacities for their implementation.

Therefore, one of the main objectives of the LEIWW project is to create preconditions for evidence-based, EU-compliant policy formulation regarding the conservation and sustainable use of genetic resources in agriculture (agrobiodiversity). Agrobiodiversity is essential for the sustainable development of agricultural production, nature conservation and adaptation to climate change, as well as for the welfare of the people living in rural areas.

In line with this objective, evidence-based policy assessments and gap analysis related to agrobiodiversity were performed in a regional process involving leading experts and institutions of all SEE countries and entities aiming to identify priorities and to formulate recommendations for mainstreaming agrobiodiversity in agriculture and rural development policies, strategic plans, programmes and relevant legislations.

On this occasion, SWG and GIZ would like to express our appreciation to the Ministries of Agriculture and Rural Development from the SEE region for their dedication and active contribution to the process.

The appreciation particularly includes the regional coordinators Prof. Sonja Ivanovska and Prof. Sreten Andonov from the Faculty of Agricultural Sciences and Food, St. Cyril and Methodius University of Skopje, all participating experts and institutions, as well as the team of international experts from the Environment Agency Austria (Umweltbundesamt, GmbH).

The coordination of the process by Ms. Irena Djimrevska, GIZ and Ms. Katerina Spasovska, SWG, as well as the technical assistance of Ms. Jana Vasilevska, GIZ and Mr. Oliver Pop Arsov, SWG is highly acknowledged.

We would like to thank you all for having contributed to this major work!

On behalf of the SWG Secretariat
Mr. Boban Ilic
Secretary General

On behalf of GIZ LEIWW
Mr. Benjamin Mohr
Team Leader
Southeast European (SEE) countries are rich in agrobiodiversity. Farming systems are built on a broad range of divergent local and autochthonous plant varieties and animal breeds of international importance. In times of ecological and economic pressure the treasure of diversity is at risk, distinction is irreversible and hinders today’s and tomorrow’s welfare, resilience and adaptive capacity. Strong links between agrobiodiversity, traditional knowledge, cultural diversity and local innovations are evident in the region and are part of its unique and rich character. In contrast to the developed countries, often less rich in agrobiodiversity, but equipped with strong policies for supporting preservation, sustainable use and promotion of genetic resources, Southeast European countries still struggle to establish an adequate framework for conservation and sustainable use of plant and animal genetic resources.

Moreover, the public, political and scientific awareness on the essential role of agrobiodiversity is on very different, mostly low levels, followed by (in-)different legislative, low institutional and financial support. Finally, all countries of SEE are facing two strong factors leading to inevitable loss of the still existing valuable genetic resources in agriculture: aging and migration of the rural population.

Conservation and sustainable use of genetic resources in agriculture are essential for the sustainable development of agricultural production, food security, adaptation to climate change, as well as for the socio-economic development and welfare of rural areas. Strong international governance structures, such as the Convention for Biodiversity (CBD) are in place, while the EU countries developed support mechanisms for safe-guarding agrobiodiversity. The SEE region, however, is lagging behind in defining and implementing support policies for conservation and sustainable use of its still rich agrobiodiversity.

National and regional policy assessments and gap analysis have been conducted in a process in ownership of the SEE countries (Albania, Bosnia and Herzegovina, Kosovo*, Macedonia, Montenegro and Serbia) in order to provide recommendations for EU compliant policy development relevant for the conservation and sustainable use of agrobiodiversity.

The assessment focuses on an analysis of the current national legislative and institutional status, trends of agrobiodiversity and its protection in the SEE countries. They also focus on identification of gaps, highlighting the necessary changes, reforms and harmonization of the legal base in respect to the Common Agricultural Policy (CAP), NATURA 2000, EU Biodiversity Strategy and Biodiversity Action Plan for Agriculture, Global Plan of Action for Plant Genetic Resources, Global Plan of Action for Animal Genetic Resources and Convention for Biodiversity (CBD).

Key problems and challenges requiring policy interventions are identified, and policy recommendations that will assist the EU integration process of the candidate and potential candidate countries are formulated and disseminated.

The work has raised awareness regarding the importance of agrobiodiversity in the SEE countries, in particular regarding the incentives for conservation and adding value to agrobiodiversity in order to enhance the rural welfare thus maintaining traditions, passing on the local knowledge and ensuring food security.

The assessments, gap analysis and policy recommendations were prepared by academic experts (one for animal genetic resources and one for plant genetic resources from each of the SEE
countries/entities), in cooperation with representatives of the respective Ministries of Agriculture and Rural Development, and coordinated by a team of experts from the Faculty of Agricultural Sciences and Food at the St. Cyril and Methodius University in Skopje.

Considering that the agrobiodiversity heritage of the SEE countries is without boundaries, shared, or mutually owned, while the EU accession process represents a common framework for the whole region, the issue of agrobiodiversity affects not only the national levels of each SEE country, but also touches upon the aspects of regional coordination and cooperation. Key challenges and reform priorities at regional level are presented in the Regional Synthesis Report prepared by the Environment Agency Austria, in their position as international backstopping institution.

The assessments were performed in the period between June 2017 and April 2018, through a process of research, consultations, peer learning and networking, both on national and regional level. During this period of time, four coordinative regional working meetings of the experts and Ministries were held.

All the information presented here are as of December 2017.

*This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence*
1. SOCIO-ECONOMIC, INSTITUTIONAL AND LEGISLATIVE CONTEXT

1.1. GEOGRAPHICAL AND POLITICAL CONTEXT

The Republic of Serbia covers 88,499 km². It is located in the south-eastern part of Europe, landlocked, and traversed by the River Danube valley. The Danube’s watershed includes the Sava and Morava rivers and their tributaries. Serbia has diverse terrain, ranging from the rich, fertile plains in the Vojvodina region to the north, to the limestone ranges and basins in the east. In terms of altitude, hilly-mountain terrain (over 500 meters) covers 33,992 km², or 38.47% of the Serbian territory; mountain terrain (exceeding 1,000 m) covers 9,887 km² (11.19%). Medium high mountains with altitudes of between 1,000–1,500 m are spread over 9,681 km²; and the high mountains (over 1,500 m) cover just 206 km².

The country can be divided into three zones: Vojvodina, Central Serbia, and Southern Serbia. The Southern Serbian zone is the largest, covering 44% of the total land area. It is also the poorest, least developed region and includes most of Serbia’s mountains. Of the total area of Southern Serbia, 37% is classified as forest and 55% as agricultural land.

The Republic of Serbia has a moderate-continental climate with a few local variations. The north experiences a continental climate, with cold winters, hot, humid summers and a uniform pattern of rainfall. The south has an Adriatic climate, with hot, dry summers and autumns and relatively cold winters with heavy snowfall inland. For areas up to 300m in altitude, the average annual air temperatures was 10.9oC for the period 1961–1990; around 10.0ºC for areas with altitudes between 300 to 500 m; and around 6.0ºC at altitudes over 1,000 m. On average, annual precipitation in lower regions, annual precipitation ranges from 540 to 820 mm; from 700 to 1,000 mm in areas over 1,000 m; and some mountain summits in south-western Serbia have rates of precipitation of up to 1,500 mm.

The current population of Serbia, according to the SORS – Statistical Office of the Republic of Serbia (the estimate on January 1st 2017) was 7,040,272. The average age according to SORS is 42.9 years. According to the census data there are 1.44 million people working on agricultural holdings in Serbia.

According to the Statistical Office of the Republic of Serbia, SORS (2016 updated 30.6.2017.), the total GDP per capita at current prices was 4,200,197.1 million RSD (34,115.2 million euro), GDP per capita was 595,070 RSD (4,833 euro), and Quarterly Gross Domestic Product between 2nd quarter of 2016 and 2017 have real growth of 1.3%. The overall external trade in the Republic of Serbia for the period January – July 2017 amounted 19,890.5 million euro, which was an increase of 13.1% compared to the same period in 2016. Agricultural products (cereals and produces thereof and various sorts of drinks), iron and steel, road vehicles, metal products, as well as exports of various finished products are predominant. European Union member countries account for 64.8% of the total external trade. A second major partner of Serbia refers to the CEFTA countries.

The main pillars of development in Serbia are defined within the Strategy for Sustainable Development of Serbia, valid through 2017 as sustainability based on knowledge, socio-economic conditions and prospective and environment and natural resources. Sustainable development...
strategy is emphasizing equal opportunities for eradicating poverty. Within sustainable economy development the basic development goals of Serbia are:

1. Economic growth – people have the right to have a better quality of life, which includes technological prosperity, structural changes, productive employment and strengthening of competitiveness.
2. Increase employment and decrease unemployment – providing the possibility for people to support themselves entirely based on their own work.
4. Sustainable regional development – decrease of the influence of the “curse of territorial origin” i.e. to regional development disparities.
5. Social responsibility, social balance, and increased social cohesion.
6. Life in society and economy with less macro and micro risks.

Accession to the European Union remains Serbia’s strategic goal, which rests on a wide political and social consensus. According to the Ministry of Foreign Affairs of the Republic of Serbia, the state of the Serbian integration is as follows: The Republic of Serbia signed the Stabilization and Association Agreement (SAA) with the European Union on 29th April 2008, and applied for EU membership on 22nd December 2009. On 28th June 2013 the EU decided to open accession negotiations with the Republic of Serbia.

The acceleration of the EU integration processes has resulted in numerous policy and institutional improvements. The Strategy for Agriculture and Rural Development was adopted for the period of 2014-2024. The National Programme for Agriculture and the National Programme for Rural Development, which were supposed to define mid-term policy objectives and their implementation, have not been adopted. In the meantime, the Law on Agriculture and Rural Development was replaced by the Law on Incentives in Agriculture and Rural Development (“Sl. glasnik RS“, no. 10/2013), which does not predict the need for a policy framework for the mid-term period. Therefore, agricultural policy is still implemented based on the annual regulations (“Sl. glasnik RS“, 142/2014, 103/2015 i 101/2016 based on the Law on Incentives in Agriculture and Rural Development), while the support measures are being implemented based on secondary legislation (rule books).

The support measures are envisaged by the Law on Incentives in Agriculture and Rural Development, including changes in relation to the previous law. The maximum amount of direct payments will depend on the available resources (defined by the annual law on budgets). The operationalization of agricultural policy is regulated by: The Annual Regulation on the Allocation of Subsidies in Agriculture and Rural Development), which defines the total funds, the type and the maximum amounts for certain incentives, and annual rulebooks on conditions and methods for exercising the right to support for particular measures, which stipulate in detail the amount of support, the eligibility criteria and the method of exercising both the rights and the responsibilities of beneficiaries.

The main strategic document has been supplemented by a multi-annual implementation programme. In parallel, the Instrument for Pre-Accession Assistance for Rural Development (IPARD) programmes were also prepared; however, the establishment of the necessary institutions for implementing the IPARD programme has not been completed, which has resulted in delays in using EU funds.
1.2. AGRICULTURAL PRODUCTION

Serbia’s natural potential and physical resources make it a country with a respectable capacity for growth in its agro-food sector, in terms of productivity and competitiveness. The contribution of agriculture to the Serbian economy is considerable. Over the last decade the share of agriculture in total gross value added (GVA) decreased from over 12% to about 10%, whereas the share of agriculture in employment remains over 20%.

Due to its biophysical and climatic conditions, Serbia has favourable natural conditions for diversified agricultural production. The 2012 Agricultural Census recorded 3,861,000 hectares of agricultural land, out of which 3,437,000 hectares (89%) are utilized agricultural area (UAA). UAA accounts for 44% of the total Serbian area and about 2% of the EU-27 UAA. Arable land dominates the land use structure. Both UAA per capita and the arable land per capita are above the EU-27 averages.

Heterogeneity of natural conditions, wide regional imbalances and historical heritage has contributed to a highly diverse farm structure. Along with small subsistence agricultural households there are semi-subsistence farms, large family farms, as well as privatized large enterprises (formerly state-owned) with a mixed ownership structure. The average farm size is 5.4 ha UAA, which is 2.7 times below the EU-27 average (14.4 ha in 2010). However, in the northern parts of the country, the Panonian planes of Vojvodina Province, the farm structure is more favourable with the average size of farm being 10.9 ha. In general, the highest proportion of agricultural holdings (48.8%) has no land or up to 2 ha and use about 8% of the UAA. In contrast to this, the biggest farms (over 50 ha) account for a mere 1% of the total number of farms, but occupy around one third of the total UAA.

Serbia is one of Europe’s most important crop producers, especially in maize (11% of EU-27 production), soya (35%), sunflowers (6%) and sugar beet (2.5%). On the other hand, the share of livestock products is much lower, exceeding 1% of EU-27 production only in cow’s milk, lamb and pork. About two-thirds of Serbia’s Gross Agricultural Output (GAO) comes from crop production, and one-third from animal production. Cereals, particularly maize and wheat, hold the dominant position in the GAO structure, accounting for 30-35%. The production of fruit and vegetables accounts for approximately 20% of the GAO, while industrial crops contribute 9% to total GAO. The contribution of livestock to the GAO has declined, largely due to negative developments in the meat sector, where the contribution of both pig meat and beef production have shown a downward tendency in recent years. Of all the livestock products, pig meat (11-14%) and cow’s milk (8-10%) contribute the largest shares to the GAO.

1.3. INSTITUTIONAL AND ADMINISTRATIVE SET-UP

Ministry of Agriculture, Forestry and Water Management (MAFWM) is responsible for agrobiodiversity conservation on a policy level. The Ministry is also responsible for implementing international policies and agreements related to sustainable conservation and utilisation of plant and animal genetic resources in Serbia. This includes implementation of the FAO Global action plan for plant and animal genetic resources and responsibility over Interlaken declaration. MAFWM provides budgetary support to operations in the field and on farm conservation, mainly supporting farmers that hold plant genetic resources (old varieties and local populations of crops) and animal collections. The MAFWM occasionally supports research and development projects. The Ministry establishes both regular and occasional professional commissions which are in charge of reporting...
to the Serbian Government or contribute to Country reports at the supranational level, such as to the FAO. The Ministry coordinates all activities for implementation of the National Program (not yet adopted officially) at the national, regional and local level, adopts normative acts from the scope of preservation of plant and animal genetic resources, conducts international cooperation with relevant international organizations, prepares international reports, maintains a register of varieties in use, as well as breeders of locally adapted breeds, establishes the information system for animal genetic resources, keeps and updates the national database on an annual basis based on the reports submitted by the main breeders organization, gene bank, research institutions and other relevant organizations.

The National Plant Gene Bank was established as a consequence of Article 41 of the Food Safety Law, in 2015, as a part of the Directorate of National Reference Laboratories of the Ministry of Agriculture, Republic of Serbia. The Plant Gene Bank performs activities related to the preparation of protocols for plant gene bank needs, keeping a collection of seeds and plant material, registration of seed samples, their cleaning, drying, packing, storage and maintenance, reproduction and regeneration of samples, storage of duplicate samples of seeds, organization of maintenance of plant material collection, sharing samples with other gene banks, creation of national program for plant genetic resources, realization of international (funding) projects, development of a database on plant genetic resources, cooperation with scientific research institutions, and carrying out other tasks in this area. The National Gene Bank keeps the National PGR collection, comprising from over 4,000 accessions, mainly of local and autochthonous populations, as well as old varieties.

The high number of PGR in Serbia is the result of an existence of several research and breeding institutes and organizations dealing with different aspects of PGR (maintenance of collections, breeding programs, regeneration, multiplication, characterization, etc.). Therefore, it must be stressed that conservation, management and utilization of plant genetic resources are decentralized in Serbia, and that the responsibility is shared among several agricultural institutes and some other organizations, such as: the Institute for Field and Vegetable Crops, Novi Sad (cereals and maize, fodder crops, industrial crops, minor crops, established in 1938, created and developed over 1000 of varieties and hybrids of crops, see http://nsseme.com); Institute for Maize Research, Zemun-Polje, Belgrade (maize, cereals, some under-utilized crops, established in 1945, over 600 of maize hybrids developed, see www.mrizp.rs); Institute for Forage Crops, Krusevac (forage crops and wild crop relatives, established in 1959, over 40 varieties of perennial legumes and grasses developed, see www.ikbks.com); Institute for Vegetables, Smederevska Palanka (vegetables and wild crop relatives, established in 1946, over 120 varieties of vegetables developed, see http://www.institut-palanka.co.rs); Fruit Research Institute, Cacak (fruits, established in 1961, about 35 fruit varieties developed, see http://www.institut-cacak.org); Institute for Medicinal Plant Research “Dr Josif Pancic”, Belgrade (medicinal and aromatic plants, established in 1948, keeps collection of more than 50 MAP species, see www.mocbilja.com); Faculties of Agriculture of the Universities of Novi Sad (fruit and grape collection at experimental station in Sremski Karlovci) and Belgrade (fruit and grape collection at experimental school Radmilovac), Institute for Biological Research “Sinisa Stankovic”, Belgrade (wild crop relatives and medicinal plants in vitro regeneration), and some smaller institutes, including “Agroekonomik”, Institute for Viticulture and Vine Production, Nis, Institute “Tamis”, (small collection of local varieties of some cereals and soyabean), Agroinstitute Sombor, etc.

Apart from MAFWM, there are three main institutions and organizations involved in agrobiodiversity conservation related to animal genetic resources. Their involvement at the technical and policy level, and their role in developing agrobiodiversity conservation, their gaps and needs for future strengthening are presented below:
Institute for Animal Husbandry and Agriculture Faculties of University of Novi Sad and University of Belgrade, are involved in all levels of animal genetic resources (AnGR) conservation. They are the main livestock breeding organizations, coordinating networks of regional and local selection organisations and maintaining the central herd book. They participate in policy design for animal husbandry and are also responsible for adopting and implementing breeding programs for locally adapted breeds. The main breeding organizations implement action plans, control the population parameters (the effective population size, level of variability, relationship, sex and line representation) and participate in screening and appraisal of animals at exhibitions and events. The main breeding organisations submit reports to the MAFWM on the situation of locally adapted breeds, mandatory, once per year for updating the national database, and in addition upon request. They provide expertise to public institutions, local breeding organizations, and other interested parties involved in AnGR conservation and participate in the education of farmers. They promote locally adapted breeds and cooperate with stakeholders worldwide. Being scientific institutions, they all carry out scientific-research tasks, complement knowledge about exterior features, production characteristics and genetic structure of breeds, participate in population monitoring activities, conduct scientific and professional analysis of the results of the conservation program implementation.

Besides the three main institutions and MAFWM, which are in charge of agrobiodiversity conservation, other stakeholders have defined roles, too. According to the draft National Breeding Plan for Locally Adapted Breeds, local and regional self-government bodies also actively participate in the implementation of conservation programs, directly or indirectly, by helping sustainable use locally adapted breeds. They encourage preservation, promotion and affirmation of locally adapted breeds and their products in the context of rural development and conservation of natural habitats. They support the development of processing capacities in the function of developing local products.

Agricultural extension services, financed from the national budget to provide expert advice and conduct trainings of farmers in accordance with the approved five-year program, contribute to the education of farmers who grow locally adapted breeds, too. In addition, agricultural extension services provide trainings in organic agriculture and thus sustainable use of agrobiodiversity and PGr, as old and tradition varieties and local populations of crops are used in organic modes of cultivation. Moreover, extension services are actively involved in different projects and programs together with research and academic institutions (e.g. IPA programs, projects supported by Ministry of Agriculture), including those focusing on PGR management and conservation (for example Project on mapping of resources of Timocki region, explained in detail in Annex 7). The work of these services is regulated by the Law of Advisory and Professional Activities in the Field of Agriculture, and they are coordinated by the Institute for Science Application in Agriculture.

Centers for reproduction and artificial insemination are involved in the implementation of the conservation program through collecting, storing and distributing genetic material. They participate in the maintenance of the gene bank in accordance with their capacities and interests of the state. Also, if necessary, they participate in the implementation of the breeding program and submit reports on the gene bank to the Ministry on an annual basis.

1.4. NON-GOVERNMENTAL SET-UP

Generaly speaking there are three types of organisations dealing with agrobiodiversity conservation in Serbia. This refers to: associations of producers, civil society organisations dealing
with agriculture, traditional products and rural development, and environmental organisations dealing with agrobiodiversity, as a part of biodiversity conservation. Farmers’ organizations in form of cooperatives do not exist in practice to deal solely with agrobiodiversity. Activities of the kind which include profitable businesses exist more within various kinds of contracting arrangements and agreements, which include farming and delivery of live animals or products to the entity doing processing or marketing. Their involvement in developing agrobiodiversity protection systems is limited although their role in agrobiodiversity protection is crucial.

Concerning plant genetic resources, none of the NGOs are focusing only or predominately, on PGR inventory, characterization and conservation. On the other hand, there are about 500 registered NGOs dealing with biodiversity, environmental protection and agriculture. In Serbia, many of the professional and non-professional farmers’ associations operate as sectoral organizations, mostly protecting the farmers’ rights by negotiating about a product price. In addition, they serve as supporting services for development of production technologies, and for supply of seed material, fertilizers and agro-chemicals (e.g. raspberry farmers’ association, association of blueberry producers, medicinal plant producers and processors, plum producers, etc.). However, there are several organizations from the non-governmental sector, which are more or less involved in surveying, research, production, marketing and raising public awareness about the range of crops.

"Serbia Organica", established in 2009, is the biggest and the most active NGO dealing with all aspects of organic production, gathering all farmers who perform organic agriculture, issuing publications and performing trainings and seminars (see [http://www.serbiaorganica.info](http://www.serbiaorganica.info)). Apart of Serbia Organica, there are some other NGOs, officially registered with the Agency for Economy Register ([see www.apr.gov.rs](http://www.apr.gov.rs)). However, from there it is not possible to have a full insight into their former and current activities. The following organizations may also be mentioned: Center for Plant and Animal Genetic Resources “Nucleus”, Belgrade; Association of Researchers in Genetics of Serbia, Belgrade; Seed Association of Serbia, Belgrade; Association of Plant Breeders of Serbia, Belgrade; Scientific Fruit Association, Novi Sad, etc. Finally, among this host of civil associations focusing on certain crop or group of crops production is the Association of Producers and Processors of Futog Cabbage (“Futoški kupus”), worthy of mentioning, since its members are involved not only in production and processing (mainly fermented cabbage, known as “kiseli kupus”), but also in preserving that local and very acknowledged variety (see [www.futoszikupus.org](http://www.futoszikupus.org)).

The strongest impact in developing new conservation programs for animal genetic resources was provided by a non-govermental organization (NGO), at that time called Nature Society Natura Balkanika ([now Society Natura Balkanika](http://www.naturabalkanica.info)) from Dimitrovgrad, assisting with establishing a new conservation program for the Mangalitsa pig and the Domestic Mountain Pony, and supporting the establishment and inclusion of other NGOs in conservation of endangered breeds. This organization discovered Karakatchan sheep, which was thought to be extinct in Serbia, while their members attracted the interest of local farmers, persuading them to join the conservation program and to establish collections of the Nonius horse, Pirot zeckel, Bardoka sheep, Busha cattle, Domestic buffalo, Balkan donkey, and Svriljska chicken, etc. Members of this society have drafted components of the first guidelines for establishing agro-environmental (AE) measures in Serbia and complete AE measures for IPARD axis 2 (Dutch project and United Nations (UN) financed program). Natura Balkanika experts have designed the first typology of High Nature Value Farming (HNVF) as an integral frame for joint natural and agrobiodiversity conservation.

Various projects launched by the Natura Balkanika Society have promoted endangered animal breeds for enriching rural tourism offers (heritage trails have been designed), promoted local breeds
and traditional products made of them within Slow Food Arc of Taste world platform, explored limitation for their further production and marketing, etc. The Natura Balkanika Society has funded and organized the Regional Balkan Fair of Agrobiodiversity and Rural Heritage in Dimitrovgrad for 14 years, and mobilized local authorities to pronounce this small municipality as unique in the country Park of agro-diversity. Finally, members of this society have participated in implementing the Global Environmental Facility (GEF) component of the World Bank Serbia - Transitional Agriculture Reform (WB STAR) project, which was improving the management of Stara Planina Nature Park in regard to agro-diversity conservation and conservation of high nature farming on its territory, while also developing rural tourism and other suitable kinds of rural economy diversification.

The most influential NGO now is Pokret gorana Sremska Mitrovica (Nature Conservation Movement Sremska Mitrovica), which is a unique NGO that is entitled to manage one nature reserve in Serbia – Special Nature Reserve Zasavica (also Ramsar and Important Bird and Biodiversity Area - IBA). This organization has developed an original agrobiodiversity conservation program which includes an efficient organization of traditional farming (in cooperation with a number of producers in the area of Srem), educational and nature protected areas tourism, gastronomy offer based on locally adapted breeds within the Reserve of Zasavica wetland, and a number of promotional activities of importance for conservation of animal genetic resources. Through national media, this organization has managed to attract the interest of customers from niche markets of so called health-food fans, as much as those interested in traditional products and gastronomy. This activity has provided lots of benefits for the conservation efforts in Serbia including increasing the number of some breeds, especially the Mangalitsa pig. Although Zasavica reserve and its managing NGO have established a number of links with processors meeting all the standards imposed by law, a gap exists within the capacity to support producers to legally process products from autochthonic breeds in their small on-farm and other small processing units. This organization has had lots of success in fund raising, starting with the local authorities, diverse nationally and internationally funded projects as much as in cooperation with educational, scientific and nature protection institutes. Their reserve, together with the Animal Genetic Resources Collection is an educational base of the Faculty of Applied Ecology and a destination for a number of school excursions. The spreading of good practices from their portfolio is regular, so a number of new organisations are popping up in other parts of the country.

Sources of funding are deriving from diverse non-profit non-governmental organizations. These funds are limited to few ad-hoc calls for support to projects released with international assistance. Very few calls of the kind are released by MAFWM, the Ministry of Environment, or local self-goverments (for instance support of the Municipality of Sremska Mitrovica for the Special Nature Reserve “Zasavica” provided to the NGO Nature Conservation Movement Sremska Mitrovica, which manages this reserve and runs its own animal genetic resources conservation program). Support is crucial for agrobiodiversity conservation programs, yet this program is earning itself an important sum of money for the survival of animals through the Mangalitsa pig and the Podolian cattle traditional meat processing and their gastronomical offers, producing donkey milk and cheese, as well as supporting visits to their habitat by tourists.

Farmers do organize themselves into unions and associations; however, very few are truly operational. One of the most active is the Cattle Breeders Association, a group of farms owning collections of endangered and other animal breeds in Krchedinska Ada. They rear animals in a fully traditional way on one of largest islands on the Danube, a wetland which provides space and grazing for about 700 animals during vegetation season. The association is fighting to keep their indigenous rights to keep animals on pastures and mitigate the threat imposed by the Public enterprise “Vojvodina Forests”intention to plant island with industrial poplar and expel animals.
from it. Farmers from Krchedinska Ada, although united in public promotion, market their products individually. They fail to approach to funds and rarely succeed in launching development projects of mutual interest. Their negotiating position with local administration, nature protection institutions, public enterprises and ministries is weak. Their knowledge in all aspects is limited as much as their financial power, (while their main strength is their enthusiasm and determination to keep tradition and skill and to use the willingness of diverse environmental organizations to run public advocacy in some critical moments/periods, such as during hard winters or natural catastrophes, when animals need to be saved by prompt action.

1.5. LEGAL FRAMEWORK FOR PROTECTION OF AGROBiodIVERSITY

The Biodiversity Strategy of the Republic of Serbia establishes basic principles for the conservation of biodiversity in Serbia pursuant to the principles of the European Union. The process of the review of the current Strategy (adopted in 2011) is ongoing, in cooperation with the UNDP. Within the Law on Agriculture and Rural Development, the conservation of biodiversity has been defined through structural incitements and measures for rural development, which incites programs for the protection of the environment and the conservation of biodiversity. Pursuant to the Law on the Means for the Protection of Plants, conservation of natural resources is defined through good agricultural practice, which implies performance of agricultural activity in a manner that enables the management of agricultural land and reproductive material.

The National Agro-environment Program has been made and it defines some of the areas of high natural values in Serbia and points out the advantages of agricultural practice, which benefits the conservation of biodiversity. The measures for the conservation of plant genetic resources for food and agriculture have also been entered into the National Strategy for Agriculture and Rural Development, as well as in the National Program for Agriculture and Rural Development.

The legislative framework in the area of PGR management and conservation was improved by the amendment and adoption of a number of acts. This refers to the Law on the Verification of the International Treaty on Plant Genetic Resources for Food and Agriculture, which was enacted in 2013. The National Strategy for Sustainable Utilization of Natural Resources and Goods was enacted in 2012, and it was created by support of the Swedish International Development Cooperation Agency (SIDA) and the Swedish Environmental Protection Agency. Within 66th session of the United Nations General Assembly (New York, 2011), Serbia ratified the Nagoya Protocol, which improves access and allocations of the profit from genetic resources and provides larger legal safety of providers and users of these resources.

The proposal of the Law on the Management of Plant Genetic Resources for Food and Agriculture was prepared in 2016 (thanks to the efforts of the Working Group for Law on PGR Conservation, formed in 2014), referring to all segments of plant genetic diversity conservation. The National Council for Plant Genetic Resources will be formed according to the Law, as soon as the Law passes. The National Program for the Conservation of Plant Genetic Resources for Food and Agriculture (2013-2020) in Serbia was prepared in 2013, thanks to FAO technical support project. The Program describes the current state, states goals and proposes measures related to the conservation, utilization and development of PGR for food and agriculture. The Program is harmonized with the national regulations in the area of agriculture, and with international conventions and contracts, such as the CBD, the International Contract on Plant Genetic Resources for Food and Agriculture and Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic
Resources for Food and Agriculture.

The Republic of Serbia adopted a number of laws that directly or indirectly influence the management of Animal genetic resources. The Law on Agriculture and Rural Development—regulates agricultural policy objectives and ways of implementation, Law on GMO, Law on Organic Production, Law on Geographical Indications, Law on Environmental Protection, Law on Natural Protection, Law on National Parks, Veterinary Law, etc. which influence conservation of animal genetic resources. Law of Livestock regulates measures and rules related to animal husbandry. The Ordinance on the establishment of a national program for the conservation of biological diversity of domestic animals for the period 2017-2021 was withdrawn from the process of adoption, since the Law on Animal Husbandry needed to be changed to bring about an appropriate frame for its implementation.

According to the Second National Report on the Status of the Conservation of Animal Genetic Resources (2014), creators of the agrarian policy in the former period included almost all the objectives which agriculture of a modern country should have in the Strategy of Agrarian development. However, its implementation during economic crisis is uncertain. Cutting of budget funds for conservation of endangered locally adapted breeds during the period 2011-2012, left grave consequences in terms of reducing the number of the effective population size of endangered locally adapted breeds. This situation showed weaknesses of the system that is based on a single measure - moderate subsidies per head of locally adapted breeds and minor support to research.

Rulebook— a list of genetic reserve of domestic animals, ways of preserving of genetic reserve of domestic animals, a list of indigenous breeds of domestic animals and endangered autochthonous breeds define original, autochthonous, locally adapted breeds as a specific group of animals that has been cultivated in a given country long enough to genetically adapt to traditional production systems and the environment. Endangered autochthonous breeds are those breeds of domestic animals in which the total number of female reproductive animals is not greater than: 1) for cattle of 7,500 animals; 2) for sheep 10,000 animals; 3) for goats 10,000 animals; 4) for horses 5,000 animals; 5) for sows of 15,000 animals; and 6) for poultry 25,000 animals. The Rulebook sets out the criteria for determining the status of vulnerability.

According to the draft Rulebook on the establishment of a national program for the conservation of biological diversity of domestic animals for the period 2017-2021 preservation of locally adapted breeds is done through two methodological approaches: preservation in production systems where they are now (in-situ), and preservation outside the production systems (ex-situ). In-situ protection and preservation of locally adapted breeds strategic framework in Serbia should: ensure the preservation of locally adapted breeds, to improve the system of incentives for cultivation and use of locally adapted breeds and encourage the use of locally adapted breeds for the preservation and improvement of their habitats. The Action Plan should include development of an incentive program for locally adapted breeds and encouragement for keeping locally adapted breeds in the environments where they originated.

The Law on Agriculture and Rural Development stipulates incentives for measures of rural development. Incentives for rural development measures include support for programs that, inter alia, relate to the preservation and improvement of the environment and natural resources that include the conservation of plant and animal genetic resources. Based on the current allocation of incentives in agriculture and rural development, the scope of assets for the incentives for measures regarding rural development amounted to about 8,307,826 euro, and the incentives for sustainable rural development amounted to about 1,076,086 euro namely for: (1) Organic production in the amount of 815,217 euro (2) conservation of plant and animal genetic resources in the amount of
260,869 euro of which the amount of 43,478 euro has been set aside for conservation of plant genetic resources, and the amount of 217,391 euro has been envisaged for conservation of animal genetic resources.

<table>
<thead>
<tr>
<th>Type of the subsidy</th>
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<tbody>
<tr>
<td>Podolian and Busha cattle (bulls, cows and other over two years age)</td>
<td>252</td>
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<tr>
<td>Balkan ass (all over 6 months of age)</td>
<td>84</td>
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<td>42</td>
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<tr>
<td>Sheep breeds (Zeckel/Pirot, Krivovir, Bardoka, Lipska, Vlashka vitoroga &amp; Karakachan strains and Chokan Tsigai (all animals)</td>
<td>38</td>
</tr>
<tr>
<td>Balkan goat (all animals over 12 months)</td>
<td>38</td>
</tr>
<tr>
<td>Poultry – Sombor kapor hen, Banat naked neck and Svrljig hen (hens and cocks)</td>
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According to the current Rulebook, the natural person - holder of an active commercial family farm registered in the Register of Agricultural Holdings and in the Register of Indigenous Breeds of domestic animals, exercises the right to incentives for the conservation of animal genetic resources in accordance with the law governing agriculture.

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The first guidelines for the development of agro-environmental measures within the framework of the policy for supporting the development of agriculture and rural development were developed in consortium with Avalon, International Union for Conservation of Nature - IUCN, Natura Balkanika Association and the European Institute for Environmental Policy, with the financial support of the Kingdom of the Netherlands. For the MAFWM, United Nations Joint Project Millenium Development Goals Fund (UN JP MDGF) Rural Tourism Development Project, drafted axis 2, 3 pilot measures were developed to support of organic production, endangered autochthonous breeds of animals and high nature value grasslands. Unfortunately, measures for supporting AnGR conservation and organic agriculture have remained part of the financially modest national support scheme financed, while measures supporting pastures’ maintenance remain to be reintegrated into national program in 2018. Support to High Nature Value Farming (HNVF), as an integral concept of preserving low-
intensity production systems that include the preservation of precious natural biodiversity and agro-
diversity is not yet provided, although measures fitting in IPARD axis 2 have been developed. Serbia
still lacks subregulations of food safety regulations to provide a more favourable frame for traditional
artisan products' value chains development. The lack of these regulations has subsequently
blocked the provision of economic valorization for agrobiodiversity conservation. Traditional food
products, being under the threat of disappearing due to severe food-safety standards (the same
standards still implemented on small scale production as much as for industrial production), are
fighting for the survival of the agrobiodiversity from which they derive.

According to the National Strategy for Sustainable Utilization of Natural Resources and Goods of
Serbia, it is necessary to upgrade knowledge in regard to the possibilities for their sustainable use,
taking into serious consideration population trends. For this study, a defined sectoral goal related
to biodiversity, is of special interest (conservation, revitalization, and upgrade of local biodiversity
utilization). Ex-situ and in-situ conservation of genetic variability of domestic animals and plants,
especially autochthonic, is specially emphasized. Valorization of production systems based on the
use of biological resources, in particular linking traditional use of space in protected areas, with
the programs of the ministry in charge of agriculture (preservation of old breeds and varieties,
renewal of extensive livestock farming, etc.) is prioritized. Among the priorities is the promotion of
economic valorization of biological resources based on the principle of ecosystem services, and
the need for economic measures for both local communities and other stakeholders.

1.6. FOREIGN DONOR SUPPORT FOR CURRENT AND
PREVIOUS ACTIVITIES RELATED TO
AGROBIODIVERSITY

Very few projects related to agrobiodiversity have been launched and completed in Serbia with
foreign support. The most important project was the Transitional Agriculture Reform Project for
Serbia (STAR). The project consisted out of four components. Component three was intended to
exercise conservation of the globally important eco-system in the Stara Planina mountainous area
(West Balkan Mountains), to preserve biodiversity in nature and in agro-ecosystems, and promote
sustainable land use through reinforcement of traditional agriculture and cultural practices in
ecologically fragile areas. This component was supported through a Global Environment Facility
GEF grant (5 million USD). The following items related to agrobiodiversity were completed as part
of the four main project activities under this component: Increase populations of endangered
breeds of farm animals inside the Stara Planina Nature Park. The activities aimed at increasing the
number of livestock of rare animal breeds through grants for interested households and individuals.
A total of 66 grants were allocated with around RSD 36 million (360,000 euro) of investments.
These projects were implemented in 2010 and 2011.

1.2 million euro was provided as competitive grants to support the global objectives of promoting
sustainable land use (particularly well-managed, extensive grazing), ecological restoration,
sustainable rural tourism and related enterprises, and preservation of natural and agrobiodiversity,
including using the LEADER approach where appropriate. Areas of abandoned and degraded
meadows/grasslands and pastures were restored through local grants. A total of 49 projects were
approved to the amount of RSD 24 million (approximately 240,000 euro). In the period, June-
October 2010, the project team reported that 2,250 ha of pilot pastures were grazed on by 400 LU
(livestock units). In 2011 the pilot pastures were grazed on by 532 LU, covering a territory of more
than 3,000 ha.
The greatest impact has been recorded vis-à-vis endangered breeds, where 42% of respondents claim there has been an increase in the number of these animals. Slightly less favourable results have been noted while assessing the impact of grants on the number of tourist and grassland areas. The conclusion is that the interventions under component three have contributed to the fulfilment of several of the objectives of the component. The increase in the local populations of autochthonous livestock breeds is fulfilling the set target, while the area of restored grassland only is 80% of the defined target. On the other hand, a management plan is prepared for the Stara Planina Nature Park and support has been provided for several rural development projects including those providing support to animals and pastures, processing facilities, as well as to rural tourism projects. With the grant scheme for the arrangement of grazing for rare animals is set to increase the number of autochthonous species, the area of mountain pastures under management, and the biodiversity will improve (plants, birds, and animals). Farmers have attained an increased income from milk from the autochthonous animals, in particular sheep.

Several international projects had a specific target for PGR management and conservation. Serbia participated in the EU project: **Establishment of PGR information infrastructure system (EPGRIS)**. The project supported EU countries in creating a national inventory through thematic workshops, technical collaboration, exchange of staff, and development of standards and protocols. The EU catalogue of PGR – EURISCO currently consists of more than 1.1 million of accessions of crops of 5,586 genera, and 36,356 species from 250 world institutions from 43 countries ([http://eurisco.ecpgr.org](http://eurisco.ecpgr.org)).

**SEEDNet project** (2004-2010), included 13 different partners from Southeast Europe and was funded by the Swedish International Development Cooperation Agency (SIDA). The Project mostly contributed to: a) (re)establishment of a National Plant Gene Bank, b) inventory of many varieties and local populations of different crops by realization of national and regional collecting missions and projects, c) evaluation and regeneration of accessions in the national collection, d) characterization (including DNA ‘fingerprinting’ in accessions of medicinal plants), e) upgrading of equipment in the National Plant Gene Bank, f) capacity building in terms of development of a national legislative, trainings of PGR experts and management of the Gene Bank, g) development of a documentation system, h) regional and international collaboration and networking. The project lasted from 2004 until 2010. The total budget was 35 million of SEK (Swedish Krona) out of which Serbia was allocated funds to the value of 100,000 euro for equipment and facilities within the National Plant Gene Bank.

**FAO Technical Collaboration Project** entitled as “Support for Development of the National Program for Plant Genetic Resources for Food and Agriculture” TCP/YUG/3203 (D), Phase 2 (2011-2013) aimed at preparation, development and issuing of the National Program on PGR for Food and Agriculture. The Program was issued in 2013, but has not been officially adopted yet. In fact, its fate is dependent on the enactment of the Law on PGR, which passed into procedure. The budget of the FAO Project was about 120,000 euro, where funds were allocated to purchase and upgrad equipment in the National Gene Bank, and prepare the National Program.

Serbia participated in the **ECPGR** program from the beginning, and now participates in the IX phase of the program. In 2010 Serbia officially entered **UPOV** (The International Union for the Protection of New Varieties of Plants).

Other projects of importance were:

The UN Joint *Programme (JP) "Sustainable tourism for rural development"* (budget 4,000,000 USD), aimed at supporting the diversification of the rural economy through
sustainable tourism. It was implemented by five UN agencies, namely the FAO, UNDP, UNEP, UNICEF, and UNWTO in cooperation with the Ministry of Economy and Regional Development, Ministry of Agriculture, Forestry and Water Management, and the Tourism Organization of Serbia. Agri-environmental situation analysis and preparation for implementation of actions related to the environment and countryside within IPARD was conducted resulting in the preparation of measure fiches to support agrobiodiversity, organic agriculture, and HNVF. Weak absorption capacities of the state administration in charge of the preparation of the IPARD prevented the adoption of solutions that were a result of the project and their practical implementation.

EU financed **Project ESSEDRA** (budget about 1,000,000 euro, with 70,000 euro allocated for Serbia), implemented by the SLOW FOOD Organisation and their partner NGOs between 2013-2016. The ESSEDRA project aimed to draw together and support a skilled and engaged CSOs network in the Balkans (including IPA and EU countries) and Turkey to develop a joint strategy to achieve the goal of an effective agricultural and rural development program that provides effective analysis, advocacy and monitoring at local, national and European levels. The project promoted the diffusion of practices and models, which protect ecosystems, recover traditional processing methods with low environmental impact and safeguard native breeds and local plant varieties. The project also promoted plant varieties, ecotypes, indigenous animal breeds and populations and processed products through the Slow Food organization’s world platform *Arc of Taste*.

**Project “BushaLive”** (Budget 100,000 euro), financed by FAO (2013-2015) was managed by the Swiss SAVE, and the Universities of Sarajevo and Munich. The topic was to determine the different types and strains of Busha Cattle in the Balkans, phenotypical characterization of different types and strains and molecular genetic analysis including the estimation of the purity of distinct subpopulations, an overview of in-the-field work for the collection of information about the situation, production, conservation and market possibilities of Busha cattle, as well as discussion and determination of best practice methods.

**Project Developing a National Agro-Environment Programme for Serbia** the main goal of which was to assist Serbia in the process of preparing for candidature and future accession to the EU by supporting the development of the capacity and organizational structures necessary for agro-environment policy-making and programming with an emphasis on biodiversity conservation. The project also introduced the concept of HNVF, the concept of AE payments, support the development of two pilot agro-environment schemes in contrasting protected areas, applying the results and lessons learnt from this process to the development of proposals for a National Agro-environmental Plan, establish a range of “tools” to support the necessary capacity and organizational structures for agro-environment policy-making and programming and widely disseminated and promoted the project results. This project has been developed in accordance with the stated interests and needs of the MAFWM. The project was jointly implemented by Avalon, IUCN, IEEP and Natura Balkanika within the Dutch BBI Matra Programme, and the IPARD 2014-2020 Program (Project budget - EU Contribution): 230,000 euro.
2. GENETIC RESOURCES IN AGRICULTURE

2.1. OVERVIEW OF THE STATUS OF GENETIC RESOURCES IN AGRICULTURE

2.1.1. Plant genetic resources

Conservation of plant genetic resources in the Republic of Serbia is implemented in two basic ways: in-situ and ex-situ. Measures of in-situ protection are applied to protect indigenous flora, wild relatives of crop species, medicinal and aromatic plants and forage species in their natural habitats, and it also refers to protection of autochthonous and old varieties of cultivated plants in terms of ‘on-farm’ protection, on households’, farmers’ and cooperative properties. Most of valuable genetic resources of fruit and grape old and local varieties are kept in ‘on-farm’ conditions, followed by genetic material of vegetables and cereals.

In general, the highest number of accessions of cultivated plants is currently protected ex-situ, i.e., outside of their natural habitats - within breeders’ collections and gene banks. It is thought that there are about 15,000 seed accessions and 3,500 accessions of fruit trees and grape, respectively, in collections of different national institutes and stakeholders. In the National Plant Gene Bank, there are more than 4,000 of accessions of nearly 250 plant species.

The entire diversity of all PGR in Serbia is unknown, since there is no detailed evidence and the National Inventory of PGR has yet to be completed. It is extremely difficult to estimate the overall agro-biodiversity, because of the existence of thousands of genotypes (populations), hybrids, and varieties in use. Unfortunately, the list of priority species has not been prepared (e.g. target crops, old landraces, commercial varieties, local populations, and wild relatives, etc.).

Over the past few decades more than 1,200 varieties of agricultural plants have been created in the Republic of Serbia: over 740 of cereals, more than 170 of industrial crops, over 120 of vegetables, over 70 fodder crops, more than 40 and 50 of fruit and grape varieties, respectively, and six of medicinal plants. More than 800 foreign varieties have been acknowledged (National Program for PGR, 2017).

Under-utilized crops in Serbia belong to different groups (Annex 6), including: Cereals, Fodder crops, Vegetables, Fruits and Grape and Medicinal and Aromatic Plants, which might be treated as minor crops, with a range of about 700 species, including both wild and cultivated ones.

The number of registered cultivars in minor crops is significantly lower than in major crops, i.e. common buckwheat – two, millet – two, and sorghum – three cultivars. The great value of genetic resources in this group of plants lies in the numerous old, primitive varieties wild relatives populations, landraces, indigenous material, etc.

Within wild species, there are a great number of plant genetic resources, including forage species – the indigenous flora of semi-natural and natural grasslands, followed by medicinal and aromatic plants, wild crop relatives and forest genetic resources. Of high importance are genetic resources of wild fruit species, estimated at 122 species of 38 genera and 23 plant families. Most of them belong to the Rosaceae family and are used for grafting.
A considerable portion of PGR in Serbia represents officially registered varieties. The total of 4,970 crop varieties and populations have been officially registered since 2000, out of which 1,622 were created by the national breeding institutes (http://www.sorte.minpolj.gov.rs/index.php). There is no evidence of all varieties registered in Serbia since the 1960’s, when the varieties recognition started.

Old, autochthonous and local varieties and populations

Several crop species in Serbia are autochthonous, including a few cereals, forage grasses, legumes, vegetable species, fruit crops, and vitis. Certain parts of inter-species diversity of PGR refer to old – local and traditional varieties and landraces – autochthonous plant populations. Nevertheless, the complete list of old and local varieties does not exist for Serbia. Available data on old and local varieties illustrate the importance of their inventory, characterization and conservation.

Today, old/primitive varieties and local/autochthonous populations (landraces) of cereals and maize can only be found on the farmers’ fields, in marginal agricultural regions and/or in mountain regions. According to recent estimates, no more than 130 of such landraces still exist. Among the old and autochthonous maize landraces, the “krivak” (which means crooked, curved), also “osmak” (which means with eight grain rows), “tvrdunac” (which means hard, solid), “beli” (white), “crveni” (red), “Timočki”, “Pecki”, “kosovski”, “Banatski”, “Zaječarski” (all named according to the region of origin), and some others, might be among the most interesting. Old and/or primitive landraces and local populations of cereals and maize can be only found on the fields of marginal rural areas and mountain regions.

One of the most interesting autochthonous wheat landraces is the “spelta,” or the “krupnik.” “Spelta” (Triticum spelta L., syn. Triticum aestivum ssp. spelta (L.) Thell), represents a husk form of wheat, which has grown in the Balkans and Serbia since ancient times. This species is known for its high nutritive value, especially with regards to its high protein and essential amino acid content, as well as for its high concentration in cellulose, mineral elements (including selenium), and carbohydrates. Besides wheat, there are reports on the long cultivation tradition of rye, barley, and oat in Serbia. Barley was used for production of homemade beer and yeast, while its straw has been appreciated for feeding livestock. Rye was used (aside from its flavor) for making spirits (“rakija”), beer, and feeding the poultry, while its straw was used as roof and ground cover. The flavor and texture of oats were known to be very sticky and of bad quality, and its grains and hay were used mainly as horse food. In addition, buckwheat, which was grown in hilly parts of the country, was also appreciated and used as flour, mash, for feeding the poultry, and as an excellent melliferous plant.

Concerning genetic resources of vegetables, there are regions such as Banat, Bačka, Negotinska Krajina, Pomoravlje, Zapadno-moravski, district Aleksinački - Southern Serbia, and Metohija, where valuable domestic populations of onion (“Kupusinski jabučar,” “Kupusinski crni/ crveni”) can still be found. Domestic populations of leek were found in the south of the country. Several local populations of cabbage are well known in Serbia: “Futoški”, “Srpski melez”, “Varaždinski”, “Golubarac”, “Kačar”, “Katunski”, etc. Old local cultivars of pepper are grown in the Banat, Aleksinac district, Negotinska krajina, Bačka, Podrinje, Posavina, Pomoravlje, Eastern Serbia, Southern Serbia, and Metohija, and include the “Belopalanačka vrtna”, “Venčara”, “Niška šipka”, “Rutevka”, “Strižanka”, “Severija”, “Turšijara”, and “Makedonka” etc. Old tomato cultivars and populations are still grown in gardens and farmsteads due to their specific characteristics, most notably, the fruit taste and shape. Old local tomato cultivars (e.g. “Trešnjar”, “Pečki jabučar”, and “Zlatni plod Timoka”) were well recognized in the past, but are now very poorly known, with the exception of the beef heart-
type tomato ("Volovsko srce"). Many domestic populations of the common bean ("Žutotrban" and "Zeka") are grown on farms in Serbian fields, while landraces, "Tetovac" and "Gradištanac" (originating from the region along the River Danube in Eastern Serbia) today represent high market classes from Serbia. Domestic populations of lentil are grown in Eastern Serbia (Homolje, Stara Planina, and Suva Planina), Southwestern Serbia (around the Studenica Monastery), Western Serbia (around Požega), and the Bačka region. Faba bean landraces ("Krupnozrni" and "Sitnozrni") can be found in the mountains. The most important domestic populations and ecotypes of the Cucurbitaceae family grown in Serbia include "Mramorka" of watermelon, "Cerovača" of the melon, "Bundeva", and “Bundevka”, “Belokorka”, “Bela ludaja”, “Bela tikva”, “Dulek”, “Buca”, “Bela bundeva”, “Tikva”, “Žuta tikva”, “Dudanja”, “Ludaja”, and “Budimka” all from pumpkin species. In Serbian villages, there are many old PGR of vegetables, grown on-farm, mostly in the gardens.

Genetic resources of industrial crops in term of existence of old varieties and/or local populations mainly refer to some local tobacco populations grown on-farm, including oriental small-leaf type ("Jaka", “Prilep”), semi-oriental ("Ottja") and American broad-leaf type. Most of accessions were transferred to ex-situ conservation status serving for creation of new varieties, such as Jaka B125/3, Jaka MD – 80, Prilep 23, Prilep 156/1, P 66-9/7, Otija MD 159 – 78, Burley DKH – 28, Burley DKH – 33, etc.

Fruit species are very widely used by Serbs and in many different ways; this includes consumption of fresh fruits, compote, juices and syrups, fruit tea, “slatko,” jam, marmalade, etc. The Balkan region, including the territory of Serbia, is an important gene pool source for autochthonous apple genotypes, which are very important for further diversification and breeding of domestic varieties. Apples are traditionally used as a healthy food, as medicine and refreshment, and their use is exceptionally important for modern humans. In Serbian tradition, the apple fruit is a symbol of good health, fertility, happiness, prosperity, and good wishes. It is widely used at weddings, engagements, proposals, and birth ceremonies. The most valued old apple varieties are “Petrovača”, “Pamuklija”, “Ružica”, “Šarunka”, “Belobubka”, “Funtača”, “Devojačka crvenka”, “Masnjača”, “Krstovača”, “Šimširka”, “Ovčij nos”, “Slatkara”, “Prespanka”, “Kožara”, “Zelenika”, “Budimka”, “Kablarka”, and “Senabija”.

One of the oldest naturalized varieties of pear, originating from Asia Minor in the Karaman area, is known as “Karamanka”. Until the Second World War, this was the most common pear variety in the region of Serbia, Bosnia, and Macedonia. Presently, it is still rare, but it still may be found in the catchment valley of the Zapadna Morava region, in the Vranje Valley, Toplica, Raška, and Metohija. The fruit is medium sized, pear-shaped, and asymmetrical with characteristic pronounced bumps. Apart from this variety, there are also older ones, such as “Jagodarka”, “Vidovača”, “Ječmenjača”, “Petrovka”, “Mirisavka”, “Lubeničarka”, “Medunak”, “Stambolka”, “Okruglica”, “Mesnjača”, “Jarac”, and “Kaludjerka” etc.

Plums are presently the leading fruit crop in Serbia, thanks to the favorable climate and soil. Plum is a traditional Serbian fruit, connected to the house and yard. Almost every village house in our region has a plum in the yard or in the orchard. The well-known spirit “šljivovica” (slivovitz brandy) that has its origins in Serbia is made from plum and is still traditionally produced in most rural households in Serbia today. Plums are used in either their fresh or processed forms (prunes, juice, smooth or chunky jam, preserves, in various dishes, and sweets). The most pronounced autochthonous varieties of plum are “Ranka”, “Požegača”, “Belica”, “Metlaš”, “Gorčivka”, “Turgulija,” “Govedjača”, “Moravka”, “Magareša”, “Bardaklija,” and “Pandara”.

Among the grape varieties “Prokupac”, “Volujak”, “Balenta” (red grapes), as well as “Smederevka”,...
“Demak”, “Slankamenka” (white grapes), and “Tamjanika” (white and black), etc., are of the greatest importance and serve as vine types. The most important vineyard regions in Serbia are Oplenac, Jagodina, Zupa, Negotin, Fruska Gora, Palic, Subotica, Vrsac, Niš and Knjazevac. The tradition of viticulture is growing, despite having existed for some 2,000 years in some of these regions.

The Serbian “Vinogradarska” - Vineyard Peach is a very popular local variety. The fruit is small, but highly flavorful and used in jams, preserves, and other processed peach products. It is also known that Serbia is very rich in genetic resources of walnut, but no research, inventory and characterization has been performed so far. Blackberries are mostly grown on small farms, and local varieties are “Bestrna” and “Čačanska bestrna”. Within quince, the most known old varieties are “Leskovačka” and “Dunjac” (“Vranjanska”).

Collections of local fruit populations conserved in-situ and on-farm comprise several hundred accessions.

Among fodder crops, the known local populations are alfalfa K-1 and M-1, red clover K-17, and orchard grass K-6 and K-7. Fodder crops are nowadays grown on much smaller areas, and local populations are highly endangered. However, there is a high diversity of wild populations of fodder species, spread on diverse types of semi-natural grasslands in Serbia.

Minor crops – medicinal and aromatic plants, are very diverse and abundant in their natural habitats where the most abundant are species of Lamiaceae (41 species), Asteraceae (40), Apiaceae (20), Ranunculaceae (19), Scrophulariaceae (17), Malvaceae (15), Rosaceae (15), Brassicaceae (10), Polygonaceae (10), etc. However, there are several species which have been cultivated for a long time, including chamomile, mint, lemon balm, valerian, thyme, and others. The most appreciated local populations of MAPs are “Domaca” (Achillea millefolium), “Domaca aromatica” (Foeniculum vulgare), “Domaca krupna” (Angelica archangelica), “Petrovacki” (Artemisia absinthium), “Domaci rani” (Carum carvi), “Banatska” (Chamomila recutita), “Krupnolisni”, “Sitnolisni” “Sveti bosiljak”, “Crveni” (Ocimum basilicum), “Citron” (Melissa officinalis), and “Vojvodjanski” (Valeriana officinalis), etc.

There is no evidence of farmland areas with local and/or old varieties and landraces in the total agricultural area. At a rough estimate, no more than 2% of the entire agricultural land is currently occupied by local populations and varieties, out of which only 0.3% are focused on organic production. However, there has been evidence of some greater public interest in growing the old and local varieties of vegetables, fruits and cereals, because of some specific and good traits, mainly the difference in taste between fresh and processed products, which are recognized by consumers at the market. Such varieties are much appreciated in specific, local and traditional food and beverages, and are of high importance for preparation of so called “slow-food” dishes.

Quite recently there have been some attempts at regeneration, commercial production and thus, conservation of range of old and/or local varieties, mainly by a few private companies, such as “Superior”, Velika Plana, known for tissue culture laboratory for nursery plants production (http://www.superior-seeds.co.rs), and nursery-garden companies, the “Profesional”, Kruševac (http://sadniceprofesional.rs/stare-sorte), and company “Petrović” as a representative of the Institute for Organic Production and Promotion of Health Foods which initiated a project of conservation and promotion of old varieties of crops. As part of the project, the web site entitled as “Old seed varieties” (http://sadniceprofesional.rs/stare-sorte) was set up in order to promote more than 200 of old/local varieties of fruit, vegetables, maize, aromatic plants and other crops which could be ordered and bought in the form of seeds or nursery plant material.
Lost or endangered crops/landraces by extinction and reasons for their extinction

The number of PGR’s has a tendency to rapidly decrease, not only in the country, but globally, too. The number of varieties, genotypes and populations on the market and on-farm has rapidly decreased, leading to dramatic genetic erosion.

In the past, each region had its own traditional landraces and varieties, which were well adjusted to local environmental conditions, representing a mixture of genotypes, i.e. populations. With the advent of industrialization, these old and local varieties were being replaced with new, commercial species and varieties, demanded for by market forces - due to its better yield and trait performances. It is estimated that since then, more than 70% of existing genotypes globally have been permanently lost.

Genetically heterogeneous local populations, which dominated in the past, have been replaced by more uniform genetic material of clear lines, clones, and hybrids. As a consequence, on agricultural land situated around small cities and villages, only a few different genotypes/varieties of particular crops are now able to be distinguished, and all plants look therefore, quite similar. The application of mineral fertilizers and chemical protection methods has additionally contributed to a loss of genetic material of local and old populations, and favoring the introduction of new commercial material suitable for large scale and intensive agricultural production. In addition to the loss of genetic diversity, the significant loss of traditional knowledge on the use and growing of such varieties is evident.

In general, old and/or local/autochthonous varieties are sporadically grown in Serbia. For example, the wheat landrace Banatka (Old Banatka) was well spread out, not only in Banat and Vojvodina, but also in Sumadija and Kosovo*. Until the 1930’s, wheat landraces were gradually replaced by “formally” bred varieties: Rumska crvenka, Banatska crvenka, Banatska brkulja, Leganj, Hatvanska šišulja, Prolifik, Sekač, U-1 (Korićevo šišulja). By the end of the 1950’s, Triticum durum and Triticum vulgare landraces (spring and winter wheat production) are still grown in Easter Serbia under different names: “Starinka”, “Ranka”, “Belija”, “Jedrenka”, “Vidovača”.

Unfortunately, no serious and coordinated inventory attempts have been performed, and consequently, a list of these most valuable plant genetic resources has yet to be prepared. Since there is a lack of data on the exact number of old and local varieties of certain crops in the past, it is not possible to determine exactly which landraces are critically endangered or have become extinct. However, there are some notes on already extinct and/or critically endangered varieties, such as: “Osmak” and “Krivak” of maize, “Belo smiško” of millet, “Trešnjevac”, Ribničan”, “Junički” of beans, “Futoška višnja” of sour cherry, “Pozegača” and “Ranka” of plum, as well as a range of apples (e.g. “Bela kalačuša”, “Crvena debelokorka”, “Demirka”, “Dunjka”, “Moljača”, “Novčićeva buđimka”, “Dobrinjka”, “Carka”, “Armutka”, “Koturajka”, “Djilajka”, “Saranika”, “Masnjača” and “Streknja” – it is thought that between 70-100 local apple varieties disappeared from Serbia after the Second World War). Also pear varieties (e.g. “Jagodarka”, “Vidovača”, “Sijerak”, “Okruglica”, “Jarac”, “Batva”, “Miholjača”, “Ovčara”, etc.) are lost.

A significant number of already extinct and endangered local populations and genotypes of cereals, fruit and vegetables maybe due to the ageing and depopulation of rural areas and the supply of new modern varieties by seed companies. In Serbia, more than 4,500 villages no longer exist, while an additional 700-750 are in the process of ‘disappearing’. Knowing that rural households, mainly in the hilly-mountainous regions, but also (and to a lesser extent) in the lowlands of Vojvodina (north Serbia) had been, and are still the places where local and/or old landraces and populations could be found, the key reason for their endangerment and extinction is in general down to the
following points: the loss of traditional practices, traditional knowledge and low concern on PGR by the government (the state) and society. Modern agricultural farms, organizations and cooperatives are oriented to intensive agriculture, a high yield and profitable food production systems, where competition of new hybrids and varieties of better performances in terms of yield and tolerance to abiotic and biotic stresses and adjustment to new agricultural practices is much expressed. Therefore, old and local varieties cannot be maintained without subsidies and state support, as they are not competitive in comparison with new varieties promoted by national and foreign seed production companies.

A number of old fruit cultivars is also maintained on-farm. However, there is a great danger of genetic erosion of these resources. Domestic populations of field crops and vegetables are still grown on-farm.

The constant drive to find a selection of varieties that are superior to existing ones has led toward a drastic reduction in the number of species and genotypes (genetic erosion), or the narrowing of biological diversity of local populations and spontaneous relatives of cereals and other crops. With the development of the agricultural markets, the traditional agricultural systems of low investments are being discarded. However, growing and keeping of autochthonous, old and local varieties and populations enables production of high quality food products, which could be promoted as local traditional brands, and be integrated as a component of rural and ethno-tourism. In addition, these genetic resources are usually convenient for organic agriculture, since their cultivation requirements are adjusted to local agro-environmental conditions.

The areas under autochthonous populations are continuously decreasing in Serbia. Farmers who keep the local populations of field crops and vegetables on-farm generally do not receive any regular financial support and benefits, except in cases when they have applied for (relatively small) subsidies from the Ministry of Agriculture. As such, only populations kept by poor households in marginal regions, usually far from modern communications and traffic routes and unable to pay for commercial seed material, survive.

In general, farmers do not participate greatly in the conservation processes. The 2017 rulebook on the allocation of incentives in agriculture and rural development define funding schemes and procedures for farmers who store, keep, collect or conserve the accessions of PGR. During the last 10 to 15 years, these funds annually accounted for about 200,000 euro. Nowadays, the funds are several times lower, reaching about 40,000 euro per year. This decrease in funding for PGR conservation (mainly for on-farm) is partially related to farmers' lower interest in this area which is as a consequence of access to information, complicated regulations, rules and technical requirements, including a far too detailed application process for even one single accession in conservation.

Knowing that Serbia is approaching EU, it is expected that soon there will be higher investments and opportunities for farmers and cooperatives (IPARD program), which will reflect on the farmers’ positions and their role in the whole sector, including PGR conservation. In light of the implementation of the concept of High Nature Value Farmlands (HNVF), ecological networks and, especially NATURA 2000, it might be anticipated that interest in PGR conservation, inventory, regeneration and characterization, together with conservation of traditional knowledge about agricultural practices and production will significantly increase.
2.1.2. Animal genetic resources

Current status – lost, endangered, vulnerable

Livestock production is an important branch for agriculture of the Republic of Serbia. For a large part of the small mixed farms it is the main source of income. However, there is a significant negative trend in the number of domestic animals, albeit with minor fluctuations, present in Serbia for at least three decades. The reduction in the number of domestic animals is accompanied by an improvement in productivity, in a way that the total production of major livestock products is increased. However, consumption of animal products, especially meat and milk, is still below the average expenditure of the EU, primarily due to the poor economic situation and the decline in the standard of living, which to a large extent adversely influences locally adapted breeds. It is expected that recovery of the local economy will increase the number of all domestic animals; however, the predicted decrease of the Serbian population due to migration, low natality and high mortality rates might erase the effects of economic recovery. This negative trend might not be of importance for locally adopted breeds if the farmers’ products manage to find new niche markets. Once the Serbian market has become capable of consuming more expensive products, farmers breeding locally adapted breeds, as well as producers of artisan food products, should be able to function together in a strong value chain, providing clear information to that market quite why their product is valuable enough to demand a higher price, which currently is not the case. Otherwise, in ten years’ time, no more local breeds will exist in Serbia, or their number will have decreased to insignificant numbers.

High levels of fragmentation of farms and dominance of farm sizes between five and six ha is a natural response to long periods of instability in the Serbian economy. This fact still goes more in favor of preservation of animal genetic resources than in favor of modern livestock production development, which tries to get rid of them. Conservation programs exist only on small farms. However, the absence of functional associations and breeder associations with negotiating potential and capacity further affect the expression of negative trends in livestock production in general and even more so in growing locally adopted breeds. A decrease in the number of farms, while increasing production per head, is usually considered positive from the perspective of modern livestock husbandry development. Import of exotic genetic material, which is responsible for this trend, along with production improvements in Serbia, will however have serious consequences on the local gene pool. This import was intensified when SAPARD-like measures were introduced in 2004, since farmers’ desires were to immediately increase the number of animals with more productive materials from abroad. The rationale behind this was that the farmers refused to trust the government that this measure will last longer, which in hindsight appears to be justified. Measures were changed in structure, rules and amounts almost ever year since. Imported animals were not always of the top genetics, but their number was sufficient to shut down any rising initiative to multiply cattle from their own production in the country.

Domestic spotted cattle of the type Simmenthal were replaced without using any rational criteria, even where conditions for intensive rearing of exotic breeds did not exist, bringing about limited success. An increase in the standard of living and the attempts to emulate western gastronomic cultures, which will further provoke the demand for products of specific quality attached to exotic breeds, may completely suppress some locally adapted breeds, even those which are stable now, such as sheep (there is pressure to replace the light Zeckel sheep with the more productive Suffolk and other breeds with heavy lambs). So far, local markets have resisted since the tradition of using light lambs remains part of local culture. Traditionally, the rearing of light sheep breeds in Serbia was as a response to conditions of marginal and remote mountain lands, which were the whereabouts of the majority of sheep production. The cost of this production is higher,
yet products of higher quality can justify lower production if the price is fair. These grasslands are unsuitable for intensive breeds, and neither feed humans directly through other kinds of agriculture. However, unfair competition on the market with conventional intensive production has already destroyed the mountain economy. The trend of abandonment of marginal mountain areas however, and the concentration of livestock husbandry in intensively cultivated lowlands, will have the most serious consequences on the survival of locally adapted breeds of domestic ruminant species. The main agriculture resources in these areas are semi-natural grasslands, which used to be part of traditional farming with characteristics of high nature value farming. This farming had been, for an extremely long time, the basis for the production of typical high quality products from locally adapted breeds. The fact that exactly these kinds of extensive traditional farming practices maintain biodiversity, keeping the economic and environmental value of the numerous 'valuable nature protected' mountain areas is not going to help, since awareness about it is low and financial support to it is seen as a luxury for poor Serbia.

The opportunity, which was seen with protected origin for typical artisan products deriving from these products has been missed, since there are almost no famous Serbian products which have been protected in a way so as to include the origin from the exact breed or strain of the locally adopted breed, grown in traditional high nature value farming systems. Since there no longer exists the lively mountain community to protect their products and their breeds, intensive farming will finally benefit through stealing their image and sell industrialised products under same names, which will cause the market to slowly lose its capacity to distinguish true products from traditional farming systems and locally adapted breeds. Sooner or later, this will lead to the extinction of local breeds since the need for such breeds’ hardiness and adaptability with the local natural conditions will cease to exist. Such a fate almost overcame the karakachan and pirot zeckel, which are on the edge of extinction. Their existance now solely depends on subsidies, and numbers remain small and remote mountain semi-natural grasslands do not serve the required purposes for grazing anymore. The majority of these grasslands have been severely pushed out and overrun by shrubs, decreasing their economic value and biodiversity (succession of vegetation is not leading to the rehabilitation of valuable forest vegetation, but low quality bush, while green biomass produced is decreasing in its nutritional quality). Landscapes are degraded and the chance for rehabilitation of livestock farming, even that of wild game, is very small and is wholly dependent upon a host of extremely expensive interventions.

Inconsistent agrarian policy and discontinous financial support to Animal genetic resources conservation is already threatening survival of all animal collections. After 2009, populations of conserved animal genetic resources were already on the edge due to fluctuations in state support per head. A fragile balance had been reached through regular support provided for animal genetic resources was looking to become more stable thanks to the introduction of development and research support, and support for rural turism. When this support became uncertain and even missing for some periods, the number of animals decreased, leading to the extinction of the Podolian and Nonius cattle breeds, and the Domestic Mountain Pony. A lack of investments in production slowed down the recovery of animal husbandry in general and further threaten the conservation of animal genetic resources; however, animal genetics resources’ conservation continued to suffer further from the weak value of chains of processing and marketing, in particular adding value through tourism (Zasavica reserve) which at first showed good results, promising to become a good model for making production of locally adapted breeds economically sustainable.

According to the MAFWM, Table 3 shows the current status of conserved locally adopted breeds in Serbia.
Table 3 The current status of conserved locally adopted breeds in Serbia

<table>
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<tr>
<th>Species</th>
<th>Breed/Strain</th>
<th>Number of animals under control</th>
<th>Effective size of population</th>
<th>Vulnerability</th>
<th>Population trend</th>
<th>Notes</th>
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<td>Pirot</td>
<td>178</td>
<td>1 79 98</td>
<td>3.95</td>
<td>high</td>
<td>stable</td>
</tr>
<tr>
<td></td>
<td>Svrljig</td>
<td>864</td>
<td>40 824 /</td>
<td>152.59</td>
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<td>decreasing</td>
</tr>
<tr>
<td></td>
<td>Sjenica</td>
<td>2,457</td>
<td>117 2340 /</td>
<td>445.71</td>
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<td>stable</td>
</tr>
<tr>
<td></td>
<td>Tsigai</td>
<td>4,581</td>
<td>102 1713 2766</td>
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<td>Chokan Tsigai</td>
<td>503</td>
<td>20 154 329</td>
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</tr>
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<td>Sharpalina</td>
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<tr>
<td>Goat</td>
<td>Balkan</td>
<td>582</td>
<td>19 270 293</td>
<td>71.00</td>
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</tr>
<tr>
<td></td>
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<td>154</td>
<td>10 144</td>
<td>/</td>
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</tr>
<tr>
<td></td>
<td>Domestic black</td>
<td>1,038</td>
<td>107 692 239</td>
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<td>stable</td>
</tr>
<tr>
<td>Poultry</td>
<td>Banat nacked</td>
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<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kosovo* singer hen</td>
<td>NA</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
</tr>
<tr>
<td></td>
<td>Svljih hen</td>
<td>200</td>
<td>10 190 /</td>
<td>38.00</td>
<td>critical</td>
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</tr>
<tr>
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<td>Somborska kaporka hen</td>
<td>478</td>
<td>46 323 109</td>
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<tr>
<td></td>
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<td>NA</td>
<td>/ / / /</td>
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</tr>
<tr>
<td></td>
<td>Domestic goose</td>
<td>NA</td>
<td>/ / / /</td>
<td>/ / / /</td>
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<tr>
<td></td>
<td>Domestic duck</td>
<td>NA</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
</tr>
<tr>
<td></td>
<td>Domestic turkey</td>
<td>NA</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>/ / / /</td>
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</tr>
<tr>
<td>Bees</td>
<td>Apis mellifera carnica</td>
<td>670,000 beehives</td>
<td>/ / / /</td>
<td>/ / / /</td>
<td>Not endangered</td>
<td>Stable</td>
</tr>
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</table>

Conservation measures are not implemented. Endangered by new diseases and pests, pesticides and climate changes. Introduction of other species and varieties represent threat.
Use of local breeds for commercial production, their sustainable use and participation in total production

Cattle production in the Republic of Serbia is dominated by two breeds; the Simmental and the Holstein-Friesian. The number of cross-breeds dominates small farms. Cattle in small farms are mainly grown in tie stalls, while loose housed system exist on medium and large farms. Grazing is rarely applied, mostly in traditional farming systems on marginal lands. The main directions of the production are dairy and dairy-meat. Autochtonic Podolian and Busha cattle and Buffalo production is economically non-profitable due to low production of milk and slow growth. Since the need for draft power does not exists anymore, these cattle can’t bring profit to their owners. The quality of their milk and meat has once again recently drawn attention to them. Ecological services they can provide by maintaining sustainably semi-natural grassland vegetation in some nature protected areas (where semi-natural grasslands are important part of protected biodiversity) also become interesting (West Balkan Mt., Deliblato sands, Zasavica reserve etc.).

Pig production is almost entirely based on Yorkshire and Swedish Landrace, that are used for production of F1 gilts and that are further cross-breeding with some of the terminal meat breeds, such as the Pietrain, Duroc, Hampshire, and German Landrace. All locally adapted pig breeds except the so-called Domestic Meat pig, are at risk (Mangalitsa, Moravka and Resavka are grown in low-intensive free-range systems). There is not enough interest for raising these breeds due to consumers’ preference for lean meat. Long-term promotion of the Mangalitsa pig and its products has led to a growing interest in this breed, and the most popular traditional products were finally commercialized and can be found in supermarket chains after 2015, while the rest are marketed through restaurants, agritourism and rural catering/box schemes. The majority of products are still prepared for their own consumption on farms, or sold through semi-legal direct marketing.

Sheep breeding is mainly represented on the extensive, semi-extensive, and semi-intensive family farms. Grazing in mountains is organised following seasonal vegetation dynamics, while in other areas sheep graze close to their pens, using communal grasslands, orchards and yards, or graze on stalks and other harvested remains on harvested small crops and maize fields. Although mountain areas are of more importance for sheep rearing due to the wide areas of grasslands, the total number of sheep bred in lowland and hilly areas of central Serbia tend to grow faster. Sheep breeding in Serbia is based on locally adapted breeds, mainly Zackel, with the number of strains specific to certain parts of Serbia (their names correspond to the area). The most dominant in the Western and Central parts are Sjenicka, and in Eastern parts the Svrjiljshka sheep. The production in the Central Hilly region is limited, with only scarce pastures, so flocks are mainly small and organized so as to produce lamb meat for covering the family needs (subsistence farming), with occasional surpluses sold from the farm door, or for supplying restaurants. Larger farms keep flocks, mainly in folds. Production in mountains is always market oriented, and flocks are larger and grazing is regularly organized during the whole vegetation season (pastoral systems). While first system is rarely dairy but meat oriented, the second one is traditionally mixed. The tradition for dairy products is radically decreasing after remote intercontinental markets (USA, Canada, Egypt) are lost. Wool production is totally marginalised, although in the last ten years a few attempts have been made to revive marketing chains. Sheep breeds and strains that are at risk of extinction have lost their importance mostly due to the depopulation of mountain regions and not because of lower productivity or quality.

Goat breeding has been gaining enormous interest in Serbia over the last two decades. Being forbidden after the Second World War due to belief that it contributes to the devastation of forests, production and breeding was marginalized for almost 30 years. Yet certain numbers of goats survived in small rural households, holding within them the precious genetic material of the...
Balkan goat as the most prevalent one, and the White Serbian goat. The last one was close to a official breed recognition, after decades of collection work and selection from local populations in the Institute for Animal Husbandry in Zemun, when it was lost due to lack of financial support. After the rehabilitation of this precious animal interest began to grow, under the influence of extension services, and partly the media, the Alpine and Saanen breed were promoted as being more productive, and this resulted in the more autochthonous breeds becoming marginalized. The Domestic Balkan goat remained welcome in remote mountain areas, areas with natural constraints, etc. while exotic breeds conquered almost every place where better conditions for housing and nutrition could be provided. The Domestic Balkan goat has remained at risk in Serbia, although its performance on marginal lands is excellent, not to mention the great contribution it provides to the maintenance of forests, if stocks are properly managed that is.

**Poultry breeding** in Serbia is dominated by chicken farming, turkey, geese and ducks are significantly less present. The economic devastation of poultry production during the last decade of the twentieth century resulted in the shutting down of parent and grandparent flocks. Chicken production is almost entirely based on foreign commercial hybrids, while domestic selections have been abandoned. Commercial and semi-commercial farms and enterprises generate almost 85% of poultry meat and eggs. The remaining 15% are produced on small subsistence farms, with possible sale of any small surpluses. Commercial farms are intensive, whereas the smaller family farms are represented by production systems of different intensity, from extensive to semi-intensive ones. Locally adapted breeds represent Banat Naked Neck, Sombor Crested, Kosovo* Singer, and Svrljig hens which all have the status of ‘at risk’. Sombor geese and Domestic turkey are the only locally adapted breeds of these two species in Serbia. These breeds are present in small numbers, hence their contribution to food production is insignificant.

Various **horse breeds** are reared for sports and cultural reasons in Serbia. Almost the entire population of sports horses belongs to exotic breeds commonly used for jumping, racing or trotting worldwide. A small number of horses play a role in recreation, hippotherapy or tourism (the leading breed being the Lipizaner, cold breeds and diverse crossbreeds). Horse rearing is in crisis in Serbia, with the horse as a species being endangered. The Domestic-mountain pony and Nonius are locally adopted breeds, which are at risk in Serbia since their work purpose has ceased to exist. The Domestic pony is still used only in mountain regions where firewood is gathered on the steep terrain, where machines have no access. In a few remote mountain areas, some isolated communities such as those in Rashka (Sandžak) still use horses as a means of transport. Nonius, together with Lipizaner, is reared mainly by enthusiasts in Vojvodina to pull carriages during weddings and various rural events. A certain number of Nonius horses are in the Karadjordjevo stud farm. All efforts to reintroduce the horse through horse tourism have failed, although between 2005 and 2007, support was provided to purchase animals.

In Serbia, as in most of Mediterranean countries, the **donkey** was originally a draft animal. When draft animals were not used anymore, donkeys vanished from the countryside. The destiny of the old animal was the processing of its meat. The remaining animals either lead flocks of sheep in the Banat region of Vojvodina or belong to a few herds of donkeys used for milk production, which appeared in response to the offer of subsidies for their conservation. Under the influence of the media, which have promoted "Zasavica" Nature Reserve and their products - donkey milk, sausages, cosmetics, liquor and the world’s most expensive cheese, few more breeders have joined to the donkey conservation programme. Yet, the donkey (domestic ass) in Serbia has remained at risk.
2.2. CONSERVATION EFFORTS OF GENETIC RESOURCES

2.2.1. Plant genetic resources

_Ex-situ PGR conservation_

The total number of _ex-situ_ accessions in Serbia was estimated as being close to 25,000. In _ex-situ_ national collection, a high number of accessions represent the old varieties and populations. The most represented species are the economically important crops (maize, wheat, sunflower, barley). The national plant collection (NPC) is stored in the Plant Gene Bank, and it contains 4238 accessions of 249 plant species. Part of the accessions have critical germination ability and must be regenerated. From 1996, when the collection of accessions started, most of the existing accessions had been regenerated only once or twice.

The most abundant collections were established by research institutions aiming to develop their breeding programs. However, three research institutes have undergone bankruptcy: The Center for Agriculture and Technological Research, Zaječar; The Institute for Cereals, Kragujevac; and the Institute for Potato, Guča, which kept 279 small grain accessions, 1,990 accessions of cereals and 3,132 potato accessions, respectively. These collections are now in jeopardy. Two institutes have already been privatized (Center for Sugar Beet, Aleksinac, and Tobacco Industry, Niš) and the fate of their collections is unknown. 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 40 countries. The total number of cereal _ex-situ_ accessions is estimated to be 5,888. Most of accessions are local and domestic accessions and material that were created by breeders of the Institute. The remainder consists of material from abroad.

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 (as result of cooperation with VIR Gene Bank, the database of the Novi Sad soybean collection is available at [http://vir.nw.ru](http://vir.nw.ru)); 60 accessions of rape seed (characterization of accessions has been partially performed); 69 castor oil plant cultivars from 23 countries (for all accessions, passport data exists and characterization has been completed); 450 genotypes of sorghum; 39 hemp genotypes (in VIR there are 34 accessions of hemp that originated from the former Yugoslavia).

The largest number of vegetable accessions is _ex-situ_ conserved in the National collection (733). The collection is mostly comprised of local populations. A total of 245 accessions of old cultivars and domestic landraces maintaining _ex-situ_ is kept by several national institutes and faculties, including: tomato (18), pepper (23), eggplant (2), peas (12), cauliflower (10), broccoli (1), cabbage (19), Savoy cabbage (9), onion (20), garlic (10), leek (5), watermelon (5), dry beans (6), snap beans (5), cucumber (13), lettuce (24), melon (9), small radish (7), radish (4), parsley (6), spinach (4), celery (7), carrot (13), parsnip (1), red beet (3) and kohlrabi (9). This material is kept by national institutes, mainly the Institute for Vegetables in Smederevska Palanka, and the Institute for Field Crops and Vegetables in Novi Sad.

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 exists due to synonyms. There is no information for pommes fruit (Maloideae), but a number of autochthonous cultivars which are conserved _ex-situ_, is higher than 150 (for example, more than 50 local apple genotypes are kept in the Institute for Fruit Research, Čačak). In the case of the pear, the most valuable collection...
of autochthonous cultivars comprises 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 at the Faculty of Agriculture, Belgrade (Experimental School Station Radmilovac, with about 550 genotypes and 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). It is known that the Serbian accessions are present in several world gene banks and agricultural institutions (e.g. Beltsville, USA; VIR, Russia; Gatesleben, Germany, and ICARDA, Syria). It is important to note that generally we have no data about the use of Serbian accessions or plant material collected in Serbia by the foreign gene banks.

**Status of collections**

Inventory: There is no coordinated inventory and monitoring system of PGR in Serbia. The first prerequisite is to create the complete list of *in-situ* and on-farm accessions, which will be further controlled and monitored. It is necessary to develop the concept and principles of monitoring. The inventory of accessions exists in each of national research/breeding institutes and mainly serves for their own breeding programs purposes. These data are not available in full and are not fully accurate.

Characterization, Regeneration, Evaluation and Multiplication of Accessions: Stakeholder institutions are in charge. Some of these institutions have characterized only a small number of accessions of their collections, while some others (e.g. Institute for Maize Research, Institute for Field Crops and Vegetables) performed much of the characterization, including the DNA ‘fingerprinting’ and mapping of genes encoding some of key traits of a crop. A good example is the characterization of 54 local population and six introduced accessions of maize, by performing an analysis of 18 morphological traits, as well as RAPD and SSR molecular markers. Characterization of accessions of old varieties and landraces usually follows IPGRI descriptors. Passport data exists for most accessions. For some samples, there are FAO WIEWS descriptors, such as accessibility of additional passport data and data on characterization and evaluation. In regard to regeneration, each year part of accessions from the National Collection is regenerated and multiplied. This refers to 100 accessions of small grain crops and 50 accessions of millet, flax and hemp from the National collection in 2016/2017. In 2010, a total of 400 accessions from the National Collection were evaluated. Domestic varieties are well characterized and described (according to UPOV descriptors) due to efforts of breeding institutes aiming at variety acknowledgement.

**Documentation**

Currently, the process of adjustment of the National Collection database of Serbia is taking place, according to the standards of the European database for an entry into the European Search Catalogue (EURISCO). Adjustment of the National Collection database is done in collaboration with experts from relevant institutions.

There are different documentation systems at different stakeholder institutions. Some of them have already entered the EU central database on crops (ECCDB). The database for 1,300 maize accessions of the Maize Research Institute has been completed and that institution holds ECPGR database (http://www.mrizp.rs/emdb/default.htm). 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
There are several information systems for PGR in plant gene banks, including GRIN-Global which is one of the most promising. Currently, the National Collection database follows Access and Excel, with the intention of being transferred into the GRIN-Global. Serbia is preparing a legal frame to sign data-sharing agreement with Bioversity International regarding EURISCO, as well as the AEGIS Memorandum of Understanding and the FAO ITPGRFA ratification. At a global level, the “World Mechanism for Information Exchange on Implementation of Global Plan of Action for Conservation and Sustainable use of PGR” (WISM-GPA) was approved. The WISM-GPA (www.pgrfa.org) enables accession to portals of national databases on PGR for 73 countries, including Serbia. The national mechanism for information exchange was adopted, thanks to the support of the FAO and which is implemented by the Ministry of Agriculture. There is a need to prioritize the accessions which will be submitted to the Integral System of the EU gene bank (AEGIS).

**Access to PGR**

Access to genetic resources from the Serbian research institutions is regulated by specific mechanisms of these institutions. External (international) material exchange exists mostly between plant breeding institutions on a bilateral basis. However, the most frequent form of exchange is the personal exchange of selected material by breeders. Such an exchange lacks a centralized record keeping and control system.

**Status of in-garden and in-field (in-situ) conservation**

In Serbia, protected areas (PAs) occupy about 6% of the whole territory, and they include the National Parks (Fruška Gora – 25,393 ha, Djerdap - 63,608 ha, Tara - 19,175 ha, Kopaonik – 11,810 ha and Shara Mt.– 39,000 ha), Nature Parks (18), Landscapes of outstanding features (20), Nature Reserves (31) and Nature Monuments (480). The protection of biodiversity in Serbia is realized through the implementation of measures for the protection and improvement of species, their populations, natural habitats and ecosystems, and it has been regulated by the Law on Nature Conservation. The Decree on Ecological Network determined the manner of protection, management and financing of the ecological network, i.e. areas of ecological importance and ecological corridors of national and international importance, including Emerald and Natura 2000. This Decree includes 101 areas of ecological importance, as well as ecological corridors of international importance.

Protected areas have different protection and management regimes. The strict (“core”) protecting zones do not permit any agriculture and/or touristic activities. Protected nature areas represent landscapes and habitats of high diversity, including ecosystems, species and genetic diversity. In Serbia, there are also IPA’s (Important Plant Areas), HNVF’s (High Nature Value Farmland), Emerald and other habitats of concern. These habitats are especially important for in-situ conservation of wild plants, including wild crop relatives, medicinal and aromatic plants and forage species, as native flora of natural and semi-natural grasslands.

Several crops and species are characterized by richness in local populations. A rough estimate indicates that about 2,000 of the local population of different crops exist on-farm, out of which a significant number have been already transferred to ex-situ conservation by national research (breeding) institutes. According to estimates, a total of 8,646 accessions belong to the “Cereals and Maize” group in the Republic of Serbia, including 1,509 accessions in wheat, 447 accessions in barley, 260 accessions in oat, 46 accessions in rye, and 6,384 accessions in maize. Out of this number, 2,758 accessions (cultivars, breeds, landraces, and relatives) are grown on farm and in-situ, mostly within germplasm collections of state or private institutions.
In terms of diversity of registered domestic cultivars, the most numerous varieties/populations that are grown in Serbia are: maize (700), wheat (200), followed by barley (70), triticale (25), and rye (1). In addition, genetic resources of cereals consist of breeding lines created by different breeding institutes. Old, primitive varieties and local populations (landraces) of major cereals can be found only on the farmer’s fields in marginal agricultural regions.

The great part of industrial plants grown in the fields is comprised of registered domestic cultivars (sugar beet – 60, rapeseed – 9, soybean 21, sunflower – 47, castor bean - 4, hemp - 31, and flax – 17). Only in tobacco, both domestic cultivars (16) and old domestic populations (6 oriental, 7 half-oriental) are in use.

Within collections of fodder crops, the new domestic varieties dominate, being divided into three following groups: a) Perennial legumes (32 landraces), b) Perennial grasses (12 landraces), and c) Other forage species (34 landraces). Nowadays, after more than fifty years, all these landraces no longer have any commercial significance, and some are excluded from the list of landraces. Among them, the most famous and the most distributed were K-1 and M-2 landraces of Alfalfa (Medicago sativa), K-17 of Red clover (Trifolium pratense) and K-6 and K-7 of Cocksfoot (Dactylis glomerata).

In Serbian institutes, 174 domestic varieties of 26 vegetable species are grown. The coordinator for conservation of fruit crops diversity, both in-situ and ex-situ is the Institute for Fruit Research, Čačak. Other important stakeholders of fruit conservation are: The Faculty of Agriculture, Novi Sad, The Faculty of Agriculture, Belgrade, and The Institute PKB-Agroekonomik, Belgrade. The field collection of the Fruit Research, Čačak consists of 471 samples of apple, pear, plum, apricot, peach, cherry, sour cherry, walnut, hazel, and raspberry.

The most important traditional, old and/or autochthonous varieties of plum, which are kept in-situ in farmers’ households are: Stanley, Madžarka, Pozegaca, Čačanska lepotica, Čačanska rodna, Dženerika, Ringlov, and Trnovača. The main varieties of peaches include Spring Gold, Spring Lady, Red Heaven, and the Serbian Vineyard Peach. The most valuable collections of domestic cultivars of grape are located at The Faculty of Agriculture Belgrade and Novi Sad, as well as the Center for Grape and Wine Production.

All data for field collections and status on domestic cultivars grown in the fields (mainly by national stakeholder institutes) provided here, were compiled from the FAO Country Report (2009), and the National Program for PGR (2013), where the status of domestic material “conserved in-situ” it was explicitly reported upon, but in fact meaning that the number of domestic populations and cultivars which grow in the fields: both on the land of the institute or on the farmers’ fields. However, there are no accurate data about the number of varieties and populations conserved in-situ in terms of existing or former contracts with farmers, agreed by the national stakeholder institutes or the Ministry of Agriculture.

No permanent and coordinated activities on inventory, characterization and conservation of PGR, mainly of old varieties and local populations of crops has been undertaken and no regular recording of in-situ conservation activities exists.

In the Republic of Serbia the National Action Plan for Development of Organic Agriculture (2014 - 2019) integrates organic production and biodiversity conservation. Organic production is currently being realized on the surface of 15,298 ha (including meadows and pastures and areas in conversion and in organic status). It is thought that old and tradition cultivars and local crop populations dominate the existing organic fields, mainly referring to cereals (2,183 ha), fruit (1,604), industrial crops (1,458 ha), fodder crops (1,042) and vegetables (170.5).
2.2.2. Animal genetic resources

*In-situ* on-farm conservation of endangered animal breeds occurs in regions, which traditionally breed locally adapted breeds. According to the MAFWM, there is no specific breeding programme for all these breeds. Only a few sheep breeds are covered in the herd book and for them a breeding programme exists. The rest of AnGR is inscribed in the registry book. The following areas are monitored and are included within AnGR support programme.

**Busha cattle** are reared in the municipalities of Dimitrovgrad (Stara planina), Sjenica, Tutin, and Novi Pazar. Individual collections are located in Kovin, Vrsac, Crna Travi and the surroundings of Leskovac. It is also present in the vicinity of Prijepolje, Mionica, Valjevo, and Kuršumlija. **Podolian cattle** can be found in the municipalities of Bačka Topola, Sremska Mitrovica (Special Nature Reserve “Zasavica”), then in the Special Nature Reserves of Kovilj and Deliblatska sands, Krčedinska ada and Deliblatska peščara. **Domestic buffalo** are reared in the municipalities of Novi Pazar, Tutin, and Sjenica. It can be traced to the vicinity of Dimitrovgrad (Stara planina) and Vojvodina (near Kikinda), where this animal was reintroduced under the influence of the Animal Genetic Resources Conservation Program.

For the **Domestic Mountain Pony**, its breeding areas are the mountainous regions of Stara planina, Čemernik, Pesterska plateau, Prokletije, Šar-planina, and in the vicinity of Bosilegrad. Many other mountain locations hide a certain number of animals of the type Domestic mountain pony, which are used for gathering of firewood. However this population is under constant influence of other breeds, in particular cold blood and Lipizaner breeds. **Nonius** is with individual agricultural producer in Vojvodina (around Novi Sad, Kovilj, Backa Palanka), and several specimens are reared in the vicinity of Nis. The largest number of animals is found at the Karadjordjevo stud farm. The **Balkan ass** (donkey) is reared in the area of Sremska Mitrovica (Special Nature Reserve “Zasavica”), Dimitarovgrad Park of agrobiodiversity (Stara Planina), Special Reserve Kovilj (Krčedinska ada). It is individually present in all parts of the country, but not all animals are covered by subsidies.

**Mangalitsa** are reared in the wider area of the Republic of Serbia, mainly within the larger wetland areas of Vojvodina and in Shumadija. **Moravka** are reared in the municipalities of Despotovac, Ub, Ljig, Mionica, Mladenovac, Topola, Prokuplje and Kuršumlija. Identification in south and east Serbia has not yet been completed. **Resavka** are reared in the municipalities of Despotovac, Ub, Ljig, Prokuplje, Kuršumlija and Pirot. Identification in the area of southern and eastern Serbia has not yet been completed.

**Bardoka** are reared in Kosovo*, in the areas of the municipalities of Peja, Istok, Decani, Prizren, and Dimitrovgrad (Stara planina). Traces are also present in the Raska region (only in registry book, no breeding programme). The **Vlaška vitaroga** sheep are reared in the municipalities of Bela Crkva, Kovin (Deliblatska peščara), and Vršac. The black variety of **Karakacan sheep** are reared in the municipalities of Dimitrovgrad and Bosilegrad (animals are recorded only in registry book). The white one is not found in Serbia. The Krivovir sheep are mostly reared in the area of the Cmrenecki basin, which is surrounded by the mountains of Rtanj, Čestobrodica, and Kućaj. It is partially present in the valley of the river Morava, in the Sokobanja municipality and Zajecar region (a breeding programme exists and 216 animals are in the herd book). **Lipska sheep** are reared in the municipality of Smederevo, in the village of Lip and Umcar near Mladenovac (a breeding programme exists and 638 animals are recorded in the herd book). **Pirotka sheep** are reared in eastern Serbia in the municipalities of Pirot, Dimitrovgrad, Bela Palanka and Babušnica. It is mostly represented in Stara and Suva planina. The sheep breed of Pirot has now spread throughout the whole territory of Serbia (a breeding programme exists and 85 animals are entered in the herd book). It is cultivated in a pure breed, and often crosses with imported German Merino Landshaff
(Wurtenberg) breed and svrljiska and sjenicka zeckels sheep. Svrljiška sheep are mostly reared in hilly-mountainous areas between Knjazevac and Nis. It has also spread from Lebane and Leskovac, areas in the south up to Donji Milanovac and Kladovo in the north of Central Serbia. Sjenička sheep are reared in the Raska Region, primarily on the Pestersko-Senica Plateau and are also present in western Serbia and Shumadija area. Tsigai sheep are spread out over a wide area. They are reared throughout Vojvodina (Srem, Banat and Backa), while Čokanska Tsigai are reared in the narrow space of Čoka and Sanada (a breeding program exists and 858 animals are in the herd book).

The Balkan goat is reared in the municipalities of Vršac, Kovin, Bela Crkva, Dimitrovgrad, Bosilegrad, Gadjin Han, Niš, Knjaževac, Sokobanja, and is also present in Vojvodina, Raska and Kosovo*. The Domestic white goat was widespread in the former republics of the former SFRY, and today it is most commonly found in central Serbia, in the mountainous regions. It has the highest number in the Nishava, Rasinski and Zaječar regions.

The Banat Naked Neck hen is bred in Banat and in the municipalities of Novi Sad and Ub. It is sporadically present in other parts of Vojvodina. The Kosovo* singer hen is bred in Kosovo* and sporadically in Raska Region and the territory of the municipalities of Vranje and Dimitrovgrad. The Svrljiška hen is bred in the municipality of Svrljig, and it can be traced in the municipalities of Dimitrovgrad and Ub. The Sombor Crested hen is bred in Vojvodina, the surrounding of Sombor, Novi Sad and the municipality of Ub.

The best progress in terms of numbers of animals for one local breed was achieved with the Mangalitsa pig, whose number increased from 60 heads in year 2,000 to 3,000 heads in 2013. This progress was a result of the promotion of breed itself, its meat and fat quality and the switch from selling live animals to selling of value-added traditional products. Imports of boars for refreshing the population and increased awareness among breeders about the importance of preserving this breed resulted in improved production results. Regarding ex-situ conservation, there is a stock of about 5,000 doses of semen from only two Busha bulls. The action is performed on 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, but has an active cooperation with the European Regional Focal Point working group for ex-situ conservation. There are no standardized methods and technologies for in-situ and ex-situ conservation in place.

There is also no gene bank for AnGR in Serbia.

2.3. SOCIO – ECONOMIC ASPECTS OF AGROBIODIVERSITY PROTECTION

In general, conservation of agrobiodiversity, including use and management of PGR is closely linked to socio-economic issues. On one hand, development and modernization of agriculture will: a) increase the economy and the income of farmers’ households, b) strengthen the research, science, and R&D, c) improve the position and impact of national PGR stakeholders, mainly big national agricultural institutes, and d) enable more investments in breeding programs and gene bank operations (inventory, collection, regeneration, evaluation, characterization and documentation). Approaching the EU will create a stricter and more controlled framework and will define use, management and exchange of the PGR and germplasm material. Globalization and acceptance of EU regulations and rules could affect the use and existence of old, traditional and autochthonous genetic material, since these accessions are mainly kept by individual farmers living in depopulated and marginal areas. The fate of local material and so-called “loft seed” (“seme sa tavana” in Serbia)
is doubtful in regard to the adoption of the International Treaty and the protection of intellectual rights of owners of the PGR material. Thus, there is a serious need to find a balance of these trends – global and local (traditional) and to make a significant and targeted effort in the conservation of PGR of high importance. Development and modernization of agriculture increases the potential for research, enabling more investments in breeding programs, and in gene bank operations. EU approximation will create a stricter, more controlled framework and will define use, management and exchange of the PGR and germplasm material which will affect the use of reproduction material and therefore existence of old, traditional and autochthonous genetic materials which often survive thanks to small farmers in remote areas. Thus, the possible implementation of High Nature Value Farmland concepts and of NATURA 2000 could contribute to the protection and maintenance of local populations and old and autochthonous varieties and landraces.

In the 20th century, local breeds and local populations of PGR were widely reared on small private farms, while big state-owned farms were reserved for exotic breeds and foreign varieties and hybrids. An exception was made in the case of local sheep breeds, which were also reared on large state-owned farms making the majority of breeds and strains widespread. Those rare breeds and strains of domestic animals, as well as local populations and landraces of crops, which were less productive, remained present in remote rural areas, most often mountainous areas. The first migrations of man, working seasonally in urban areas, did not bring with it any changes in the structure of plant varieties and animal breeds, as much as farming systems. Selection of breeding material was in the hands of women, older and young people, who were capable of keeping production, but not leaving their birthplace to bring innovations such as exotic breeds. Worsening of the living conditions in rural areas (which was intentionally introduced by government in mid 20th century, to attract interest of people to employ themselves in industry), pushed this time women (unwilling to grow children in such conditions) to leave rural areas. Remaining man, having no chance to marry, followed or remained marginalized in remote areas, struggling to survive. Once population from these remote mountain locations start their intensive outmigration in the second half of 20th century, last refugium for locally adopted breeds and plants ceased to exist.

The introduction of advisory services influenced the remaining farmers to adopt more intensive breeds (and highly productive new crop varieties), which have changed farming across the majority of the country. Intensified production, however, often had a devastating effect on the environment, whenever a respective area could not hold increased pressure due to low fodder productivity per surface caused by severe climate, shallow and poor or steep soils. With an aging rural population, the ability to organize grazing on remote pastures has become lost: however, they are able to keep their animals on limited space close to villages, causing often destruction of vegetation cover, and consequently, erosion of the slopes. At the beginning of the twentieth century there still survived traditional small-scale farmers who tried to modernize their production while majority of local breeds and local crop varieties were on the edge of extinction. Their rehabilitation is now more dependable thanks to the enthusiastic local people who are trying to rehabilitate traditions for their own sake or to increase attractiveness of their tourist and gastronomic offerings, or make a profit through reintroduction of traditional or innovative products (donkey cheese) for niche markets of special food. Yet, owners of local breeds today actually have no common characteristics. They are of different ages, genders, education levels, and even employment status - farmers, entrepreneurs, workers, even the unemployed. The size of their farms are small, even not farms at all but just small rural households which keep a few animals in their backyards, trying to fill gaps in their budget.

Traditions related to the use of certain animal products have always existed. In Kosovo* and Rashka regions, due to religious reasons, pork is consumed in insignificant quantities, while in the rest of the country pig meat dominates the meat market. Buffalo fat was used in these areas
instead pig fat and busha milk is appreciated for its high fat content. Demand for Tsigai sheep is minor compared to lambs of the Zeckel breed, especially breeds such as Sjenichka, Pirotksa, Sharplaninska, etc. Tsigai is, for that reason, spread mainly in Vojvodina, while the rest of the country hardly have any pure flocks of exotic heavy breeds. Differences regarding habits have shaped geographical distribution of cattle too, but not in a way that this or that area have preferred and kept local breeds instead of exotic ones, but preferred different exotic breed. Rich and specific markets of Vojvodine dictate which high productive dairy breeds will prevail, such as the Holstein-Frisian, while in other areas cattle of combined milk-meat type such as domestic spotted cattle of the type of Simmental, or pure Simmental (central Serbia). Sometimes even simple impressions that the one is more beautiful than another will make a farmer decide (Simmenthal or domestic spotted rather than black and white, such as is the preference in central Serbia). In areas with extensive production of livestock food (passive mountain areas of Kosovo* and Rashka) Busha and its halfbreeds have remained the longest. In Prešev, Bujanovac, Novi Pazar, Tutin and Sjenica regions, with the predominant population being Muslim, there is a large demand for sheep and buffalo milk products as well as mutton and lamb meat, of locally adapted breeds (of combined purpose). In these regions, demand is a key for conservation of AnGR.

Concerning gender issues, women are more aware of the traditional use and quality of local breeds, old varieties and local populations in traditional products, food and beverages, made of these local PGR populations and landraces, as much as AnGR.

### 2.4. STATUS OF PUBLIC AWARENESS

In Serbia, the **public awareness on PGR importance, use, management and conservation** is generally low. However, there is an increasing interest for old, traditional and local varieties and populations, due to its quality and specific traits, as well as consumers’ habits and preferences in taste, especially from the middle-aged generation and older people who still remember their favorite varieties of crops, mainly fruit and vegetables. There are some efforts to inform the public on importance on PGR, like food festivals, fairs on traditional and organic products, participation of experts in media (TV, radio, newspapers), and exhibitions on particular PGR, such as “Old and Gone Fruit of Serbia”, which was performed by Ms. Aleksandra Savić, the custodian of the Natural Museum of Belgrade (see Case study), etc. In 2007 the pilot project entitled as “Let’s preserve and protect the old Vojvodina’s vegetable varieties”, was realized by Agro-institute in Sombor, supported by the Ministries of Education and Agriculture of the Republic of Serbia, which had the participation of 22 ground schools and 3,000 scholars from northern Serbia. A total of 5,296 accessions of 40 different crops, mainly vegetables, were collected ([http://www.sorte.minpolj.gov.rs](http://www.sorte.minpolj.gov.rs)).

Concerning academic framework in relation to PGR promotion, at the Faculty of Agriculture of the University of Belgrade, the elective modules for master’s and doctoral studies, such as “Plant Genetic Resources” and “Biodiversity and Natural Plant Resources in Agriculture”, respectively, were implemented into the new study programs. A number of scientific papers concerning local and/or traditional varieties and populations was published, as well as several PhD theses, mostly by Faculties of Agriculture of universities in Belgrade and Novi Sad. In addition, some monographs on PGR have been issued. The seed material is regularly promoted by national agricultural institutes, which invest certain funds into the branding and marketing of their products. There were also some research and professional projects, supported by the Ministry of Education, Science and Technological Development (e.g. “Improvement of genetic potential and production technologies of fodder crops in function of sustainable livestock production”, “Vegetablearieties and hybrids for open
field and plastic house production", "Inter-disciplinary approach in creation of new varieties of soybean and development of cultivation technologies and seed processing", etc., all for the period 2011, and the Ministry of Agriculture, respectively (e.g. "Improvement of agricultural production based upon diversification of certified agricultural and food products with the added value", "Improvement of organic production in the western Serbia", 2015; the important component of both projects was mapping and valorization of local PGR landraces and populations). The most recent IPA project “Cross tree” between Serbia and Croatia was launched with the aim of inventoring and conserving the old, autochthonous, and local varieties of fruits.

Awareness about the importance of AnGR in the mind of the public in Serbia is surprisingly high. This is primarily as a result of the encouraging activity of media. One of the most popular topics of the century were old breeds and their products, mountains, pastoral life and countryside. While countryside was always getting connotation of something lagging, poor or degraded, old breeds soon after first popular TV reporters have released films about Mangalitsa pig, got the biblical importance and halo of sacred. Today, after more than 15 years there is no TV program, production, famous reporter or his show, which had not broadcasted story about old breeds in this or that way. Some of them had dozens of popular programs which contained always at least few minutes about local breeds, their quality products, importance for local cultural heritage, tourism, health.

At the begginig, information about the quality of Mangalitsa fat and its HDL cholesterol which dominates LDL, rised public interest. Later interest was spread to other local breeds. Consumers have accepted the challenge, and although purchasing power was low, products made of local breeds have entered even supermarkets (Mangalitsa), which was a new opportunity in addition to direct marketing and offer of local restaurants. TV was the main promoter and educator for bringing more farmers to grow old breed. Their business interest was finally provoked once MAFWM started offering financial support for animal genetic resources development projects.

In a meantime, agrobiodiversity topic moved from the farms into the local community, bringing the wider population into the countryside. Local breeds and their products become attractor in some nature protected areas, monasteries and organic farms.

NGOs had a very important role in increasing the public awareness and promotion of conservation. The most proactive were members of the Green Movement of Sremska Mitrovica, which based their concept of Zasavica nature reserve management on traditional farming and artisan products on offer within their own restaurant. The second one was Natura Balkanika, which launched a conservation programme in partnership with local farmers, trying to provide advice and promotion to those who were ready to accept animals. The activities of this NGO further evolved into support for processing and promotion of artisan products deriving from local breeds and finally into projects which provided the opportunity for designing tourist products and tourist destinations out of the conservation of animal genetic resources. Dimitrovgrad, where Natura Balkanika was registered, already had a number of farmers which were included in the Animal Genetic Resources Conservation Program of the MAFWM, and the Ministry of Agriculture placed one of its projects financed by World Bank (WB) and Global Environmentat Facility (GEF) on West Balkan Mountain (Serb. Stara Planina). This generated even more interest from farmers to get local breeds, and soon the municipality managed to get the majority of endangered species on its territory, which was the rationale behind the decision of the local authority to promote an Agrobiodiversity park on its territory and adopt a regional event called the Balkan Agrobiodiversity Fair and Rural Heritage as a municipal event. This first event of this kind was so well promoted in the media, that soon a number of other rural events became regular events connected to direct or indirect ways to
agrobiodiversity. All stakeholders from the farmers and civil society dealing with agrobiodiversity were regularly present, followed by local and national media, and supported by a number of international organizations. These activities are carried out through media appearances, participation in trade fairs, exhibitions, print brochures, etc.

Agrobiodiversity fair as much as media have attracted interest of schools and universities. After these became regular, Zasavica came up with an innovative way of promoting agrobiodiversity by promoting educational base in the Nature Reserve (EDIT - education, demonstration, innovation and training concept) with the Faculty of Applied Ecology. MAFWM and Veterinary Faculty have established mountain education base in Dimitrovgrad municipality which was also promoting agrobiodiversity. Following a private initiative, Dimitrovgrad promoted the First International Camp of Swiss students studying environment which had agrobiodiversity issue as a light motive. Finally, agrobiodiversity become regularly present in tourism promotion. On the International tourism fair in Belgrade supported by United Nations Millenium Development Goals Fund (UN MDGF) project, rural population for the first time got the chance to promote their tourist offer enriched with new tourist attractions and artisan products made of locally adapted breeds and landscapes shaped with traditional practices.
3. CONCLUSIONS

**Plant genetic resources of Serbia** are considered to be a very rich and important source of genetic variability. About 200 species are used as food and for other commercial agricultural purposes. However, the entire diversity of PGR in Serbia is unknown, mainly due to a lack of evidence and regular and coordinated inventory collection. The National Inventory has not been completed, but there are lists of PGR conserved and/or used by different PGR stakeholders, mainly breeding and research institutions. Several crop species in Serbia are autochthonous, including several cereals, forage grass, legume, and vegetable species. Certain parts of inter-species diversity of PGR refer to old – local and traditional varieties and landraces – autochthonous plant populations. The complete list and exact number of old and/local is unknown, so it is not possible to determine exactly which landraces are critically endangered or have become extinct.

Although traditional farming systems are considered an important part of indigenous rural culture and agrobiodiversity, many indigenous local populations of agricultural plants have been replaced by high-yielding varieties and hybrids which has led to the erosion of biodiversity. In general, old and/or local/autochthonous varieties are sporadically grown in Serbia, and occupy less than 1-2% of the total agricultural land. The areas under autochthonous populations continuously decrease in Serbia. Farmers, who keep the local populations of field crops and vegetables on-farm, generally do not receive any regular financial support and benefits, except in cases when they apply for (relatively small) subsidies from the Ministry. Thus, today only populations kept by poor households in marginal remote regions can survive, due to their inability to pay for commercial seed material. According to recent estimates, no more than 200 of old autochthonous varieties of different crops still exist. Collections of local fruit populations conserved *in-situ* and on farm are comprised of several hundred accessions.

The Plant Gene Bank is not fully operational in regard to performing all necessary activities mainly due to a lack of trained staff, the non-existence of a Gene Bank Management Plan and Program of Activities, as well as the generally low concern/interest of the administration. The Gene Bank is acknowledged for its extraordinary capacity and facilities, which are among the best in the whole region. The National Plant Collection (NPC) is stored in the Plant Gene Bank, and it contains 4,238 accessions of 249 plant species. The material is documented within an e-database (passport data), and part of the collection is further documented with characterization and evaluation data. A certain part of the accessions has critical germination ability and must be regenerated. Activities of evaluation, regeneration and characterization of PGR are mainly performed by stakeholder institutions, the breeding and research institutes and faculties of agriculture. Some of them do not work anymore.

Knowing that Serbia is approaching EU, it is expected that soon there will be higher investments and opportunities for farmers and cooperatives (IPARD program), which will reflect upon farmers’ positions and their role in the whole sector, including PGR conservation. In light of the implementation of the concept of High Nature Value Farmlands (HNVF), ecological networks and, especially NATURA 2000, it might be anticipated that interest for PGR conservation, inventory, regeneration and characterization, together with conservation of traditional knowledge on agricultural practices and production will significantly increase.

In recent years, some efforts were achieved, including:

- Uploading of near 5,000 maize accessions into EURISCO;
• Adopted national strategies for: Biodiversity conservation with the action plan, Strategy for Agriculture and Rural Development, National Program of Agriculture and Rural Development, Decree on subsidies for PGR conservation, etc.;
• Law on Management of PGR for Food and Agriculture has been drafted, National Program for PGR Conservation has been prepared; Grin-Global Gene Bank Management Information System has been prepared;
• Signed, ratified or accepted: CBD, ITPGRFA, FAO GPA 1 and 2, Nagoya protocol;
• Participation in IX ECPGR phase;
• Public awareness slowly grows, in term of existing research projects; promotion of PGR, especially traditional and local varieties and landraces at fairs, festivals and exhibitions; new modules relating to PGR and agro-biodiversity at agriculture faculties introduced, and the number of scientific papers and PhD theses dealing with PGR increases.

Although there is a significant genetic pool and high genetic diversity and agro-biodiversity in the Balkans and Serbia, there are several factors strongly affecting the status of PGR:

• High level of gene erosion of PGR is still expressed, despite the few and irregular attempts for support of on farm, ex-situ and in-situ conservation;
• Low investments in the agricultural sector, low production rate and yield of crops;
• Depopulation and ageing of rural population led to loss of genetic diversity, irreversible loss of old varieties and local landraces, as well as loss of traditional knowledge on PGR, traditional agriculture and ethno-botanical data;
• Lack and/or devastated rural infrastructure further diminishes the chances for revitalization of agriculture and economy of rural areas, minimizing the chances of perspectives for young people and thus for sustainable rural development;
• Low concern and lack of knowledge, low capacity and instruments of management of Nature Protection Areas for PGR assessment, its sustainable use and conservation;
• Very low to no state investment in PGR research and conservation.

Animal genetic resources conservation program in Serbia has prospered over last 15 years to a great extent. The key points for this were governmental financial support for farmers rearing endangered breeds, support to economic valorisation of animal gentic resources and successful promotion of both animals and their products in media.

Increasing the capacity of the Ministry of Agriculture for launching brand new programs for the conservation of animal genetic resources and established public/private cooperation between administration, NGOs and farmers resulted in an obvious increase in the number of heads of endangered breeds.

The Increase of the financial support per head of endangered animal and the newly introduced support for research projects working towards reaching better valorisation of local animal breeds showed positive effect on the conservation efforts. However, the stability of the conservation of AnGR is not reached yet.

Subsidy systems showed serious weaknesses at the very beginning of the budgetary constraints connected to the economy crisis. The cause is deeply rooted in the fact that neither conservation of AnGR nor the environment is not yet even the minor priority of agropolicy designers/decision makers. Raising their awareness seems to be crucial, as does seeking intensively for more economically sustainable solutions for AnGR valorization, which seems inevitable.
Yearly planning and fluctuation of available funds, including two years of a complete lack of money for this purpose, showed all the weaknesses of such a conservation program which is based on inconsistent and unstable agrarian policy. Planning the budget for one year is far from convenient for any kind of development, while it is also devastating for the conservation of animal genetic resources and agrobiodiversity in general.

Serbia has missed out on how to better utilize the international assistance for developing AnGR support systems. Basing the whole AnGR conservation support on subsidies per head is too narrow and insufficient. Support to rural economy diversification, e.g. tourism and processing, support to HNVF, organics, investments in farms' infrastructures, breeding material and mechanisation has never been provided so as to assist small farmers become involved in conservation. Environmental policies do provide space for supporting AnGR conservation from other agricultural sectors, but no action has been observed so far in that direction.

The *ad hoc* extension services and trainings provided through some internationally funded projects, as well as the initiatives for partnerships and exchanges of good practices, have showed obvious benefits for the conservation efforts. Cooperation between the agriculture/rural development stakeholders and the environmental sector stakeholders has brought good results and progress towards new conservation approaches. It was obvious that the NGO sector should have been awarded for their contribution to AnGR conservation, however despite the good relations between the public and the private stakeholders, no support was provided.

The Serbian IPARD programme is drafted without AnGR or HNVF conservation measures. Support to the branch remained a part of the national support as a subsidy/compensation. The Law on Livestock Farming has not been improved to accommodate new programs for conservation of animal genetic resources, while regulations on food safety introduced without derogations for small scale artisan processing, devastated the possibility of adding value which is the only option capable of provide sustainability to AnGR conservation. Space for developing sustainability for AnGR conservation program seems to be greatly reduced.

Farmers, entrepreneurs and non-governmental organisations made an additional effort in regard to the conservation of endangered animals by rehabilitating traditional value chains and extending it to tourism. These were promoted on the market with lots of enthusiasm and with the assistance of enlightened individuals in media. This good idea first led to positive results – increased consumer interest, increased populations. Partnerships have again showed their power, yet this conservation strategy was heavily dependant on the awareness, talents, knowledge, willingness and energy of individuals and the good will of politicians.

Conservation of animal genetic resources in Serbia is based on fragile *in-situ* conservation of a small number of animals at a limited number of locations, and therefore very exposed to various risks such as diseases and catastrophes caused by climate change, etc. Breeding programs were not done, *ex-situ* conservation almost non-existent, veterinary, advisory and extension services on disposal were insufficient. Technical support to AnGR conservation in Serbia is at a level which does not correspond to its importance. Considering that many farmers who should take part in conservation activities, live in remote rural areas where the most favourable conditions exist for collections, access to information should be improved. These farmers mainly do not have internet access, or cannot even properly browse TV programs, while institutions and organisations in charge of providing technical and financial support are not sufficiently decentralized, therefore not accessible to farmers in remote areas. This is a serious threat to the AnGR conservation efforts.
Due to the intensive migration of the Serbian population, locally adapted breeds surviving in economically and environmentally justified traditional low input farming systems are losing ground. Entirely new deals are needed to keep these animals alive, such as the introduction of novel models of managing nature protected areas using ecological services that old breeds can provide or connecting agrobiodiversity with the rural economy diversification and valorisation of natural capital in marginal areas etc. Since Serbia, except for sheep strains, has no specific breeds to protect (which are not the heritage of the wider Balkan area), this means that the sole work searching for solutions in Serbia is irrational, and should be integrated with other Balkan countries.

The poor economic situation and the decline in living standards, coupled with the additional decrease in population, has to a large extent influenced locally adapted breeds’ chances in Serbia. This negative trend might not be of importance for locally adopted breeds if emerging new niche markets survives. The favourable fact is that consumers in Serbia still recognise quality of the traditional product yet their knowledge of its linkages with locally adapted breeds is questionable, and this puts additional risk on possible overtaking brands by intensive production and industrialised agriculture, including the introduction of exotic breeds.
4. PERSPECTIVES AND RECOMMENDATIONS

4.1. RECOMMENDATIONS FOR CREATION AND UPGRADE OF POLICY AND LEGISLATION

Rural areas of the hilly-mountainous region, usually with high rates of depopulation and ageing of inhabitants, characterized by small area of arable land per household are the main source of on farm agrobiodiversity conservation, where old and local varieties and populations still can be found. This refers to cereals, fruit, and vegetable crops. Thus, they are of the highest conservation priority. Aside from the general Strategy for Agriculture and Rural Development of the Republic of Serbia 2014-2024, there is a need for the creation of rural strategies of local communities (municipalities, regions) and development of measures and policies of integration of on farm PGR conservation.

Specific legislation on PGR is still under-developed, because of a lack of some important laws and regulations (e.g. National Strategy for Agro-biodiversity and Genetic Resources with the Action and Management Plan). The Law on PGR has not yet been officially adopted, and special regulations and bylaws are needed. In addition, there exists a low or very weak implementation of current regulations (low capacity, insufficient number of ecological and agricultural experts, professionals and inspectors) in local communities and municipalities.

AnGR conservation depends of the conservation of traditional rural life systems. Therefore, if Serbia is not capable of supporting the revitalization of all rural communities which are lost during depopulation, then strategy and selection of priority areas which will be selected for preventing migration, should take care of remote mountain and other marginal areas plus areas which are national priority for nature and culture heritage conservation.

Derogations within food safety regulations for small-scale, artisan food products prevent blocking valuable traditional artisan food value chains due to non-critical introduction of food safety standards. It is crucial to provide favourable legislation for the conservation of artisan food production and products, to accommodate the possibility for economic valorization and adding value to primary production of species and breeds valuable for the agrobiodiversity conservation. This is the only way to move animal genetic resources conservation programmes closer to becoming economically sustainable.

It is important to implement the agro ecological measures into the agricultural policy of the country for conservation of PGR and AnGr.

Special measures for the implementation of global strategies and regulations, such as the International Treaty for Food and Agriculture and HNVF are needed.

Agro-environmental measures should provide a special frame for supporting agrobiodiversity conservation in nature protected areas and High Nature Value Farming (national measures should evolve to AE measures of IPARD axis 2).

Production on shallow, sandy, wet, steep terrains, and similar marginal lands, and as much as possible in biodiversity sensitive nature protected areas would be only allowed if locally adapted breeds of ruminants in extensive farming systems are used. This will include the obligation of HNVF practices for rehabilitation of the landscape and biodiversity conservation.
Serbian legislation and international conventions protect new plant varieties through *sui generis* protection or by patent rights. However, the International Treaty on Plant Genetic Resources for Food and Agriculture, signed and ratified by Serbia in 2013, has endangered the rights of plant breeders, due to the fact that most plant varieties are not protected as intellectual property. Moreover, the Treaty allows the use of new plant varieties of Serbian plant breeders by entities from signatory countries, which might affect the plant breeders’ rights.

The introduction of indigenous property rights regulations should be used to assist rural communities, especially mountain ones, to provide proper benefits from their AnGR heritage and to create emotions which are in favour of conservation of locally adapted breeds.

Both nature conservation and agricultural policy should be developed in favour of small farms, due to their adaptability and adequate response to specific agro-ecological conditions and consequent importance for nature conservation.

It would be of immense importance if, for measures targeting diversification of the small farming sector, AnGR conservation were introduced as a cross-cutting issue (IPARD axis 3).

Finally, a set of measures, plans, activities, and regulations for NATURA 2000 should be developed, where PGR and AnGR conservation should be implemented.

Financial support of the government must be locked in a way that can guarantee, for longer (multi-annual) periods, financial support.

### 4.2. RECOMMENDATIONS FOR IMPROVEMENT OF INSTITUTIONAL CAPACITIES

The capacities of local communities are insufficient. The information accesses are weak as is its dissemination. Thus, it is needed to improve the capacities of local communities by training and knowledge transfer regarding GR conservation. Local agro-environmental management and action plans, together with investments plan and development programs usually do not exist or are not implemented, and thus should be developed.

The National Gene Bank is not fully operational, because of a lack of any/a low number of trained staff, insufficient staff number, lack of investments, plans and projects. Due to frequent political and management changes it was not possible to predict the full operations and activities of the Gene Bank, especially because of the fact that the Gene Bank is not an independent organization but an integrated part of the large food safety complex. It could be recommended to employ trained, young and enthusiastic staff for conducting gene bank operations. There is the urgent need to reconsider the management of the National Gene Bank and to try to centralize the management of the PGR and AnGR from one unit within the Ministry of Agriculture, Forestry and Water Management. Only operational and technical issues and operations should be run and performed by the Gene Bank, while financing, top management and policy making should be directed from the special unit of the Ministry for GR conservation.

Multidisciplinary teams should be engaged to assess existing legislations and shape specific derogations or adaptations required for supporting animal genetic resources conservation, such as further improvements needed within food safety regulations, for on-farm small scale artisan food products, as much as for all other adaptations needed within other regulations.
4.3. RECOMMENDATIONS FOR IMPROVEMENT OF AGROBIODIVERSITY CONSERVATION

PGR

There is high biodiversity at all levels: genetic, species, and ecosystem diversity. Lists of species and crops are available. The lists of protected (wild) species exist; however, the lists of PGR, especially of target ones, do not exist and should be performed, including an inventory of old, autochthonous and local varieties, landraces and populations. Types of ecosystems were determined and lists of important habitats and agro-ecosystems exist; however, the state of all agro-ecosystems is not evaluated and thus, should be performed. Ecosystem services of agro-ecosystems should be assessed and analyzed.

Key habitats of wild PGR are semi-natural grasslands, occupying more than 1.5 million hectares – for these habitats some digitalized vegetation databases exist, containing information on flora composition and ecological features of flora and vegetation, and partially for some grassland types, additional data on quality and productivity (yield) were assessed. However, medium and long-term management and action plans for their sustainable use and conservation of wild grassland flora, mainly fodder species and wild relatives are needed.

To improve and ensure the conservation of PGR for short, medium and long-term periods, the following measures are needed, too:

- Perform a national inventory of all PGR in Serbia and regional inventory of former Yugoslavia, and Balkan countries, aiming to identify traditionally acknowledged and most used PGR, especially of old and autochthonous varieties and local populations for national needs and breeding programs and for exchange of accessions in the region;
- Collect, analyze and document the ethno-botanical data on PGR: traditional use, use in products – food, beverages, and other products;
- Make a list of priority/target crops for the country;
- Make priority and management plans for the evaluation, characterization and regeneration of accessions; to characterize all accessions in the National Collection upon ECPGR descriptors, to check the duplicates, to ensure repatriation of accessions from foreign gene banks and to establish a list of accessions for delivery into Svalbard gene bank for permanent conservation;
- Check documentation and to adjust existing databases in accordance with the Grin Global documentation system;
- Perform collection and evaluation of target accessions and conservation in the form of a safety base collection (in country and/or regional);
- Conduct regular monitoring of the biodiversity and PGR, especially of target priority accessions.

AnGR

- Farmers growing locally adapted breeds in extensive pastoral and other systems which are classified as HNVF practices should be compensated for providing ecological services, especially for rehabilitation and maintenance of the valuable biodiversity ecosystems and for maintaining grasslands in forest zones.
- For integrated rural development of areas with natural constraints and those that are nature protected and therefore forbidden for intensive farming, traditional low input farming
systems with locally adapted breeds should receive incentives.

- The incentives for the investments in the whole value chain of locally adapted breeds and their products should be introduced. Strengthening and shortening of these value chains (localization) should be provided. This includes expansion of the production/processing value chains of AnGR based products through their marketing in tourism.

- Serbia needs a new complex multi-disciplinary oriented scientific and professional programme to develop in-situ conservation. This programme should include a strong Balkan network component, since AnGR are shared with other countries in the region.

- Development of ex-situ (genbank) for AnGR, should have the international dimension (joint action with other nations in the region should be conducted for establishing such bank), since Serbia has limited capacity to do this alone.

4.4. RECOMMENDATIONS FOR IMPROVEMENT OF SCIENTIFIC AND PUBLIC AWARENESS

Assessment and further use of PGR tolerant to drought stress is needed. There are no precise estimations on the rate, intensity and all impacts of climate change. So far, any serious research, modeling or projections were performed to allow creation of special strategies, action plans and programs. Therefore, searching for drought tolerant crops/varieties with acceptable range of traits (yield, tolerance to pests, nutritional value, taste, etc.) will be a long-term target. Some more drought tolerant crops are apple, pear and plum, okra, faba-bean, potato, amaranth, etc. - so tolerant/accessions should be searched within these crops.

Use of modern biotechnologies and DNA ‘fingerprinting’ is necessary to assess the variability, genetic characterization, and phenotype plasticity in target PGR.

Public awareness: Recently, the quality of traditional products (food, beverages, other) made upon old varieties and local populations of PGR has been recognized and at some locations/areas it is an integral part of the rural tourism offer, like “slow food”, “ethno-food” or traditional /local food (e.g. East and South Serbia).

High potential of use could have varieties and populations which were traditionally used and appreciated by interesting, expressed and/or specific taste (some old/autochthonous fruit varieties, e.g. apples: “Budimka”, “Kozara”, “Zelenika”, “Pamuklija”, “Petrovaca”, etc., pears: “Kaludjerka”, “Lubenickarka”, “Mirisavka”, “Petrovka”, etc., vegetables, including old tomato, potato, pepper, beans and cabbage, or cereals (and “pseudo-cereals”), like millet, amaranth, buckwheat, spelt, barley, oats and rye. Some of “forgotten” crops could also have their “renaissance”, such as white and black mulberry (Morus alba, M. nigra), medlar (Prunus germanica) gooseberry (Ribes grossularia), red and black currant (Ribes rubrum, R. nigrum), rhubarb (Rheum rhaponticum), faba-bean (Vicia faba), chickpea (Cicer arietinum), lentil (Lens culinaris), okra (Abelmoschus esculentus), kale (Brassica oleracea), etc. The varieties/populations/genotypes which are known as “foods from childhood” are required on the marked, but there is no supply and it is not possible to obtain them, neither as a sowing/planting material, nor for consumption.

It will be interesting to integrate the use of PGR in concepts of ethno-villages, wellness centers, spa centers and all touristic places.

Conservation of AnGR requires wide community action and should overcome the narrow frames
of agricultural policy and practice. Engagement of media in raising awareness should be further developed through the interaction of academia, farmers and administration using, as much as possible, local and international good practices.

There is a need for farmers to cooperate with the civil sector (customers organisations, organisations interested in health, education, nature protection, etc.) in order to conquer the market.

Farmers need strong public awareness campaigns to explain to the public the need for joining efforts to increase pressure on administration and provide more support to agrobiodiversity conservation and related high-quality food production. This demand for a political process which can benefit not only from the winds of EU integration for lifting the environmental culture, but also from raising the need for protecting cultural, national, ethnic identity, and traditional family values, etc.

Growing of locally adapted breeds in organic farming systems should be promoted for small farms as a sustainable option for adding the value and diversification component within the introduction of agritourism, as much as due to their adaptability to climate changes.

An aspect of AnGR and HNVF conservation should be promoted for inclusion with typical artisan products protection for interested parties, particularly entrepreneurs (artisan and SMEs).

It is extremely important for AnGR conservation to be approached from the environmental aspect, too e.g. rehabilitation and conservation of agro-environment through support of HNVF within the portfolio of the Ministry responsible for nature protection which could be of huge importance for making AnGR more sustainable.

### 4.5. RECOMMENDATIONS FOR IMPROVEMENT OF REGIONAL COOPERATION

- To propose a common regional project on target for germplasm characterization: genetic fingerprinting / application of molecular markers, such as SSR and/or AFLP to define variability, origin, the similarity and diversity of material in the region;
- Initiate the regional (and EU) research project aiming at deeper characterization of key old and local varieties of great importance for the Balkan region, using modern and advanced scientific approaches, such as DNA mapping, epigenetics, and metabolomics;
- Creation and development of new and innovative products based upon the PGR of best nutritional quality, taste and other desired performances, which will be a regional brand;
- Alternative strategies of use of PGR in the region: rural and ethno-tourism, use of PGR in “slow” and functional food in case of accessions previously evaluated for high content of bioactive compounds; “bio-gardens” and organic fields, as a way for conserving target PGR (old, autochthonous, traditional varieties and populations); special gardens and nature museums – collections of target PGR as exhibition material; such concepts will be especially important in cross-border areas.
- Promotion of traditional PGR in special media shows – to create films on the PGR for the country and the region; issuing monographs and books on target PGR of regional importance;
- Although Serbia is actively involved in all international cooperation, not many concrete activities and projects within AnGR conservation were implemented. Further activity should target capacity building of administration but supporting farmers developing good practices will be even more important. Support to farmers should also include dissemination of good practices through support to mobility of all stakeholders.
• In areas where grasslands are the result of a long history of interaction between nature and humans, and this is the case in whole region, locally adapted ruminant pastoral systems should be rehabilitated to conserve resource and contribute to a reduction in conflict between humans and animals competing to use cultivated land. To come to the most viable solutions, the region should explore present systems, those of which are shared, such as practices in Dinaric Mt. Arch, Scard-Pind Mt. Arch and Carpathian-Balkan Mt. Arch.

• For mitigating risk of losing collections of endangered animal breeds, it seems rational to attract the interest of farmers in similar environments to adopt endangered breeds even if their origin is not from that exact area. Regional cooperation can help this action be more rational since the region shares the majority of breeds.

• A weak educational system, especially formal vocational and non-formal for farmers, represents a huge threat for the conservation of agrobiodiversity. More activities for improving curricula in vocational schools and engaging the NGO sector in non-formal education should be supported. This could be done within regional cooperation as the most rational approach.
5. CASE STUDIES

Plant Genetic Resources

Production of wines of an outstanding quality from old and autochthonous Serbian grape varieties: sustainable use, conservation and promotion of genetic resources – the Prokupac case

History: The first grape varieties originate from the wild forest grape, the *Vitis silvestris*. Over time, thanks to spontaneous reproduction and mutations within the genome, the pool of autochthonous populations in particular geographic region increased where similarities in fruit morphology, metabolomic profiles and other characteristics occur due to the geographic affiliation. Within the so called subgroup Balkanika there are grape varieties and genotypes which occur in Serbia, Romania, Bulgaria, Macedonia, Greece, and Albania. The common characteristics are hairy leaves, high fruit yield, moderate to weak fruit quality, and frost sensitivity.

In medieval times, the most widely grown grape varieties in the Balkans and Serbia were: Prokupac (rskavac), Tamjanika, Lalica, Kečun, Gak, Pandurka, Smetuša, Hajmana, Volujsko oko, Šljiva grožđe, Crna ranka, Bela ranka, Peršun grožđe, Pljuka, Radovinka, Meljnik and Vrapčije grožđe. During the Ottoman and Austro-Hungarian Empires, the varieties Drenkovi, Afus-ali, Čauš, Čilibarka and Razaklija were introduced.

Later on, in the period after the Ottomans, Prokupac, Začinak, Bagrina, Kavčina, Crna okata, Tamjanika, Smederevka, Zelenika, Slankamenka crvena (Plovdiva), Slankamenka bela (Mađarka), Ružica (Kevidinka), and Skadarka were the most popular in Serbia. Varieties of the Balkanika group dominated for a long time, until modern cultivation technologies appeared, bringing requirements that could mostly meet the new, international varieties. Therefore, most of the previous genotypes and genetic material was lost and many old and autochthonous varieties were forgotten. After the Second World War, the variety Slankamenka crvena was grown on 55% of a total grape growing area; the Crvena dinka (ružica) on 10%, Šasle (Plemenka) on 10%, Mirkovača – 6%, Bela slankamenka – 5%, Italijanski rizling–4%. To some smaller degrees, other varieties were presented too, including Smederevka, Bela kadarka, and some others.

Nowadays, due to the lane system of grape growing, dominant different international varieties (mainly from Western Europe), which are more tolerant to frost and low temperatures compared to the old autochthonous ones, have become popular. Wines made from autochthonous varieties could be competition to wines from international varieties dependent on specific traits of a variety, cultivation and wine production technology. Such varieties usually do not need the application of much of agro-chemical means and are grown upon traditional agriculture practices. Wines of autochthonous varieties make a special feature of a touristic and culture offer of a country in terms of the establishment of the national wine identity. Old and autochthonous grape varieties are adapted to local climatic and soil conditions bringing unique features of taste and aroma to their wine.
There are some new and branded wineries which make wines from autochthonous Serbian varieties, such as tamjanika, prokupac, kadarka, prokupac, smederevka and some others. Winery Maurer is known for growing autochthonous grape varieties like kadarka, kevedinka, sremska zelenika, bakator and medenac beli. Winery Nagy-Sagmeister brought again the variety Furmint typically grown in region of Fruška Gora, as well as the rare variety Lipolist. The winery Imperator is among the first which started growing grapes upon biodynamic principles, whereas winery Winery Panić grows a variety crna tamjanika.

Among interesting autochthonous grape varieties of Serbia, the following ought to be stressed:

Tamjanika (white) is an old autochthonous grape variety that was almost forgotten. The wine is light and harmonized, of a pleasant taste and aroma (some sweetish). The wine is straw-yellow colored with a golden shine, with a characteristic musket aroma and notes of basil, cinnamon, as well as fruits of pineapple and strawberry. It goes well with fish and even better with sweets from walnuts, nuts, and almonds.

Kadarka wine is elegant, light and of moderate acidic taste. The special aroma of the wine reminds one of cherries. The north part of Serbia (Subotica region and Suboticko-Horgos sand region, especially) was known for kadarka cultivation. Nowadays, it is grown in Serbia, as well as Hungary and Romania. There are several types/populations of kadarka: crvena kadarka, kadarka siler, bela kadarka, kadarka roze i desertna kadarka. The wine is of nice reddish color and has a mild taste.

Slankamenka variety used to be grown along the River Danube in Serbia, but is very rare nowadays. It is used usually in wine mixtures.

Sremska zelenika is autochthonous variety of white grape, originating from the Srem region of north Serbia. The fruits are of a moderate size, while the plants are exuberant and of good yield, maturing relatively late.

Kevedinka is an interesting autochthonous variety, originating from Fruska Gora, and in the seventeenth century was spread into the Horgos vineyard region. The wine is white yellowish, bright and translucent. Aromas are rich and complex with notes of peach, meadow honey and elder in the background. It should be served with fish, light meat, and cheese.

Smederevka is one among the autochthonous white grape varieties of Serbia. It is very exuberant, high yielding, sometimes providing more than 25,000 kg of grape per ha. The fruit is big, round, yellowish and of a slight acidic taste. It is also convenient for champagne production, as it possesses a very fresh and mild taste.

Prokupac is an old Serbian autochthonous variety. In the past it was much more widely grown than it is today. It is thought that Prokupac was grown even at the time of Tsar Lazar. Nowadays it can be found in Serbia, Bulgaria, and Macedonia. Prokupac is characterized by having a strong vigor and yielding capacity, which manifests as a well-provided or low fertility soil. Prokupac shoots are developed and strong, with erect growth. Prokupac bunch is medium large, with cylindrical or conical form and medium compact. Berries are medium large, round or slightly snippy with a thick and dark blue epidermis. Prokupac can be grown at lower training systems without a post system. For the Prokupac variety it is recommended to ensure short pruning as this will provide an excellent yield. The grape is of a moderate to big size, and oblong. Upon genotype, it varies from 150 g to 300 g. The fruit is round, dark blue and fleshy, lacking in strong taste and with 18-22% sugar content. Prokupac requires warm, dry habitats of south expositions and skeletal soil.
One of the most famous wineries in Serbia is the winery Radovanovic, which has just started cultivation of Prokupac, forming the vineyard with more than 3,200 of plants of this variety. Traditional and ecologically friendly agronomic practices will be performed, aiming at production of about 3000 liters of best quality wine.

It is believed that the Prokupac variety originates from the Prokuplje and Zupa region – southeast Serbia. It is also grown in central Serbia (Sumadija), the Smederevo region, and sporadically in the northern part of the country. Clonal selection of this variety is ongoing. Researchers from the Faculty of Agriculture, University of Belgrade, allocated 42 Prokupac clones, of which 25 were completely characterized and 11 have been already registered among the oldest autochthonous Serbian grape varieties by the Ministry of Agriculture under the following codes: 40/5 (c 1), 40/8 (ПР 14), 41/1 (ПР 3), 41/3 (ПР 9), 41/4 (ПР 10), 41/6 (ПР 15), 42/1 (ПР 4), 42/2 (ПР 11), 43/2 (ПР 6), 43/6 (ПР 7), 43/7 (ПР 12).

**Taste of heaven:** Prokupac was previously the ground for the beloved and acknowledged wine in Serbia and the Balkans, the “Ruzica” wine. The main characteristics of wine are the fuller medium-bodied, dryness. It starts with a deep purple color and a brilliantly floral, earthy nose. It progresses onto the palate with violet candy, wild cherries, and red currants, finishing with herbs, leather, and meat notes over sturdy tannins and bright acids. Elegant, luscious, mysterious and great to have during cold weather. Pair with grilled/roasted lamb, spit-roasted pork, stews, and any meat dish of Balkan or Mediterranean origin. The wine is light, refreshing with a maximum alcohol content of 12% and with a color that is “Rubin”. The key aroma reminds one of mature red fruits, with a balanced texture. It could be used in wine mixtures too, as well as for the production of grape spirits and cognac.

**Some famous brands of Prokupac wine** in Serbia are:

- **Pro rose**, winery Čaša vina i priča, Ražanj;
- **Vila vina winery Milosavljević**, Trstenik;
- **Prokupac**, winery Virtus, Viteževo;
- **Prokupac**, winery Ivanović;
- **Aleksandrovac i Boje lila**, winery Budimir, Aleksandrovac;
- **Triada Prokupac**, winery Budimir, Zupa;
- **Sveti gral**, winery Botunjac, Aleksandrovac.
AGROBIODIVERSITY IN SOUTHEAST EUROPE - ASSESSMENT AND POLICY RECOMMENDATIONS

COUNTRY REPORT - SERBIA

Author: Suzana Đorđević-Milošević

Mangalitsa piglet, the most important inhabitant of Zasavica Nature Reserve and a symbol of the rehabilitation of agrobiodiversity in Serbia. Almost on the edge of extinction at the beginning of the twenty-first century, this animal helped the natural biodiversity conservation of the reserve as much as the reserve helped its own survival through a smart little business initiative, the first of its kind, promoting economic valorisation of natural capital.

Animal genetic resources

<table>
<thead>
<tr>
<th>Case: Special Nature Reserve Zasavica</th>
<th>Type of HNVF under the national classification: 1. Forests and wetlands pasture-based grazing systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AnGR Conservation:</strong> Mangalitza pig, Podolian cattle, Balkan donkey</td>
<td><strong>Success story:</strong> Zasavica reserve is the first nature-protected area, which was protected and passed into the hands of a non-governmental organisation. This marginal land with no specific future was turned into an attractive tourist destination and well known biodiverse area by the pure enthusiasm of a few locals who have explored the natural and cultural value of the area, designed an efficient model of protection and economic valorisation and went a step forward to rehabilitating farming systems typical to the region by combining nature protection with conservation of animal genetic resources. They have reintroduced extensive pastoral systems and old, mainly lost, domestic animals, traditional artisan production of meat products and gastronomy with an upgrade of a few new products based on old breeds along with gastronomic tourism of special interest, educational tourism and other tourist activities in nature-protected areas. Assisted through a number of projects in all possible frames – environmental, social, agriculture, and processing development, etc. The leading organisations have built capacities to manage Zasavica Nature-Protected Area on the edge of economic profitability, but also developed skills to attract interest and raise funds from all kinds of public and private sources through various campaigns.</td>
</tr>
<tr>
<td><strong>About the location:</strong> Biodiverse IBA; Ramsar wetland in watersheds of Sava and Drina, in Srem lowland, in the vicinity of intensive agricultural zones with almost abandoned pastoral practices and under severe threat of pollution and destruction, first and only nature protected area managed by an NGO.</td>
<td>Constraints: Tourism value chains should be strengthened, risk from blockades if external support is not provided by state and local administration is very high since economic crisis is lowering consumers purchasing prices bring in to risk a high number of low-productive animals.</td>
</tr>
<tr>
<td><strong>Valorisation:</strong> Artisan products: sasuages, smoked ham, bakon etc., donkey milk, donkey liquer, soap, cheese, etc.</td>
<td></td>
</tr>
</tbody>
</table>
| **Tourism:**  
  • Faculty of Applied Ecology Education Center  
  • ‘Edutainment’: Favorite destination for children excursions.  
  • Gastroterrorism, MICE, etc.  
  • Ecological tours, camps, etc. | |
| **Promotion:** Mangalica Day, Donkey Day, TV and strong public advocacy through political and interest parties, local leadership. | Mangalitsa piglet, the most important inhabitant of Zasavica Nature Reserve and a symbol of the rehabilitation of agrobiodiversity in Serbia. Almost on the edge of extinction at the beginning of the twenty-first century, this animal helped the natural biodiversity conservation of the reserve as much as the reserve helped its own survival through a smart little business initiative, the first of its kind, promoting economic valorisation of natural capital. |
| **Support:** Ministries, local administration, EU, REC, foreign governments and their development agencies, embassies, etc. | |
| **Stakeholders:** Local NGO’s and small farmers, local processors, rural households dealing with tourism, Public forest enterprises “Vojvodina Sume” and “Vojvodina Vode”, Nature Protection Institute. | |
# ANNEX 1

## STRUCTURE OF AGRICULTURAL PRODUCTION

### Agricultural area by categories of use (in '000 hectares)

<table>
<thead>
<tr>
<th>Utilized Agricultural Area (UAA)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total UAA</td>
<td>3,528</td>
<td>3,462</td>
<td>3,491</td>
<td>3,507</td>
<td>3,469</td>
</tr>
<tr>
<td>Arable land</td>
<td>2,640</td>
<td>2,562</td>
<td>2,590</td>
<td>2,606</td>
<td>2,591</td>
</tr>
<tr>
<td>of which Fallow and uncultivated land</td>
<td>22</td>
<td>22</td>
<td>19</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Land under permanent crops</td>
<td>189</td>
<td>187</td>
<td>188</td>
<td>188</td>
<td>188</td>
</tr>
<tr>
<td>- Orchards</td>
<td>164</td>
<td>163</td>
<td>163</td>
<td>163</td>
<td>164</td>
</tr>
<tr>
<td>- Vineyards</td>
<td>23</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>- Other permanent crops (nurseries and other)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Permanent grassland</td>
<td>700</td>
<td>713</td>
<td>713</td>
<td>713</td>
<td>690</td>
</tr>
<tr>
<td>- Meadows</td>
<td>374</td>
<td>382</td>
<td>382</td>
<td>382</td>
<td>369</td>
</tr>
<tr>
<td>- Pastures</td>
<td>326</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>321</td>
</tr>
</tbody>
</table>

### Arable land by categories of use (in '000 hectares)

<table>
<thead>
<tr>
<th>Utilized Agricultural Area (UAA)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total grain (cereals)</td>
<td>1,803.5</td>
<td>1,715.6</td>
<td>1,766.4</td>
<td>1,819.2</td>
<td>1,782.0</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>354.9</td>
<td>356.9</td>
<td>357.6</td>
<td>339.4</td>
<td>363.3</td>
</tr>
<tr>
<td>Sugar beet</td>
<td>59.2</td>
<td>69.1</td>
<td>66.5</td>
<td>64.1</td>
<td>42.1</td>
</tr>
<tr>
<td>Potatoes</td>
<td>54.1</td>
<td>52.0</td>
<td>50.7</td>
<td>52.0</td>
<td>41.7</td>
</tr>
<tr>
<td>Grapes (total)</td>
<td>22.2</td>
<td>21.2</td>
<td>21.2</td>
<td>21.2</td>
<td>21.2</td>
</tr>
<tr>
<td>Fruit (total)</td>
<td>163.6</td>
<td>163.3</td>
<td>163.3</td>
<td>163.3</td>
<td>164.0</td>
</tr>
<tr>
<td>Vegetables and strawberries</td>
<td>56.3</td>
<td>54.6</td>
<td>52.9</td>
<td>52.7</td>
<td>66.9</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Dry beans</td>
<td>13.1</td>
<td>12.9</td>
<td>11.9</td>
<td>10.5</td>
<td>12.7</td>
</tr>
<tr>
<td>- Tobacco</td>
<td>5.1</td>
<td>5.0</td>
<td>4.9</td>
<td>4.9</td>
<td>5.0</td>
</tr>
<tr>
<td>- Fodder</td>
<td>267.3</td>
<td>256.0</td>
<td>257.7</td>
<td>242.0</td>
<td>250.4</td>
</tr>
</tbody>
</table>

### Livestock, poultry and beehives (in number)

<table>
<thead>
<tr>
<th>Utilized Agricultural Area (UAA)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>937</td>
<td>921</td>
<td>913</td>
<td>920</td>
<td>916</td>
</tr>
<tr>
<td>of which cows</td>
<td>510</td>
<td>480</td>
<td>451</td>
<td>460</td>
<td>456</td>
</tr>
<tr>
<td>of which dairy cows</td>
<td>477</td>
<td>455</td>
<td>429</td>
<td>437</td>
<td>430</td>
</tr>
<tr>
<td>Pigs</td>
<td>3,287</td>
<td>3,139</td>
<td>3,144</td>
<td>3,236</td>
<td>3,284</td>
</tr>
<tr>
<td>of which breeding sows</td>
<td>450</td>
<td>408</td>
<td>355</td>
<td>346</td>
<td>354</td>
</tr>
<tr>
<td>Sheep</td>
<td>1,460</td>
<td>1,635</td>
<td>1,616</td>
<td>1,748</td>
<td>1,798</td>
</tr>
<tr>
<td>of which breeding ewes</td>
<td>1,116</td>
<td>1,247</td>
<td>1,237</td>
<td>1,266</td>
<td>1,287</td>
</tr>
<tr>
<td>Goats</td>
<td>239</td>
<td>232</td>
<td>225</td>
<td>219</td>
<td>203</td>
</tr>
<tr>
<td>Horses</td>
<td>12</td>
<td>17</td>
<td>16</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Poultry</td>
<td>19,103</td>
<td>18,234</td>
<td>17,860</td>
<td>17,167</td>
<td>17,450</td>
</tr>
<tr>
<td>Beehives</td>
<td>593</td>
<td>665</td>
<td>653</td>
<td>677</td>
<td>792</td>
</tr>
</tbody>
</table>

ANNEX 2
LIST OF INSTITUTIONS AND GOVERNMENTAL BODIES

<table>
<thead>
<tr>
<th>Institution</th>
<th>Ministry of Agriculture, Forestry and Water Management (MAFWM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td><a href="http://www.mpzzs.gov.rs/">http://www.mpzzs.gov.rs/</a></td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>Responsible institution for creation of policy and legal documents and implementation of financial support to GR conservation.</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>The sector for rural development is underemployed and weakly structured considering the support for conservation of agrobiodiversity. In practice, the former competent team with four employees, which was in charge of covering both Animal genetic resources and PGR within MAFWM Rural Development Sector, as the last remaining of the whole Yugoslav Federal Institute for Genetic Resources, ceased to exist. Staff taking care of PGR is transferred to the Gene bank, which is part of the Central laboratory, while one remaining employee takes care of Animal genetic resources. The last one is presently officially attached to the group for advisory services (with a line stating responsibility over protection and sustainable use of biodiversity in livestock husbandry in his job description).</td>
</tr>
<tr>
<td></td>
<td>Within the Ministry, the Directorate for National Reference Laboratories in Batajnica, near Belgrade was established in 2009, including the National Plant Gene Bank. Only three persons are currently employed in the Gene Bank and Phytosanitary Laboratory. Thus, activities on PGR conservation and all other gene bank operations are not functioning as they should.</td>
</tr>
<tr>
<td></td>
<td>The Ministry of Agriculture consists of different units, including the Directorate for Plant Protection, Environment Protection, the Directory for Forestry, etc. Jurisdiction of the Ministry in regard of PGR is: management, conservation, coordination of ex-situ and in-situ conservation, documentation, as well as creation and improvement of current legislative for PGR, ratification of international declarations and documents, creation the of the main policy and strategy on PGR, and implementation of the legal framework. However, the concern on PGR importance is very low, and the PGR issue it is not of any priority – not now, nor in the past.</td>
</tr>
<tr>
<td></td>
<td>Although the national program and the Law on PGR have already been prepared, but they have not yet been adopted. There is no information on the fate of these documents, in addition to the National Committee for PGR, which should become established once the Law on PGR is passed.</td>
</tr>
<tr>
<td></td>
<td>Thanks to two big international projects, the SEEDNet and FAO technical collaboration project, National Gene Bank was equipped. However, all facilities are not in full function yet.</td>
</tr>
<tr>
<td></td>
<td>Jurisdiction over Animal genetic resources is mixed between livestock farming and agro-environment (aspects of axis 1 and 2 in IPARD) due to gaps in the Law on Animal Husbandry. Animal genetic resources supporting structures in MAFWM are marginalized, failing to establish a functional link between financial support for conservation, farming, breeding and herdbooking and animal registry. MAFWM, although it possesses respective human capacities (the responsible expert holds a PhD in the branch of Animal genetic resources), due to bad organization of the RD Sector, it cannot provide full support to GR conservation. Space for GR conservation within IPARD axis 2 measures is also not yet used.</td>
</tr>
</tbody>
</table>
Disfunctional solutions in the Law for Animal Husbandry is preventing a new National Program for Animal genetic resources to be implemented, so it has withdrawn from the procedure although the draft has been completed and submitted. A weak system of main breeding organisations in livestock husbandry which should design breeding programs for conserved endangered animal breeds, due to gaps in that Law, do not feed the MAFWM policy making group, contributing to further disfunctionality of the agrobiodiversity conservation system. As a consequence, farmers who take care of endangered breeds are not supported through breeding programs for high quality reproductive animals.

### Important specific actions undertaken by the institution

MAFWM has established the first functional financial support system for farmers involved in plant and animal GR conservation and has, with the assistance of foreign expertise, drafted AE measures that include AnGR for implementation under IPARD.

### Requirements for further enhancement of capacities

Reorganization and rehabilitation of PGR and AE department.
Employment of trained and enthusiastic staff in the National Plant Gene Bank; further training and education; coordination on PGR with stakeholder breeding and research institutes; national inventory of PGR is among highest priority. The clear distinction of jurisdiction over conservation of AnGR between department for livestock farming and agro-environment is needed. Building high quality links and coordination between various MAFWM departments and sectors in the ministry responsible for environment. MAFWM needs awareness raising activities over PGR and AE in general, and agrobiodiversity conservation policy and its importance, as much as the other genetic resource issues should be emphasized. Increasing mobility for GR staff considering work in the field within Serbia and cooperation with other countries and foreign institutions is crucial for transferring good management practices. A higher budget for covering support to all farmers which is included in the GR conservation program. Support to be provided through IPARD for investments in farms holding AnGR and PGR and diversification that can help farmers add value to special products.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Agricultural Faculty, University of Novi Sad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td><a href="http://polj.uns.ac.rs/">http://polj.uns.ac.rs/</a></td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>Collection of fruit and grape accessions; involved greatly in research of all types of plant genetic resources; keeping very important parts of the national grape and fruit collection. Breeding organization for Vojvodina Province. Designing breeding programs for all domestic animals (except for locally adapted breeds).</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>Sufficient number of professional staff, researchers and teachers. Equipment and space available. Financial support to research weak.</td>
</tr>
<tr>
<td>Important specific actions undertaken by the institution</td>
<td>Herd-booking for Vojvodina.</td>
</tr>
<tr>
<td>Requirements for further enhancement of capacities</td>
<td>Inclusion of researchers in to international teams and re-establishing links with farms. Equipping vehicles and necessary equipment for research. Stronger support to research projects intended to solve problems of economic valorization of conserved AnGR. The main breeding programs for locally adapted breeds are missing.</td>
</tr>
</tbody>
</table>
### Agriculture Faculty, University of Belgrade

**Contact details**  
http://www.agrif.bg.ac.rs

**Role in agrobiodiversity protection**  
Keeps the largest grape collection and collection of fruit accessions. Very active in promotion of public awareness of PGR. Designing breeding program for horses in Central Serbia.  
Education and research.

**Capacity assessment (human and infrastructure)**  
Sufficient numbers of professional staff, researchers and teachers.  
Computers and communication equipment are available. There are still no vehicles and specialized laboratories for genetic research. Financial support to research activities is weak.

**Important specific actions undertaken by the institution**  
Herd-booking for horses in Central Serbia; keeping part of the National Collection at the school experimental station “Radmilovac”; production of spirits, wines and some other products from plant resources at the estate.

**Requirements for further enhancement of capacities**  
Inclusion of researchers into international teams and re-establishing links with farms. Equiping vehicles and necessary equipment for research. Stronger support to research projects intended to solve problems of economic valorization of conserved GR. More support is needed for conducting research in breeding and seed science. There are functional laboratories for PGR characterization, including DNA mapping. The main breeding programs and licensing of stallions are missing to make possible issuing of pedigrees to ensure the quality of reproductive animals of locally adapted breeds.

### Institute for Animal Husbandry

**Contact details**  
http://istocar.bg.ac.rs/sr/

**Role in agrobiodiversity protection**  
Designing main breeding programs for all domestic animals in Serbia (except for locally adapted breeds). Taking care of herd booking for all animals except horses in Central Serbia.

**Capacity assessment (human and infrastructure)**  
Sufficient number of professional staff and researchers, although certain gaps are obvious after recent forced retirement of older researchers due to reduction of staff in public institutions.  
Computers and communication equipment available. Vehicles and specialized laboratories for chemical analysis of feeds and animal products solid, for genetic research still incomplete. Institute possesses pig, sheep, cattle and pultry farms and experimental slaughterhouse, farm for production of fodder and a shop for selling own meat products, which makes its conditions for professional work in the branch the best in the country.

**Important specific actions undertaken by the institution**  
Herd booking for Central Serbia.

**Requirements for further enhancement of capacities**  
Further education of staff, equipment for genetic laboratories and establishment of collection of endangered locally adapted breeds. Increasing mobility on the national level, since work tends to be more administrative, while research and professional selection work in the field is dropping. Stronger support to research projects intended in solving the problems of economic valorization of conserved Animal genetic resources. The main breeding programs for locally adapted breeds are missing.
<table>
<thead>
<tr>
<th>Institution</th>
<th>STADO l.t.d. Breeding/an example of a number of local level breeding organization which reports to regional and main breeding organisations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td><a href="mailto:stadodoo@gmail.com">stadodoo@gmail.com</a>, Balkanska street 68, 18320 Dimitrovgrad.</td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>Herd-book keeping for autochthonous breeds of farm animals, promotional and utilization of genetic resources activities (processing of wool and donkey milk).</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>Two employees, basic equipment (4wd vehicle, computer equipment, milk analysis equipment, etc)</td>
</tr>
<tr>
<td>Important specific actions undertaken by the institution</td>
<td>Participation in organization of the Regional Fair of Balkan Agrobiodiversity and other promotional activities; Maintenance of YouTube channel dedicated to autochthonous breed promotion, participation in the development of breeding programs for autochthonous breeds.</td>
</tr>
<tr>
<td>Requirements for further enhancement of capacities</td>
<td>Increase the number of skilled employees. To be able to do their job with locally adapted breeds they need breeding programs to be done on the level of main organisations, since up until now the animals they have record have been entered in to the B herd book.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institution</th>
<th>Institute for Maize Research Institute, Zemun Polje, Belgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td>Slobodana Bajića 1,11185 Beograd I phone: +381 11 37 56 704 I Marketing: +381 11 37 56 705 I FAX: +381 11 37 54 994, +381 11 37 56 707 I E-mail:<a href="mailto:mri@mrizp.rs">mri@mrizp.rs</a></td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>One of the biggest and among the oldest breeding institutes in Europe in the domain of genetic maize resources; in charge for ex-situ, in-situ and on farm conservation of maize germplasm; famous for its very rich collection of maize accessions (about 6,000 of accessions), the 9th biggest maize collection in the world; Known for export of hybrids of maize and cereals throughout the world.</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>Well equipped, enthusiastic, greatest exporter of seed material – to 26 countries of the world and has, so far, created more than 1,000 varieties of different crops; more than 350 employees; the institute performs research, training, and commercial production.</td>
</tr>
<tr>
<td>Important specific actions undertaken by the institution</td>
<td>National coordinator for EURISCO. Outstanding research.</td>
</tr>
<tr>
<td>Requirements for further enhancement of capacities</td>
<td>More support by the state</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institution</th>
<th>Institute for Field Crops and Vegetables, Novi Sad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td>Maksima Gorkog 30, 21000 Novi Sad, Srbija I tel.: (021) 4898 100 (centrala) I fax: (021) 6621 212 I e-mail: institut@fv CNS.ns.ac.rs</td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>The biggest and among the oldest breeding institute; in charge for ex-situ , in-situ and on farm conservation of PGR; famous for its very rich collection of sunflower accessions, as well as its collection of wheat accessions; involved in management and breeding of all other crops.</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>Well equipped, enthusiastic, greatest exporter of seed material – to 26 countries of the world, and has, so far, created more than 1,000 varieties of different crops; more than 500 employees; the institute performs the research, training, and commercial production.</td>
</tr>
<tr>
<td>Important specific actions undertaken by the institution</td>
<td>One of the greatest EU sunflower collections with 7,000 inbred lines and 900 of wild sunflower and an extensive domestic population. Outstanding research.</td>
</tr>
<tr>
<td>Requirements for further enhancement of capacities</td>
<td>More support by the state</td>
</tr>
</tbody>
</table>
# ANNEX 3

## LIST OF NGOS, CSOS, FARMERS ORGANIZATIONS

<table>
<thead>
<tr>
<th></th>
<th><strong>SERBIA ORGANICA</strong>, Bojanska 19, <strong>e-mail</strong>: <a href="mailto:office@serbiaorganica.org">office@serbiaorganica.org</a>, <a href="http://www.serbiaorganica.org">www.serbiaorganica.org</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Terra’s, <a href="http://www.terras.org.rs">www.terras.org.rs</a></td>
</tr>
<tr>
<td>3</td>
<td>Green Network of Novi Sad, <a href="http://www.zelenamreza.org">www.zelenamreza.org</a></td>
</tr>
<tr>
<td>4</td>
<td>Centre for Organic Production, Selenca <a href="http://www.organic.centar.rs">www.organic.centar.rs</a></td>
</tr>
<tr>
<td>6</td>
<td>“Udruženje Natura Balkanika”, Dimitrovgrad, <a href="mailto:naturabalkan@orion.rs">naturabalkan@orion.rs</a></td>
</tr>
<tr>
<td>7</td>
<td>“Pokret gorana” Sremska Mitrovica, Svetog Save 19, 22000 Sremska Mitrovica <a href="mailto:zasavica@zasavica.org.rs">zasavica@zasavica.org.rs</a></td>
</tr>
<tr>
<td>8</td>
<td>Asocijacija odgajivača starih rasa stoke „Pastir“, Branka Madžarevića 138, 22419 Kupinovo</td>
</tr>
<tr>
<td>9</td>
<td>Savez pčelarskih organizacija Srbije (SPOS), Dr. Agostina Neta 30A, 11070 Novi Beograd <a href="mailto:spos.rs@gmail.com">spos.rs@gmail.com</a></td>
</tr>
<tr>
<td>10</td>
<td>“Centar za očuvanje autohtonih rasa” (COAR), Vere Dimitrijevic 9, 11186 Zemun <a href="mailto:office@cepib.org.rs">office@cepib.org.rs</a></td>
</tr>
<tr>
<td>11</td>
<td>“Resurs centar Tolinci”, Vlade Obradovića Kamenog BB, 11280 Tolinci</td>
</tr>
<tr>
<td>12</td>
<td>Udruženje stočara “Dunav”, Kovilj, 064 5423 448, Mile Plavšić</td>
</tr>
<tr>
<td>13</td>
<td>Udruženje “Odgajivači starih rasa Srbije”, Svetog Save 19, 22000 Sremska Mitrovica</td>
</tr>
<tr>
<td>14</td>
<td>ZZ “Dar prirode Suva planina”, Bela palanka, 18313 Crvena reka-Glogovac, <a href="mailto:darprirode.suvaplanina@gmail.com">darprirode.suvaplanina@gmail.com</a></td>
</tr>
<tr>
<td>15</td>
<td>“Agro Vet menadžment”, Vojina Krajinovića golemog. br21 Niš, <a href="http://www.avm.rs">http://www.avm.rs</a></td>
</tr>
<tr>
<td>16</td>
<td>Odgajivačka organizacija DOO “Stado” Balkanska 68, 18320 Dimitrovgrad</td>
</tr>
</tbody>
</table>
ANNEX 4

LIST OF NATIONAL LAWS


Law on Agriculture and Rural Development (Official Gazette 41/09, 10/13, 101/16).

Law on Subsidies on Agriculture and Rural Development (Official Gazette 10/13, 142/14, 103/15, 101/16)


Rule book on incentives for conservation of plant genetic resources (Official Gazette RS", 85/13, 30/16).

Law on Animal Husbandry (Official Gazette R.S. No. 41/09, 93/12 i 14/16)

1. Rule book list of genetic reserve of domestic animals, ways of preservation of genetic reserve of domestic animals, a list of indigenous breeds of domestic animals and endangered of autochthonous breeds (Official Gazette RS, No. 33/17).

2. Rulebook on conditions regarding the breeding and trading of autochthonous breeds of domestic animals, as well as the content and manner of keeping the register of breeders of indigenous domestic animals (Official Gazette RS, No. 58/16).

3. Rulebook on the conditions for the recognition of new breeds, lines and hybrids of domestic animals (Official Gazette, No. 16/11).

Law on Organic Production (Official Gazette, No. 30/10)

1. Rulebook on the control and certification in organic production and organic production methods (Official Gazette of the RS, No 48/11, No 40/12).

2. Rulebook on documentation submitted to the authorized control organization for the purpose of issuing a certificate, as well as on conditions and method of sale of organic products (Official Gazette RS, No. 88/16).

Law on Indications of Geographical Origin (Official Gazette R.S., No. 18/10)

- Rulebook on condition, manner and procedure for quality control and special properties for agriculture and foodstuff products with geographical indication (Official Gazette R.S., No. 73/10).

Law on Veterinary Matters (Official Gazette R.S., No. 91/05, 30/10 i 93/12)

Animal Welfare Law (Official Gazette R.S., No. 41/09)

Patent Law (Official Gazette R.S., No. 99/11)

Law on Genetically Modified Organisms (Official Gazette R.S., No. 41/09)
Law on Environment Protection (135/04, 36/09, 72/09, 43/11, 14/16)
Law on Management of Plant Genetic Resources for Food and Agriculture, 2017, prepared;
Food Safety Law (Official Gazette R.S., 41/09)
Law on Breeders' Intellectual Property Rights (Official Gazette R.S, 41/09);

LIST OF NATIONAL STRATEGIC AND PROGRAM DOCUMENTS
The Strategy of Agriculture and Rural Development Republic of Serbia for period of 2014 to 2024 (Official Gazette R.S., 85/14)
National Strategy for Sustainable Use of Natural Values and Resources (Official Gazette R.S., no. 33/2012)
National Strategy for Sustainable Development (Official Gazette R.S., no. 57/2008)
Strategy of Scientific and Technological Development of Republic of Serbia 2016-2020 - innovation research (Official Gazette R.S., No. 25/16)
National Program of Environmental Protection (Official Gazette R.S., no. 12/2010);
Rulebook on establishing a national program for the conservation of biological diversity of domestic animals for the period 2017-2021 - draft
National Programme of Rural Development 2017-2020 - final draft
National Program for Conservation and Sustainable use of Plant Genetic Resources for Food and Agriculture (2013-2020), 2013, final draft prepared

LIST OF INTERNATIONAL AGREEMENTS/CONVENTIONS
Cartagena Protocol (date of ratification 08.02.2006, date of entry into force 09.05.2006)
Nagoya Protocol (signed 2011, not ratified)
International Treaty on Plant Genetic Resources for Food and Agriculture (signed and ratified in 2013)
ANNEX 5

LIST OF REFERENCES FOR GENETIC RESOURCES IN AGRICULTURE – PLANT GENETIC RESOURCES


of old tomato cultivars. Proc. of I Symp.of ecologists of the Rep. of Monenegro, 14-18 
October 2004, Tivat, 97-103.

resursi krmnog bilja u Srbiji. U: Upšrivanje genetičkim resursima biljnih i životinjskih vrsta 
Nauka i Umetnosti, Beograd, 35-45.

aspect on forages. XII International Symposium on Forage Crops of Republic of Serbia. 26-28. May, 
Kruševac, Serbia, Biotechnology in animal husbandry, spec. issue, Vol 26, Book 
1, 115-132.

32. Vasić Mirjana, (2004): Genetička divergentnost pasulja; Genetic divergence in a bean 
collection. Zadužbina Andrejević, Beograd, 94.

33. Vasić M, Pavlović N, Gvozdanović-Varga J, Ilić Z, Moravčević Đ, Zdravković M, Cvikić D, 
Srbiji. Zbornik radova XVI Savetovanja o biotehnologiji, Čačak, 4-5. mart 2011., 16 (18), 
145-151.

34. Žunić, D., Garić, M. (2010): Posebno vinogradarstvo-ampelografija I i II, Poljoprivredni 
fakultet Univerziteta u Prištini-Kosovskoj Mitrovici.

LIST OF REFERENCES FOR GENETIC RESOURCES IN 
AGRICULTURE - ANIMAL GENETIC RESOURCES

utilisation of autochthonous cattle, sheep and goat breeds in Serbia. Proceedings of the 
8th Global Conference on the Conservation of Animal Genetic Resources, 4-8 October 

breeds and strains of sheep and goat in Serbia. The 60th Annual Meeting of EAAP, Abstract 
No. 4334, Barcelona, Spain.

and utilization of local sheep and goat breeds in Serbia. The X EAAP Mediterranean 
Symposium “New Trends for Innovation in the Mediterranean Animal Production”, Corte, 

4. Ceccobelli S., Di Lorenzo P., Lancioni H., Monteagudo Ibáñez L. V., Tejedor M. T., Castellini 
C., Landi Martínez V., Martínez A., Delgado Bermejo J. V., Vega Pla J. L., J. Jurado M. L., 
García N., Attard G., Grimal A., Stojanovic S., Kume K., Panella F., Weigend S., Lasagna E. 
(2015): Genetic diversity and phylogeographic structure of sixteen Mediterranean chicken 
breeds assessed with microsatellites and mitochondrial DNA. Livestock Science, Volume 
175, pages 27-36, http://dx.doi.org/10.1016/j.livsci.2015.03.003.

5. Činkulov, M., Stojanović, S. Krajnović, M. Žujović M. (2008): Animal Genetic Resources and 
studies on Animal Genetic Resources going on in Serbia. SABRE and EADGENE workshop, 
satellite to EAAP Conference. Vilnius, Lithuania.

South-East Europe, International Symposium: Livestock, veterinary and agro economy in 
transition process, Herceg Novi, Montenegro.


ANNEX 6

LIST OF REFERENCES FOR CONSERVATION EFFORTS OF GENETIC RESOURCES – PLANT GENETIC RESOURCES


LIST OF REFERENCES FOR CONSERVATION EFFORTS OF GENETIC RESOURCES – ANIMAL GENETIC RESOURCES


harmonized with the protection of the biodiversity of the Zasavica reserve, Study for Zasavica reserve


### ANNEX 6a

**LIST OF NATIONAL COLLECTIONS**

<table>
<thead>
<tr>
<th>National/entity collection</th>
<th>CROP</th>
<th>No of samples</th>
<th>Conservation status</th>
<th>Duplicates in other GB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ex-situ</td>
<td>in-situ</td>
<td>approximate % of the total crop samples</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CEREALS and Maize</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>Zea mays</td>
<td>4,684</td>
<td>1,700</td>
<td>90</td>
</tr>
<tr>
<td>Barley</td>
<td>Hordeum vulgare</td>
<td>247</td>
<td>200</td>
<td>50</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>Fagopyrum esculentum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millet</td>
<td>Panicum miliaceum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>Avena sativa</td>
<td>215</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Rice</td>
<td>Oryza sativa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td>Secale cereale</td>
<td>33</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>Sorghum</td>
<td>Sorghum bicolor</td>
<td>450</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>Wheat</td>
<td>Triticum aestivum</td>
<td>709</td>
<td>800</td>
<td>80</td>
</tr>
<tr>
<td><strong>LEGUMES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td>Phaseolus vulgaris</td>
<td>301</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td>Adzukibean</td>
<td>Vigna angularis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadbean</td>
<td>Vicia faba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chickpea</td>
<td>Cicer arietinum</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cowpea</td>
<td>Vigna unguiculata</td>
<td></td>
<td></td>
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<tr>
<td>Lentil</td>
<td>Lens culinaris</td>
<td></td>
<td></td>
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<tr>
<td>Peas</td>
<td>Pism sativum</td>
<td>72</td>
<td>23</td>
<td>50</td>
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<tr>
<td>Soybean</td>
<td>Glycine max</td>
<td>800</td>
<td>21</td>
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</tr>
<tr>
<td><strong>FODDER CROPS</strong></td>
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<tr>
<td>Alfalfa</td>
<td>Medicago sativa</td>
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<tr>
<td>Clover</td>
<td>Trifolium sp.</td>
<td>84</td>
<td>7</td>
<td>40</td>
</tr>
<tr>
<td>Commonsunfijn</td>
<td>Onobrychis sativa</td>
<td>8</td>
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- ?
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- 50
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- 7
- 50
- 50
- 50
- 20

### Redbeet
- Beta vulgaris
- 3
- 8
- 50
- 50
- 50
- 20

### Spinach
- Eruca sativa L.
- 4
- 4
- 50
- 50
- 50
- 20

### Tomato
- Lycopersicon esculentum
- 59
- 18
- 50
- 50
- 50
- 20

### Turnip
- Brassica rapa
- ?
- 5
- 50
- 50
- 50
- 20

### Watermelon
- Citrullus lanatus
- 14
- 5
- 50
- 50
- 50
- 20

### Zucchini
- Cucurbita pepo

### FRUIT CROPS

#### Almond
- Prunus dulcis
- ?
- 2
- 50
- 50
- 50
- 20

#### Apple
- Malus sylvestris
- 337
- 55
- 50
- 50
- 50
- 20

#### Apricot
- Prunus armeniaca
- 15
- 50
- 50
- 50
- 20

#### Blackberries
- Rubus spp.
- 3
- 5
- 100
- 100
- 100
- 50

#### Blueberry
- Vaccinium spp.
- 13
- ?
- 70
- 70
- 50
- 50

#### Cherry
- Prunus avium
- 99
- 16
- 50
- 50
- 50
- 20

#### Chestnut
- Castanea sativa
- 1
- 5
- 70
- 70
- 50
- 50

#### Currants
- Ribe spp.
- 4
- 100
- 100
- 100
- 50

#### Fig
- Ficus carica
- 1
- 2
- 50
- 50
- 50
- 20

#### Grapevine
- Vitis vinifera
- 945
- 28
- 80
- 70
- 60
- 30

#### Hazelnut
- Corylus avellana
- 2
- 100
- 100
- 100
- ?

#### Mulberry
- Morus spp.
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- 100
- 100
- ?
- ?

#### Olive
- Olea europaea
- 1
- 5
- 70
- 70
- 50
- 50

#### Peach
- Prunus persica
- 567
- 37
- 70
- 70
- 50
- 50

#### Pear
- Pyrus communis
- 207
- 43
- 70
- 70
- 50
- 50

#### Persimmon
- Diospyro ssp.
- 1
- 5
- 70
- 70
- 50
- 50

#### Pistachionut
- Pistacia vera
- 1
- 5
- 70
- 70
- 50
- 50

#### Plum
- Prunus domestica
- 130
- 26
- 70
- 70
- 50
- 50

#### Pomegranate
- Punica granatum
- 1
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- 70
- 50
- 50

#### Quince
- Cydonia oblonga
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- 50
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#### Raspberry
- Rubus spp.
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- 100
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#### SourCherry
- Prunus cerasus
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- 50
- 50

#### Strawberry
- Fragaria x ananassa
- 8
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#### Walnut
- Juglans regia
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#### Prunus cerasifera
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- 28
- ?
- ?
- ?
- ?

### MEDICINAL AND AROMATIC PLANTS

#### Fennel
- Foeniculum vulgare
- 3
- 5
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#### Coriander
- Coriandrum sativum
- 3
- 5
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- 0

#### Mint
- Mentha x piperita
- 3
- 5
- 30
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- 0

#### Caravay
- Carum carvi
- 4
- 4
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#### Marjoram
- Majorana hortensis
- 2
- 4
- 30
- 0
- 0

#### Basil
- Ocimum basilicum
- 18
- 4
- 80
- 80
- 80

#### Thyme
- Thymus vulgaris
- 7
- 4
- 30
- 0
- 0

#### Valerian
- Valeriana officinalis
- 2
- 3
- 30
- 0
- 0

#### Malow
- Malva silvestris
- 1
- 3
- 30
- 0
- 0

#### Lemon balm
- Melissa officinalis
- 2
- 3
- 50
- 50
- 0

#### Chamomile
- Chamomila recutita
- 1
- 3
- 100
- 80
- 0
Data for MAP: *ex-situ, in-situ*, documented (passport data), characterized, evaluated, all other data 0 (regeneration, multiplication, and in other gene banks status unknown)

General note: **There are no accurate data for the state of PGR** on: documentation (for most of accessions the elementary passport data exist), characterization (no data, except for the major crops of the highest interest for stakeholders / institutes performing breeding programs), evaluation, and multiplication. All data provided here represents an approximation of the expert consideration and also are a result of consultations and interviews with Ms. Milena Savic Ivanov (general manager of the National Plant Gene Bank, Dr Violeta Andjelkovic (national coordinator for EURISCO and head of the Maize Gene Bank, Maize Research Institute, Belgrade) and Dr Sanja Vasiljevic (vice-manager of the Institute for Field Crops and Vegetables, Novi Sad).
## ANNEX 6b

### LIST OF NATIONAL COLLECTIONS

Current status of breeds’ diversity, number of breeds for which characterization has been carried out and their status in conservation programs

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<th>Current Total</th>
<th>At Risk</th>
<th>Widely used</th>
<th>Lost (last 20 years)</th>
<th>Baseline survey</th>
<th>Genetic distance</th>
<th>Protection status</th>
<th>At population level</th>
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- **L** = Locally Adapted or Native; **I** = Introduced/Imported (Recently Introduced and Continually Imported).
- Breeds at risk use FAO classification ([http://www.fao.org/docrep/010/a1250e/a1250e00.htm](http://www.fao.org/docrep/010/a1250e/a1250e00.htm)).
- Consider breed characterization during the last ten years.
- Baseline survey summary data describing the identification and observable characteristics, location, uses and general husbandry of the AnGR for each species used in the country for food and agricultural production.
- Genetic distances among breeds computed from molecular analyses.
- Protection status: **In-situ** (includes all measures to maintain live animal breeding populations, including those involved in active breeding strategies in the agro-ecosystem where they either developed or are now normally found, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production, now and in the future); **Ex-situ** conservation (genetic material within living animals but out of the environment in which it developed - **Ex-situ**, **in-vivo**, or external to the living animal in an artificial environment, usually under cryogenic conditions including, the cryo-conservation of semen, oocytes, embryos, cells or tissues - **Ex-situ** in vitro).
- Performance recording is based on individual animal data for milk yield, growth, reproduction, etc.
- Genetic evaluation refers to estimation of breeding values.
- Molecular evaluation includes information of markers, DNA, blood type, protein alleles, etc.
**Locally adapted breeds in the Republic of Serbia are:**

- **Cattle:** Podolian cattle, Busha cattle
- **Buffalos:** Domestic buffalo
- **Horses:** Domestic-mountain pony, Nonius
- **Donkeys:** Balkan donkey
- **Pigs:** Mangalitsa, Morava, Resava, Domestic Meat pig (Yugoslav Improved breed, or Yugoslav Landras)
- **Sheep:** Zackel (Svrljig, Pirot, Krivi vir, Bardoka, Vlashko-vitoroga, Lipska, Karakachan, Sharmountain, Sjenica, Pirot Improved sheep), Tsigai and Chokam Tsigai
- **Goats:** Domestic Balkan goat, Serbian White goat
- **Chicken:** Banat Naked Neck, Sombor Crested, Kosovo* Singer, Svrljig hen,
- **Poultry:** Domestic geese, Domestic turkey, Domestic duck
- **Honey bees:** Apis mellifera carnica

The population trend of all locally adapted breeds is more or less stable, with slight negative tendencies in certain breeds or strains, but not so severe that at this point it threatens the survival of a particular breed or strain.

**The exotic breeds in Republic of Serbia are:**

- **Cattle:** Simmental, Holstein-Friesian, European Black and White, Limousine, Charolais, Angus, Hereford, Brown Swiss
- **Horses:** Thoroughbred, Lipizzaner, Trotter, Arab horse, Styrian horse, Holstein, Hanover, KWPN, Trakener, Pinto, Quarter, Haflinger
- **Pigs:** Landrace (Canadian, Swedish, Dutch, German, Belgian, Danish, Norwegian), Large White, Pietrain, Hampshire, Duroc
- **Sheep:** Württemberg, Ile-de-France, Bergamo, Suffolk, Charollais, Texel, East-Frisian
- **Goats:** Alpine, Saanen
- **Chicken:** New Hampshire, Brahma, Koshinshin, Sussex, Leghorn, Amrock, Australorp, Italian, Plymouth Rock, Paduaner, Antwerpen, Hamburg, Bantam, Japan Silk, Federfist, Araucana, Sultan
- **Poultry:** Italian White geese, Egyptian geese, Hungarian White geese, Beijing duck, Indian Runner, Mandarian, Karoline
- **Gwinea Fowl:** Gwinea Fowl
ANNEX 7

ACTIVITIES FOR RAISING PUBLIC AWARENESS

Plant Genetic Resources

RAISING AWARENESS CASE FOR PLANT GENETIC RESOURCES

“Old and gone fruits” - *More than just a good public awareness case...*

The catalogue entitled “Old and gone fruits of Serbia” was published and promoted for the first time in 2013 in the gallery of Serbian Academy of Sciences and Art in Belgrade. The author is Ms. Aleksandra Savić, an expert from the Natural Museum in Belgrade, and the author of illustrations is Mr Bora Milicevic, art technician of the Natural Museum, Belgrade. The publication is printed in color page format and consists of 96 pages (ISBN 978-86-82145-45-5).

The brochure represents a compilation of the results of three-years’ field work on inventory, mapping, characterization and ethno-botanical recording of old and autochthonous Serbian and Balkan varieties of several fruit species, including apple, pear, plum, peach, cherry, apricot, quince and some other less represented fruits of Serbian gardens and households of rural areas. Ms. Aleksandra Savić’s pioneering work resulted in the comprehensive and deep analysis of the state of old and almost forgotten traditional fruit varieties and the necessity of their conservation and of raising public awareness about them.

The total of 64 varieties of ten of the most important fruit species were described in terms of geographic distribution in Serbia, origin and current status. The list of local names and synonyms is provided in addition to detailed morphological features, notes on aroma and taste, traditional use, as well as needs for further research and conservation.

The exhibitions on old and gone fruits of Serbia is aimed at presenting the high biodiversity and richness of plant genetic resources of the Balkans and Serbia, which should be conserved, promoted and sustainably used, as a high value of culture, tradition and a natural treasure of the country.

Many local populations and old varieties of fruits which have become almost forgotten were presented during the exhibitions, including apple varieties (e.g. Kolacara, Vajlija, Sumatovka, Petrovaca, Zelenika, Pamuklija, Senabija, etc.), pear (Takisa, Lubenicarka, Jagodarka, Vodenjak, Medunak, Vidovaca, Ilinjaca, Sijerak, Kaludjerka, etc), plum (Pozegaca, Belosljiva, Crnosljiva, Poskavac, etc.), as well as varieties of quince, walnut, cherry, apricot and pear.

From 2013 up until today, more than 30 exhibitions in 25 cities across Serbia have taken place, where herbarium material, specimens of fruits, posters, slides, catalogues and leaflets were provided. It is thought that more than 40,000 visitors have attended the exhibition. During most of the exhibitions, thematic workshops and round table discussions were conducted, as well as special educative workshops for school children.
Ms. Aleksandra Savić speaking at the exhibition in Negotin, 2015 (Source: Ms. Aleksandra Savić)

Display at the exhibition in Vrnjacka Banja, 2015, (Source: Ms Aleksandra Savić)

High interest from visitors in Belgrade at the exhibition in the gallery of the Science and Technology, 2014, (Source: Ms Aleksandra Savić)

Thematic workshop and special exhibition for school children, Gornji Milanovac, 2016 (Source: Ms Aleksandra Savić)
Project: Improvement of agriculture in the Timocki region based upon diversification of ecologically certified agriculture and food products with an added value, supported by the Ministry of Agriculture of the Republic of Serbia, 2015

Genetic resources of Timocki region were mapped. A hard copy and CD rom brochure were issued, entitled as: The Atlas of Genetic Resources of the Timocki Region.

In the atlas, a total of 36 old and autochthonous varieties of the Timocki region were presented and described.

Apple: Budimka, Jesenka, Kiselka, Kolačara, Lepovetka, Masnjača, Petrovka, Šarenka, Šumatovka, Timočanka, Tvrdajka, Zelenika

Pear: Jasenka, Stambolka, Takiša, Vodenci

Quince: Leskovačka and Vranjska dunja

Walnut: Timočki

Appricot: Šeftlija

Plum: Ranka

Cherry: Rupavica

Grape: Bagrina crvena, Plovdina, Tamjanika, Vranac, Začinak

Vegetables:

Paprika: Debelička paprika, Venčara, Šiljke crvene, Trovrška, Đinka

Beans: Gradištanac

Faba bean: Domaći

Garlic: Domaći proletnjak

Tomato: Timočki jabučar

Several exhibitions were performed and small fairs of traditional and ethno-products based upon local autochthonous varieties and local populations.

Other selected cases of public awareness:

TV show on old grape varieties: https://www.youtube.com/watch?v=bNEcERQaF3s

TV Show on Prokupac wine: https://www.youtube.com/watch?v=9gwXg8_sLyY

TV show on old and autochthonous vegetables – tomato: https://www.youtube.com/watch?v=BQAA34XcyQQ

TV show on project of Agroinstitute Sombor: Preserve old and autochthonous vegetable varieties: https://www.youtube.com/watch?v=kYJRY4OWgpU
Animal Genetic Resources

Rural events, fairs and exhibitions are some of the most effective tools for raising awareness about agrobiodiversity and its importance. One example is the Regional Agrobiodiversity Fair in Dimitrovgrad, which is also exhibiting Balkan rural tradition. Interesting events are Days of Mangalitsa and Donkey Day in Zasavica and Livestock Farmers’ Day in Krcedinska ada, which are at the same time the main centres for conservation of animal genetic resources. They are of utmost importance when summarising results of all efforts undertaken annually and represent indicators of how public awareness has risen over the course of one year. From the other side, an important role for raising awareness of farmers and attracting their interest to join the conservation programme depends on their opportunity to get into the public with their results. For that reason attracting the interest of the media is crucial because it is an opportunity for farmers who are part of the animal Genetic Resources Conservation Program to promote their breeds of old breeds at the International Agriculture Fair in Novi Sad and promote agrobiodiversity as part of the tourist attractions of the country at the International Tourism Fair in Belgrade (the largest events of both kinds in the region) and to participate with their products in exhibitions out of Serbia. Since this kind of production is of small size, these occasions are very rare.

Serbian protectors of agrobiodiversity have joined for the first time at some of the international events to exhibit their products, such as Terra Madre Salone del Gusto 2016 in Tirane, and have also organised events of this kind in Novi Sad in 2015. More about Serbian participation in Terra Madre is available on the WEB site of ESSEDRA project https://www.essedra.com/sr/

Nevertheless, the line of domestic rural events remains the main hub for raising wide public awareness. Some of these are presented below.

Agricultural and rural events were the first to promote Animal genetic resources in public. The most famous one – International Agriculture Fair in Novi Sad (organised in May) presents collections of rare animal breeds almost from its establishment. The Ministry of Agriculture supports exhibitions of rare animals along with other high-quality breeds.

The first specialised exhibition took place in 2001 in Dimitrovgrad and is called the Balkan Agrobiodiversity and Rural Heritage Fair and was primarily part of Agrobiodiversity Week in September. Later, upon request of the Municipality of Dimitrovgrad, the date was changed to accommodate the will of municipality administration to contribute to this successful event with the celebration of Municipal Day. So far, in the last 15 years, only one year was missed - the 14th event in 2017 was canceled due to bad weather. The event has become a unique tool for promoting Animal Genetic Resources, but is also a strong tool for encouraging farmers and attracting media. The fair was also the first step towards the adoption of the concept of ‘edutainment’, as a powerful tool for educating of the population, which in the future will be able to provide quality support for the conservation of Animal genetic resources. Visits to the fair have become obligatory for elementary and high schools in Dimitrovgrad, and later also for school children from surrounding areas and for students from universities in the region. During the last ten years, a few ad-hoc rural events have also contributed to the Animal genetic resources conservation. One of these was the traditional moving of animals to high mountains, which revived the tradition of old inhabitants of the region, which was the way of adaptation to the vegetation changes in time and space. This event was organised on Stara Planina with Busha cattle from one of largest farms in the country taking care of this rare breed.
There is a number of rural events, which are usually dedicated to one local product (sausages –“kobasicijada”, bakon-“slaninijada”, etc.), but covering also complete rural heritage of one location including agrobiodiversity. The majority of them present local breeds of animals, specific local plant varieties, etc, but very few focus on attracting publicity, most of them attract primarily farmers which grow old animal breeds or plants. Livestock Days on the Danube island of Krchedinska Ada is one of those at which a main role is played by a group of farmers who traditionally grow livestock in this area. Their animals are mostly traditional breeds out of which the majority gets support through the Animal Genetic Resources Conservation Program. The event is regularly organised at the beginning of September every year.

Serbian Busha calf (Author: Suzana Djordjevic Miloshevic)

The most famous rural event related to the Mangalitsa pig breed is the Day of Mangalista - Srem Pig Slaughtering Feast. It is organized every year in December in Zasavica nature reserve to raise awareness of the importance of this breed, the quality of its meat and fat, and rural traditions and products attached. Another event of the kind is the tourist-promotional event “Donkey Day” which is a day of promotion for products made from donkey milk and meat, and an edutainment made around Animal genetic resources, which is providing financial benefit for easing their conservation in Zasavica nature reserve in vicinity of Sremska Mitrovica in Vojvodina. The event is regularly organised in late April.
Park of agrobiodiversity is proclaimed by the Assembly of the Municipality of Dimitrovgrad to promote agrobiodiversity and to celebrate role of farmers of this area in the national Animal genetic resources conservation program. This proclamation was not primarily intended for advertising but more as an act of good will from the local administration to give moral support to the numerous farmers who have joined the conservation program as a result of activities and support provided by the Serbian government through the biggest project ever which has so far provided support for the revitalisation of Animal genetic resources in Serbia (WB/GEF STAR project).

Tourist products/tours and destinations After the year 2000, almost every newly published guide or other promotional material from areas where locally adapted breeds are grown has contained information or pictures on their presence and character including the quality and kinds of produced products. However, the only tourist product which is entirely related to agrobiodiversity is made in the CBC project between Dimitrovgrad and Tran municipalities by the Natura Balkanika Association [http://www.balkanika-crd.org/] promoted a heritage trail [http://balkanika-crd.org/images/Tourist%20map.pdf] which connects the biodiversity of grasslands shaped by traditional high nature value farming practices – grazing of local zeckel sheep, Balkan goats, busha cattle, donkey and domestic mountain horse, traditional artisan products deriving from them and tourist attractors such as Dr. Stamen Grigoroff museum of sour milk in Tran, Bulgaria (scientist who have first described Lactobacterium Bulgaricum) [http://notevenpast.org/the-museum-of-sour-milk-history-lessons-on-bulgarian-yogurt/].

An interesting development could be observed in ‘edutainment’ initiatives connected to agrobiodiversity and attached ecosystem features of the most prominent areas involved in conservation programme in Zasavica Nature Reserve and West Balkan Mt. This special type of tourism which is not necessarily related only to rural areas, has amazing potential for supporting agrobiodiversity conservation programs from multiple aspects – as a perfect way for raising awareness with the younger population, namely young professionals as an income source, and motivation for farmers and as a promotional activity attracting tourists. The most interesting achievements in this respect is a Swiss ETZ faculty field course, which is organised in the village of Kamenica in Agrobiodiversity Park in Dimitrovgrad.

Specialised conferences and workshops dedicated exclusively to Animal genetic resources are rare; however, this topic appears from time-to-time in the program of various conferences, dedicated to organic agriculture, livestock husbandry, rural development, etc. One of the most recent specialised events was an international seminar “Conservation of the Balkan Web of Life” in Zasavica Reserve, dedicated to active conservation of agrobiodiversity and biodiversity in marginal rural areas of the Balkans through connecting agriculture-food production and tourist value chains. The best practices, guidelines for academics, farmers and professionals in Zasavica 19-21.3.2019. This meeting had the purpose of promoting agrobiodiversity issues with young students of ecology. Events which offer informal education about agrobiodiversity for young people on purpose also happen every year in Dimitrovgrad, where Swiss students come to learn about Serbian agrobiodiversity and to also participate in the first ‘edutainment’ activities and educational tourism in this branch in Serbia.
WEB sites and blogs about animal genetic resources are mostly occupied with the promotion of locally adapted breeds and products from their milk, meat, wool, etc. These web sites are often owned by various NGOs or professional organisations, such as vets, farmers or marketing organisations, etc. Also, some bloggers, travelers or those involved in fashion are also engaged with promotion of destinations where one can see old breeds or purchase products.

Professional veterinary sites such as: [http://veterina.info/ovce/rase-ovaca/527-karakaanska-ovca-izmedju-opstanka-i-nestanka](http://veterina.info/ovce/rase-ovaca/527-karakaanska-ovca-izmedju-opstanka-i-nestanka)

Organisations dedicated to Animal genetic resources such as Centar za očuvanje autohtonih rasa: [http://www.cepib.org.rs/](http://www.cepib.org.rs/)

Zasavica products from locally adapted breeds [http://www.zasavica.org.rs/proizvodi/](http://www.zasavica.org.rs/proizvodi/)

Mangalitsa pig products and gastronomical offerings: [http://koleba.rs/about-me/](http://koleba.rs/about-me/)

O-Wool knitting - products from zeckel sheep pirotska and karakachanska sheep which is inviting customers to help with Animal genetic resources conservation through purchasing products: [https://www.facebook.com/O-Woolknitting-Stara-Planina-347704578594650/?hc_ref=ARSQwThEtFZIC81Bo2KhlFWRFEAJnys8CodtOP_84IF8Fafkk49Yh5dAwvaRuM](https://www.facebook.com/O-Woolknitting-Stara-Planina-347704578594650/?hc_ref=ARSQwThEtFZIC81Bo2KhlFWRFEAJnys8CodtOP_84IF8Fafkk49Yh5dAwvaRuM)

A blogger who is advertising MAG soap is organising with the producer a competition with various products as prizes, such as the following one: [http://beleskejosjedneane.blogspot.rs/2016/10/magi-sapun-kakao-i-zova-nagraivanje.html](http://beleskejosjedneane.blogspot.rs/2016/10/magi-sapun-kakao-i-zova-nagraivanje.html)

Professional vetea Producers also use **Social media** to attract interest in old breeds through publishing pictures of young animals, children with animals, which can provoke positive emotions, or pictures of traditional products with interesting names, packages or shapes. These pictures are often taken and published on other sites which are spreading stories about rare and old breeds as a kind of legend.


Also:


TV stations/programs are the most active promoters of agrobiodiversity, with the largest promoter being the National Radio Television of Serbia. All departments of this TV station have broadcast a number of videos about locally adapted breeds and their products, the role of agrobiodiversity in rural economies and environments. The most famous are those produced by Jovan Memedovic, the most famous author of travelogues in his serial Sasvim prirodnog (Entirely Natural).

Tens of reports which contained stories about local breeds and the people who take care of them and the products they produce were seen by millions of viewers in Serbia and other countries of the West Balkans. There is no doubt that this was one of the best contributions media has ever provided to the sustainability of the Animal genetic resources conservation program. Important contributions were also provided by ecological and scientific editorials, also a specialised national show for farmers 'Znanje imanje', and an informative editorial. The TV program 'Vojvodina' was also involved in different contributions of a similar kind. Some local TVs were very active and regularly followed all events connected with agrobiodiversity in their areas of coverage, such as former RTZ Zajecar, with their series: Selu na poklon, PI Chanell, Caribrodska TV, etc. To be more precise, during the last 15 years there has been no TV program/station which did not feature a story about agrobiodiversity (see pictures). Some links to interesting video materials are listed below.
Autochthonic Karakachan sheep (Author: Suzana Djordjevic Miloshevic)

Autochthonic Bardoka sheep (Author: Suzana Djordjevic Miloshevic)
Flock of autochtonic goats (Author: Suzana Djordjevic Miloshevic)

Podolian cattle (Author: Suzana Djordjevic Miloshevic)
1. Al Jazeera Balkans: In Serbia they produce the world expansive cheese: [https://www.youtube.com/watch?v=sqhmGtWUUp0](https://www.youtube.com/watch?v=sqhmGtWUUp0)

2. TV Avala: About karakachan sheep in Cma Trava: [https://www.youtube.com/watch?v=AN7JsoKdIFs](https://www.youtube.com/watch?v=AN7JsoKdIFs)


4. Radio Television Caribrod: Reports from Agrobiodiversity Fairs: [https://www.youtube.com/watch?v=QgPXZwWuDs](https://www.youtube.com/watch?v=QgPXZwWuDs)

5. TV Happy: The largest herd of Podolian cattle in the Balkans and why this is important: [https://www.youtube.com/watch?v=AN7JsoKdIFs](https://www.youtube.com/watch?v=AN7JsoKdIFs)

6. RTS Science in countryside – Livestock farming, locomotive of agricultural prosperity: Story from West Balkan Mt.: [https://www.youtube.com/watch?v=JO0I6Q75C2w](https://www.youtube.com/watch?v=JO0I6Q75C2w)


8. RTV 5kazanje, Racka sheep: [https://www.youtube.com/watch?v=jxAityWo6dQ](https://www.youtube.com/watch?v=jxAityWo6dQ)


10. Vertigo production: Indigenous grape varieties: [https://www.youtube.com/watch?v=3DbgXcsb5i8](https://www.youtube.com/watch?v=3DbgXcsb5i8)

11. RTS Entirely Natural: People from West Balkan Mt., Part One: [https://www.youtube.com/watch?v=Lj2-inIOWqM](https://www.youtube.com/watch?v=Lj2-inIOWqM)

12. RTS: Znanje Imanje, 10. септембар 2017: [https://www.youtube.com/watch?v=pXpecGFdL8](https://www.youtube.com/watch?v=pXpecGFdL8)

13. PI Chanel: Reviving traditional farming practices/demonstrations: Izgon busa na Staru planinu: [https://www.youtube.com/watch?v=kIfTPThyi00](https://www.youtube.com/watch?v=kIfTPThyi00)

**Film production** is not too rich, mainly the results of private initiatives or results of projects. Four films about the Zeckel sheep, Mangalitsa pig, Domestic Mountain horse and Balkan Goat were produced by Society Natura Balkanika from Dimitrovgrad and distributed to the agriculture extension service network. Films are accomanied with published brochures with directions for growing organic Mangalitsa, Zeckel Sheep, Balkan goats, and bees. A few more films cover the issue of traditional artisan production, rural tourism, etc. Mainly they have documentary or educational character, sometimes they also represent a kind of tourism promotion. Balkanika Production Chanel on Youtube, however out of 50 films, has only uploaded a few.

DOO Stado also produces, from time-to-time, interesting videos about old breeds and their products for Youtube.

While old breeds are a favorite topic of Serbian media, when plant genetic resources is the topic, GMO is overwhelms the authors. Yet, one of the most famous Serbian plant genetic resources has its place in media. The most filmed Serbian plant species is the cabbage, namely the Futog Cabbage, and indigenous breeds of grape.

**International promotional platforms** The most important promotional platforms farmers have used for emphasizing the importance of agrobiodiversity and for assisting the conservation of Animal genetic resources has been SLOW FOOD ARC OF TASTE I PRESIDIA. These platforms were introduced by the EU financed ESSEDRA project and implemented by Slow Food and its national partners across the whole Balkans and Turkey (in Serbia, the partner was Natura Balkanika).

33 products/breeds were accepted for promotion within the Arc of Taste platform by international commission out of over 70 which were nominated officially by Natura Balkanika for Arc of Taste and one more for Presidia (holding only one entry from Serbia at the moment).
These platforms are not yet adequately used for raising awareness about the importance of agrobiodiversity in Serbia. Slow food is becoming more and more famous in Serbia thanks to few honestly devoted enthusiast, although ownership is not yet been overtaken completely by local producers. The majority of actions are still controlled and directed from outcomers or individuals with agendas, sometimes to distant from interest of wider society.

**Local gastronomical offers** are a kind of promotional flirt with the human senses. Trying to reach the human heart by taking some money from his pockets via the stomach, as we like to say, is a common approach. So, although the intentions in this case are not an entirely noble trial at trying to raise public awareness for obtaining stronger support for the conservation of Animal genetic resources, gastronomy is widely used in Serbia to balance agrobiodiversity conservation programs. Promotion of good, healthy, traditional or rural food made of locally adapted breeds of animals and varieties of plants was intentionally provoked from the very beginning of the introduction of the first conservation in the twenty-first century, 15 years ago. Through promotion of special features of some animal breeds (mangalitsa and its healthy HDL/LDL cholesterol ration, public, got first insight view on rationale behind investing public money in conserving old, abandoned due to low profitability breeds).

Although we can mention just a few restaurants which are famous for offering exclusive menus containing locally adapted breed products, many other rural and some urban restaurants and agritourism do offer some of products of a similar kind. This appears to be not just one of the most efficient promotional tools for agrobiodiversity conservation, but also a valuable tool for attracting visitors to nature protected areas (Zasavica), as much as an efficient tool for making conservation of Animal genetic resources economical viable. The example of the most successful places are Zasavica Nature reserve: [http://www.zasavica.org.rs/](http://www.zasavica.org.rs/), Bojcinska koleba: [http://koleba.rs/about-me/](http://koleba.rs/about-me/) and Guljas charda: [http://www.vm.rs/guljas-carda-palic-egzotika-na-severu/](http://www.vm.rs/guljas-carda-palic-egzotika-na-severu/), which have survived from the very beginning.

**Printed media** (newspapers, tourist publications etc.) play a less significant role in public awareness raising than electronic media does. Contributions of a higher quality are again attached to a few leading locations in animal genetic diversity conservation – Zasavica Nature Reserve and the Municipality of Dimitrovgrad. Breeds and traditional products are the main topics.