Agrobiodiversity in Southeast Europe - Assessment and Policy Recommendations

COUNTRY REPORT - MONTENEGRO
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)  
Blvd. Goce Delcev 18, MRTV Building, 12th Floor, 1000 Skopje,  
Macedonia  
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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: Mr. Zoran Jovovic, PhD; Ms. Bozidarka Markovic, 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>AEGIS</td>
<td>European Genebank Integrated System</td>
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<tr>
<td>AGR</td>
<td>Agriculture Genetic Resources</td>
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<td>AnGR</td>
<td>Animal Genetic Resources</td>
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<td>AWU</td>
<td>Annual Work Units</td>
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<td>CAP</td>
<td>Common Agricultural Policy</td>
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<td>DNA</td>
<td>Deoxyribonucleic Acid</td>
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<td>ECPGR</td>
<td>The European Cooperative Programme for Plant Genetic Resources</td>
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<td>EAFABIS</td>
<td>European Farm Animal Biodiversity Information System</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>ERFP</td>
<td>European Regional Focal Point for AnGR</td>
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<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EUGENA</td>
<td>European Genebank Network for Animal Genetic Resources</td>
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<tr>
<td>EUR</td>
<td>Euro (currency)</td>
</tr>
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<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>GDP</td>
<td>Gross Domestic Product</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<td>GVA</td>
<td>Gross Value Added</td>
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<tr>
<td>IPA</td>
<td>Instrument for Pre Accession Assistance</td>
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<tr>
<td>IPARD</td>
<td>Instrument for Pre Accession Assistance for Rural Development</td>
</tr>
<tr>
<td>IPGR</td>
<td>Institute of Plant Genetic Resources</td>
</tr>
<tr>
<td>ITPGRFA</td>
<td>International Treaty on Plant Genetic Resources for Food and Agriculture</td>
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<tr>
<td>MARD</td>
<td>Ministry of Agriculture and Rural Development</td>
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<td>MGB</td>
<td>Montenegro Gene Bank</td>
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<td>MNE</td>
<td>Montenegro</td>
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<tr>
<td>MONSTAT</td>
<td>Statistical Office of Montenegro</td>
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<td>NGO</td>
<td>Non Governmental Organization</td>
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<td>OIV</td>
<td>International Organization of Vine and Wine</td>
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<td>PGR</td>
<td>Plant Genetic Resources</td>
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<tr>
<td>SASA</td>
<td>Science and Advise for Scottish Agriculture</td>
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<tr>
<td>SEE</td>
<td>South-East Europe</td>
</tr>
<tr>
<td>SEEDNet</td>
<td>South East European Development Network on Plant Genetic Resources</td>
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<tr>
<td><strong>SEERA</strong></td>
<td>Preservation and Establishment of True-to-Type and Virus-Free Material of Eddangered Grapevine Cultivars in Croatia and Montenegro</td>
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<td><strong>SIDA</strong></td>
<td>Swedish International Development Cooperation Agency</td>
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<td><strong>SNP</strong></td>
<td>Single-Nucleotide Polymorphism</td>
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<td><strong>SMTA</strong></td>
<td>Standard Material Transfer Agreement</td>
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<td><strong>UAA</strong></td>
<td>Utilized Agricultural Area</td>
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<td><strong>UN</strong></td>
<td>United Nations</td>
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<td><strong>VAT</strong></td>
<td>Value Added Tax</td>
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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!
INTRODUCTION

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

Montenegro is situated in the southeast of Europe, with a surface area of 13,812 square kilometers. The total length of the land borders is 614 km. The neighboring country to the west and partly to the north is Bosnia and Herzegovina (225 km or 36.6% of total land border); to the north and northeast, Serbia 124 km (20.2%) and Kosovo* 79 km (12.9%), to the southeast, Albania (172 km or 28%) and to the southwest, Croatia (14 km or 2.3%). The Adriatic Sea coastline is 293.5 kilometers long (Picture 1).

The territory of Montenegro is divided into 23 municipalities, where the Old Royal capital is Cetinje while the capital city is Podgorica. Due to huge diversity of area, according to the Law on Regional Development (Official Gazette of MNE, No 20/2011), Montenegro is divided into three regions, Costal, Central and Northern (Annex 1, Table 1). The North region is mostly a rural area and covers more than half of the total territory, but with a much smaller population and density (less than 30% of total population) than in the Central and Costal regions.

According to the last census carried out in 2011, by the Statistical Office of Montenegro – MONSTAT, the population of Montenegro is 620,029. The population density is 45 people per square kilometer on average, making Montenegro one of the most sparsely populated countries in Europe (except for the Nordic countries).
The results of the last two censuses (Annex 1 - Table 1.) show that two obvious trends in population migration between last two censuses existed: the first one is severe migration from the Northern region and the second migration from rural to urban areas. In the Coastal region population has increased by 1.94%, even in rural areas, while in the Central region there has been an increase of 5.05%.

Macro-economic trends in Montenegro, according to the indicators presented in Table 2 is characterized by slight economic growth acceleration up until 2009, maintaining the inflation rate at a low level, and in the last two years a slight reduction of the unemployment rate from 19.1% in 2009 to 17.6% in 2015. The value of import and export permanently grows, with a decreasing negative trade balance (Annex 1, Table 2).

The ongoing process of structural reforms should make possible the establishment of a system of sustainable public finances.

The specific character of Montenegro’s economy, in addition to what has been stated above, is reflected also in the high share of the services sector in GDP. There is no doubt that tourism is one of the key sectors in the whole economy. Services and tourism together comprise about 40% of the GDP.

The national aspects relevant to recognized potentials, national priorities and challenges

In order to achieve the strategic objective of economic policy of Montenegro, the National Development Plan identifies three priority sectors of development: Tourism, Energy and Agriculture and Rural Development.

**Tourism** is one of the first Montenegrin economic priorities. The choice to make tourism the driving force of the economy is based on the fact that Montenegro has the resources necessary for tourism development. In the relatively small area of Montenegro, nature has produced unique contrasts with the quality and diversity of its natural and anthropological values that makes Montenegro what it is.

At the same time, tourism brings with it a whole set of positive economic effects, including a decrease in unemployment, an increase in living standards, and contribution to rural development through the development of agriculture and forms of tourism related to countryside and agriculture – agro-tourism, eco-tourism and countryside tourism.

**The energy sector** is of vital importance for sustainable development of Montenegro, both from production and consumption aspects. This is due to the fact that Montenegro is very rich in hydro energy potential. Montenegro, as a country with a favorable geographic location, has relatively good natural potential for the use of other renewable energy sources, such as wind and solar energy.

**Agriculture** and rural development Together with tourism and services, agriculture is one of the top priorities of economic development of Montenegro. More details are given in Chapter 2.1.

**State of the EU integration status of the country/entities**

The Government of Montenegro adopted the National Program of Montenegro’s Integration with the European Union (2008-2012) in the June 2008. This document is the National plan for adoption, laying down short-term and medium-term priorities.
Montenegro submitted an application for EU membership on 15th December, 2008 and became a candidate country for membership of the European Union on 17th December, 2010. In December 2011 the Council launched the accession process with a view to opening negotiations in June 2012. The accession negotiations with Montenegro started on 29 June 2012.

The negotiations related to Chapter 12 (Food safety, Veterinary and Phitosanitary Policy) opened on June 2016, while Chapter 11 (Agriculture and Rural development) of EU Acquis are opened on December 2016.

Description of the strategic approach of agriculture and rural development policy of the country and short overview of the national agriculture and rural development support scheme

Montenegro chose and accepted the concept of sustainable development of agriculture and rural areas by the Strategy of Food Production and Rural Development (2007-2013) and by the second strategy: Strategy of agriculture and rural areas development (2015-2020).

The agricultural policy is organized in four main groups: market and direct support policy, rural development policy, support for general services in agriculture, and social transfers to the rural population.

Market measures (market interventions and direct payments):

Market interventions consist of two measures: market intervention program, and risk management in agriculture. Direct payments to the farmers consist of two main measures: a) Direct support to crop production per hectare of cultivated land; and b) Direct support for livestock production paid per head of livestock.

Rural Development Policy measures, as follows:

Axis 1. – Measures for improving the competitiveness of agriculture with ten different supporting measures for development of different sectors of agriculture.

Axis 2. Measures for sustainable management of natural resources.

- Preservation of autochthonous genetic resources in agriculture,
- Organic production and Sustainable use of mountain pastures.

Axis 3. Measures for improving the quality of life and diversification of economic activities in rural areas.

- Diversification of economic activities in rural areas,
- Revitalizing and development of rural areas and construction of infrastructure.

The third component or pillar of the agricultural policy refers to financial support for general services in agriculture that are of public interest.

The fourth pillar of Montenegrin agricultural policy means a kind of social policy directed towards the rural society.

Utilization of the Instrument for Pre Accession IPA, especially IPARD

A joint project, costing 17.1 million euro, between the Government of Montenegro and the Ministry of Agriculture and Rural Development was carried out in Montenegro in the period from 2009 to
The aim of this project was to prepare Montenegrin agriculture and institutions for future membership in the European Union.

In cooperation with the World Bank, the Ministry of Agriculture and Rural Development initiated IPARD like one project in 2015 for assigning grants for investments in agricultural households. The aim of this type of support is modernization of agricultural production and strengthening competitiveness, as well as the achievement of European standards in the field of increasing product quality, hygiene and food safety; improving the competitiveness of family farms; the introduction of new technologies. This project is also intended for other relevant institutions in the process of establishing a system for the future successful implementation of the pre-accession funds of the European Union. The project budget is 4.5 million euro, and funds are provided from IPA for 2011 and 2012 budget years.

Based on public calls for grants under the IPARD Like 1 and IPARD Like 2 projects and the Montenegro Institutional Development and Agriculture Strengthening (MIDAS) project, the Ministry paid out 1,786,448.85 euro of non-refundable support in 2016, while the total amount of eligible investments amounted to 3,630,211.36 euro (including VAT).

While the focus of the MIDAS and IPARD-Like 1 project was to provide support to farms and public institutions, the IPARD Like 2 project will focus on the processing sector (small and large holdings) in order to achieve the highest level of compliance with EU requirements, especially in the field of food safety. Funds for IPARD Like 2 project were provided within the EU/IPA 2013 project, worth 6.2 million euro, of which 4.7 million euro is a grant from the European Union and 1.6 million euro is a national contribution.

1.2. AGRICULTURAL PRODUCTION

The agricultural sector plays an important role in Montenegro’s economy. The Gross Value Added (GVA) of agriculture, hunting and forestry in total is 295 million euro (2015) and its share total of the GVA was 10.5%.

Employment data published regularly by MONSTAT refers only employment to the business entities (enterprises, co-operatives, etc.) without employment on the family agricultural holdings, where the share of agriculture is 1.45%. If we take into consideration data regarding employment of 47,870 annual work units (AWU) on agricultural holdings it can be estimated that agriculture’s contribution to the total employment in the country is about 24%. In addition to the high contribution to the GVA and employment, the agriculture, as a multifunctional sector, is a base for the whole food chain and many aligned services; it contributes to tourism, maintaining rural areas and their specific character, protecting the biodiversity and a desirable landscape, and providing vitality of rural areas, etc.

Land resources and farm structure

Until 2010, the official statistical data showed that in Montenegro there were about 516,000 ha of agricultural land. But the Agriculture Census conducted in 2010 showed that the total agricultural area is 309,241 ha. Taking into account only utilized agricultural areas (221,289 ha UAA), its share of the total territory is only 16%. The average holding size is 6.3 ha of available agricultural land or 4.6 ha of used agricultural land (for 48,870 holdings conducted by Census). The share of agricultural holdings with less than 1 ha of UAA is very high (55.1%).
**Agricultural production and output**

The plant production is dominated by production of vegetables, grapes, potato, fruit, olives, while production of cereals is at a very low level. A small volume of cereal production is one of the specific features of Montenegro’s agriculture, making it different even from the neighboring countries.

Vineyards cover 2,700 ha, with prevailing autochthonous varieties (‘vranac’ and ‘kratosija’) used mainly in the production of red wine, and total grape production in 2015 was 32.8 thousand tons. The fruits, together with olive trees, are grown on 2,290 ha, with an annual production of 10.5 thousand tons. In olive growing, the traditional production methods prevail and there are slightly above 118,000 olive trees, with autochthonous ‘zutica’ being the dominant variety (more than 90%).

The area used for vegetable production is about 4,000 ha, and production was about 50 thousand tons in 2015. Vegetable production in greenhouses is performed on 60 ha with positive results in terms of volume, range of products and expanding of the growing season. Potato production is a very important sector with potatoes grown on 2,150 ha, with a total production of 40 thousand tons in 2015.

The Montenegrin livestock sector is dominated by rearing ruminants primarily due to the high percentage of meadows and pastures in total agricultural areas. The cattle breeding with 92,452 heads is the largest sub-sector of livestock production. Sheep breeding (194,636 heads) is characterized by semi-extensive way of production, mainly on the North of the country. Goat breeding is also an important sector, especially in the Central and South Regions. Poultry and pig production are weak primarily due to lack of domestic production of animal feed.

The average annual production of milk in the last ten years is around 170 million liters of which 95% is cows’ milk. The average yield per cow is very low, less than 3,000 kg. The main reason is that subsistence small-sized farms prevail, which are not motivated to improve levels of production and to introduce new technologies. The total domestic meat production is about 17,110 tons, which covers only 36% of total meat consumption in the country. Approximately 60% of meat produced in Montenegro comes from ruminants, which are predominantly grown in semi-intensive production systems.

**1.3. INSTITUTIONAL AND ADMINISTRATIVE SET-UP**

**Institutional framework**

*The Ministry of Agriculture and Rural Development (MARD)*, as an umbrella institution, proposes laws and other pieces of legislation, proposes system solutions in agriculture, defines agricultural policy and undertakes measures for its implementation. MARD proposes, to the Government, the scope of support measures and schemes for agriculture and rural development (Agro-Budget) along with a number of other documents, regulations and enactments that are necessary for the harmonious operation of the Agricultural sector.

After achieving candidate status, Montenegro had to extend its range of activities related to the EU integration process, particularly in the field of programming individual policies and in their implementation and control. Within MARD, five directorates are responsible for the area of Agriculture and Rural Development.

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1 Programme for the development of agriculture and rural areas in Montenegro under IPARD II 2014-2020
The Directorate for Agriculture and Fisheries is responsible for creating agricultural policy, the preparation of the Agro-Budget, and for drafting laws and other regulations in the area of agriculture. During the accession process, this Directorate plays a leading role in the process of harmonization of national legislation with CAP. The Directorate consists of: the Department for Plant Production, the Department for Livestock Production, the Policy Quality and Land Administration Department, and the Fisheries Department. In addition, the Directorate supervises the work of the Veterinary Administration, Phytosanitary Administration, and the Tobacco Agency.

The Rural Development Directorate prepares strategies, programs, and projects in the area of rural development with the view of increasing competitiveness, and for improving living standards and environmental protection in rural areas. It also implements programs and projects concerning rural development funded through national and international funds, performed in cooperation with international institutions and donors. The Directorate for Rural Development, in cooperation with other departments within the Ministry of Agriculture and Rural Development, and also with the assistance of other ministries and institutions, develops and prepares IPARD-like, and the IPARD Program for Montenegro. It also makes the necessary preparations for the implementation of national legislation in cooperation with the Legal Affairs Department.

The Directorate for Payment is responsible for the payments made through the IPARD Program, the national budget, and others support programs; consider requests for projects approval; prepare and sign contracts in the case where it is prescribed; consider requests for support payments; executes and responsible for payment; prepares and implements control plans; monitors payments in relation to budget lines; cooperates with the Internal Audit Department and external auditing bodies; cooperates with the outside bodies involved in the distribution and control of financial support, including the European Commission, OLAF, the European Council of Auditors, the National Fund, the Directorate for Rural Development – the Managing Authority, and the National Civil Service Officer Office.

The Directorate for Water Management carries out the tasks related to water management and development policy, monitors normative activity at the national level, develops EU legislation, and works to harmonize Montenegrin legislation and system with European Union legislation; performs administrative oversight over the Water Management in accordance to the responsibilities of this Ministry; management of water and water resources of importance for Montenegro.

The Directorate for Forestry, Hunting and Wood Industry proposes policies, laws, and other strategic documents regulating the area of forestry, hunting, and wood industry, proposes normative acts and other regulations, proposes and implements development policy in forestry, hunting, and wood industry, is concerned with the harmonization of national legislation in the field of forestry, hunting, and wood industry with EU regulations, preparation of regulations regulating the management of forests, management game and hunting grounds and regulations regulating relations in the wood industry, and other regulations that regulate the area of forestry, hunting, and wood industry.

The Directorate for Food safety, Veterinary and Phytosanitary Affairs, as the name suggests, includes the food safety sector, the veterinary sector, and the phytosanitary sector.

The food safety sector performs management tasks related to animal food safety, animal feed safety, food safety of non-animal origin, nurses of animal origin, establishes and maintains a central register of approved and registered facilities/operators for food and feed; drafting strategies, reports, analysis, information, and other materials, giving expert opinions and performing other tasks that are determined by the competence.
The sector for Veterinary Administration is in charge of monitoring and preventing the occurrence of diseases in animals as well as detecting, suppressing, and eradicating certain transmissible diseases in animals. It is also in charge of implementing veterinary prevention measures regarding animals, food of animal origin, animal feed and semen for artificial insemination and waste of animal origin by-products in both internal and foreign trade.

A Specialized Veterinary Laboratory was established within Veterinary Administration. The laboratory performs specialized diagnostic and research activities in the area of veterinary science with the aim of protecting and improving animal health, detecting and diagnosing animal diseases, controlling the health and safety of raw materials, food and products of animal origin, feed, and water for animals. Authorized veterinary ambulances have already implemented activities concerning public interest in accordance with the Program of Mandatory Measures of Health and the Protection of Animals.

The Phytosanitary Sector is in charge of administrative and other related professional activities referring to the protection of plants’ health, seeds and seedlings, the protection of plant varieties, genetically modified organisms (GMO) and genetic resources, the safety and quality of food of plant origin at a primary production level, plant protection, and plant nutrition.

Research, educational institutions and expert services

The Biotechnical Faculty of the University of Montenegro plays an educational, research and advisory role in the field of agriculture and forestry. It has been performing its educational (teaching) role since 2005-2006 when two study programs (Plant Production and Livestock) were organized. The Plant Production course, which is a specialist postgraduate, master program and comprises three areas of study: fruit growing and viniculture; crop growing and vegetable growing and plant protection. Livestock courses as a specialist postgraduate master’s degree program cover all aspects of livestock breeding. The Faculty has an experimental farm in Lješkopolje with 25 hectares of vineyards, orchards, and greenhouses. It also has a wine cellar with a capacity of 300 hl. The faculty has established a good relationship with the industry through a significant number of agreements and implemented activities.

Institute of Marine Biology is an organizational unit of the University of Montenegro and the only scientific and research institution in the country that deals with the protection and study of the Adriatic Sea. One of the basic goals of the Institute is precisely the protection and study of the Adriatic Sea, with particular emphasis on the South Adriatic. This guideline of all these years of work was the basic guideline of all the workers of the Institute of Marine Biology.

There are five secondary/high vocational schools in Montenegro. Their curricula cover all aspects of agriculture, the processing of agricultural products and veterinary science. These schools provide an education for agricultural technicians of various orientations (agriculturists, fruit growing technicians, viticulture technicians, vegetable technicians, livestock technicians, veterinarians, milk producers, tobacco producers, butchers, bakers etc.).

Other institutions and organizations

"13. jul Plantaze" is the biggest wine producer in Montenegro and it owns the largest vineyard in one complex in Europe (on over 2,300 ha) and has three wine cellars with a capacity of thirty million liters of wine. It deals with the production of grapevine, wine and table grapes, peach, olive, production and distribution of wine and grape brandies, fish growing, catering and retail trade. The company owns 40 ha surface of the nursery of the grapevine rootstocks, with the aim of preserving
the autochthonous grape varieties. Production is mainly based on prevailing autochthonous grape varieties Vranac and Krstac (beside them there are two autochthonous grape varieties Kratosija and Zizak). The focus on autochthonous wine grape varieties is a basis for valorization of the country’s grapevine genetic diversity and contributes to the overall EU grapevine diversity.

The Environmental Protection Agency of Montenegro (EPA Montenegro) was established by the Decree on Amendments to the Ordinance on Organization and State Administration (Official Gazette, No.68 / 08). The mission of the Agency is to actively promote the ecological status of Montenegro in a professional manner, thus serving the nature, health and economic interests of present and future generations, with the vision that Montenegro will be a country in which to live in harmony with nature. One of the tasks of the EPA is to monitor the status of biodiversity in order to preserve, improve and protect it. Focus is on monitoring the most representative species and habitats of international and national importance.

1.4. NON-GOVERNMENTAL SET-UP

The purpose of this chapter is to get an overview of all gaps and needs, and the involvement of different non-governmental stakeholders in developing agrobiodiversity protection systems.

Green home Podgorica deals with very different problems in the field of protection of the environment and nature. One of its important activities is the protection of agrobiodiversity. Of the numerous projects in this area, it’s worth mentioning the project “Conserving wild plants and habitats for people in the South and Eastern Mediterranean”. The main aim of this project is to strengthen the significance of important Plant Areas through many activities and field actions as tool for biodiversity conservation.

Centre for Development of agriculture "Bijelo Polje" is a NGO that works on inventorying and collecting of genetic resources, public awareness, education of producers and publishing. This NGO has collected a respectable number of local populations in the northern part of Montenegro.

1.5. LEGAL FRAMEWORK FOR PROTECTION OF AGROBIODIVERSITY

The Montenegrin Constitution as the highest legal act defines Montenegro as a civil, democratic, ecological and state of social justice, based on the rule of law (Article 1), and then establishes that everyone has the right to a healthy environment, to timely and fully inform the state of the environment, the possibility of influence when deciding on issues of importance to the environment and the legal protection of these rights.

The Constitution stipulates that everyone, and in particular the State, is obliged to preserve and improve the environment (Article 23) and thus international treaties are confirmed and published as an integral part of the domestic legislation that has the primacy over domestic legislation.

The Law on Nature Protection\(^2\) is a basic law regulating the protection and conservation of nature, including, the conservation and enhancement of biodiversity and the limitation and prevention of negative impacts on biodiversity. This law introduces a ban on the use of space and natural resources.
resources and goods in a way which, inter alia, permanently disturbs the biodiversity.

Law on Agriculture and Rural Development (Official gazette of Montenegro 56/2009, 18/2011, 34/2014, 1/2015, 30/2017 and 51/2017) regulates the development of agriculture and rural areas, the objectives and measures of agrarian policy, the incentives in agriculture and the preconditions for their realization, the rights and obligations of beneficiaries of subsidies, supplementary activities in agriculture, agriculture and other issues of importance for the development of agriculture and rural areas. The measures for sustainable management of agricultural resources (Article 16) are defined through the promotion of agricultural programs that are compatible with the principles of environmental protection, agro-ecological measures and regulating the conservation and sustainable use of genetic resources in plant and livestock production (paragraph 1).

Law on the Seed Material of Agricultural plants regulates the production and trade of seed material of agricultural plants, conditions and manner of their production and certification, processing, control, quality, marketing of seed material of agricultural plants, grain, industrial and fodder plants, potatoes, the recognition of varieties, the entry of varieties into the Register of Agricultural Plant Varieties and other issues of importance for production and trade of seed material.

Law on the Plant Varieties Protection regulates the conditions and procedure for the protection of plant varieties and the rights and obligations of the holders’ breeder rights as well. It treats all plant genera and species, including hybrids. In terms of the law the breeders’ rights are granted if a variety is new, distinct, uniform, and stable.

Law on Livestock (Official Gazette of Montenegro, No. 72/2010, 48/2015) regulates the manner and preconditions for the rearing domestic animals, the way of adopting and implementing breeding programs, the preservation of genetic variability, the marketing of animal feed and genetic material, the rights and obligations of livestock farmers and other issues relevant to livestock breeding. Chapter 4 of this act declares preservation of genetic variability and genetic resources of domestic animals as public interest. A fund for preserving the genetic resources of domestic animals are provided in the budget of Montenegro (article 33). The preservation of biological diversity in livestock farming as well as the conservation of autochthonous breeds (protection of breed and its name) is governed by the articles 34, 35, and 36.

Strategic documents:

Strategy of agriculture and rural development (2007-2013), and the National Program of Agriculture and Rural Development (2008-2013)

Under this strategy, Montenegro has opted for the concept of sustainable development of agriculture, which implies establishing a full balance between economic development, the need to preserve the environment, and the social aspect. Development of the concept starts from the multifunctional role of agriculture and modernization of the state administration for the purpose of the realization of the strategic commitment of sustainable development and integration of Montenegro into the international community, and taking on the European model and conception of agriculture. This strategy was the first strategic document that set down the base for further work on the preservation agricultural genetic resources.

The richness and variety of flora and fauna, i.e. biodiversity, is characteristic of Montenegro, bearing in mind its relatively small area. Agro-biodiversity and genetic resources for food and agriculture are among the most significant components of biodiversity; this includes all animals, plants and
microorganisms that can potentially be used for food and agriculture. Today, numerous varieties of cultivated plants, along with various breeds of farm animals, are the result of many centuries of natural evolution, together with the planned selection of plants and animal breeds by those cultivating the land. This biodiversity represents a very important resource for Montenegro and is the biological basis for agriculture and food production.

Bearing in mind the commitment of Montenegro to be an ecological state, its strategic documents, and especially the development of sustainable agriculture defined in the Strategy, sustainable management of resources has to be a very important activity for the Ministry on the implementation of the integral program of rural development. Measures of this part of rural development policy should be complied in the future with a number of EU regulations that relate to the protection of environment and sustainable use of natural resources.

The measures foreseen within this strategy go beyond the agriculture domain (development of less favored areas, development organic and other environmentally friendly practices, preservation of agricultural genetic resources) and also agro-forestry management. All these measures require much more institutional preparation for the complete adjustments to EU principles, especially in regard to the numerous requirements and regulations related to the environmental role of agriculture.

The second Strategy for the Development of Agriculture and Rural Areas 2015-2020, adopted in 2015, is continued to implement the concept of sustainable agriculture development with support measures that are in line with EU agricultural policy.

The National Strategy for Sustainable Development of Montenegro 2007-2014 (NSOR) was adopted in 2007 and was a step further in the efforts to cement and realize the declarative commitment of Montenegro to be an ecological state. In the period when it was built, it relied on the guidelines and goals of the then strategic documents (such as the Horizontal Development Horizon as an ecological state). The strategy, as well as the accompanying Action Plan, was based on the concept of balancing the three pillars of sustainable development - economic, social and ecological, along with the definition of two additional steps for sustainable development of Montenegro.

The new strategy of Sustainable Development of Montenegro for the period (2015-2030) was adopted at the beginning of 2016.

The Strategy for biodiversity of Montenegro with the Action plan (2010-2015) formulated its basic principles as well as the long-term and operational goals of biodiversity protection. These goals and principles are a framework in which the existing needs and opportunities for undertaking the activities for the protection of the biodiversity in Montenegro in the period 2010-2015 are summarized. According to this strategic document, biodiversity management and protection are under the jurisdiction of the Ministry of Sustainable Development and Tourism but some segments as agricultural genetic resources and forests are under the jurisdiction of the Ministry of Agriculture and Rural Development.


All measures related to conservation and sustainable use of plant genetic resources for food and agriculture given in the National Program and Action Plan are fully compliant with the Convention
on Biological Diversity, and the FAO Global Plan of Action. The National Program and the Action Plan as a means of its implementation are focused on inventory, characterization, identification, regeneration, maintenance of ex-situ and in-situ collections and sustainable use of plant genetic resources. In addition, as very important priorities are achieved with establishing a system of documentation, work on strengthening public awareness and further strengthening of human and technical capacities as well. The Program of the Conservation of Animal Genetic Resources in Montenegro identified strategic priorities that are in-line with the priorities set out by the FAO (Declaration on Animal Genetic Resources and the Global Action Plan adopted in Interlaken, September 2007) and Global Plan of Action for AnGR. It covers four strategic priorities:

- Characterization, inventory and monitoring of trends and associated risks,
- Sustainable use and development,
- Conservation,
- Policy, institution, and capacity buildings.

The Action Plan defines sets of activities that should be implemented for the purpose of establishing sustainable use and conservation AnGR:

- analysis of the population status of certain species, breeds or strains that are reared in Montenegro, and estimation of the degree of their vulnerability, with particular reference to autochthonous breeds;
- to elaborate on the measures necessary for the realization of the AnGR conservation program;
- review the measures which should be applied, amount of budget support per head and the total amount for breeds or threatened species;
- the obligations and precise responsibilities of the institution responsible for the AnGR, including cooperation with FAO and other foreign bodies and institutions.

**Budgetary allocations**

After adoption National Strategy of Food Production and Rural Development (2006), for the first time in the budget of the Ministry of Agriculture (2007), there were established budget measures for conservation of genetic resources in agriculture (Axes 2. Rural development measure, 2.2.1 Sustainable development and conservation genetic resources in agriculture with two segments: plant genetic resources and animal genetic resources).

The main objectives of the Program are defined through the identification and inventory of genetic resources in the field, support for farmers to cultivate rare and endangered plant species and animal breeds, collection of genetic resources and genetic studies, characterization and formation of genetic registers, preservation of collected material, publication and exchange of scientific results, and engaging in appropriate international organizations, etc.
Table 3: Review of budget funds devoted to agricultural genetic resources

<table>
<thead>
<tr>
<th>Year</th>
<th>Directorate for rural development</th>
<th>Food safety directorate for Phytosanitary Affairs for PGR</th>
<th>Realized amount for AnGR, €* (to farmers and BTF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>56,000</td>
<td>-</td>
<td>11,725</td>
</tr>
<tr>
<td>2008</td>
<td>67,000</td>
<td>-</td>
<td>15,595</td>
</tr>
<tr>
<td>2009</td>
<td>80,000</td>
<td>-</td>
<td>13,653</td>
</tr>
<tr>
<td>2010</td>
<td>57,800</td>
<td>-</td>
<td>14,049</td>
</tr>
<tr>
<td>2011</td>
<td>44,000</td>
<td>-</td>
<td>16,389</td>
</tr>
<tr>
<td>2012</td>
<td>32,000</td>
<td>5,500</td>
<td>16,422</td>
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<tr>
<td>2013</td>
<td>40,000</td>
<td>5,500</td>
<td>17,399</td>
</tr>
<tr>
<td>2014</td>
<td>33,000</td>
<td>4,000</td>
<td>18,266</td>
</tr>
<tr>
<td>2015</td>
<td>33,000</td>
<td>4,000</td>
<td>20,416</td>
</tr>
<tr>
<td>2016</td>
<td>50,000</td>
<td>4,000</td>
<td>22,016</td>
</tr>
<tr>
<td>2017</td>
<td>40,000</td>
<td>4,000</td>
<td></td>
</tr>
</tbody>
</table>

*Amount spent on AnGR consists of amount for subsidies to farmers + 5000 €/year to Biotechnical faculty (BTF) for realization of on-field activities, monitoring, and characterization. In 2007 to 2008 subsidies for sheep were 15 €/head, later it decreased to 8 €/head, except the Zuja breed that is 15 €/head, due to its critical status.

Unfortunately, due to a lack of precise plans, but also other circumstances as well, these funds planned for plant genetic resources were often paid in a much smaller scope than was predicted. In the frame of the Programme on Phytosanitary Measures, since 2012 a component related to plant genetic resources has been created. Funds from this program (5,500 euro) are intended for the maintenance of field collections, regeneration, evaluation, public activity, and publications. Part of the funds was used for in vitro conservation and procurement of equipment in the laboratory needed for tissue culture.

Since the National Program for Conservation and Sustainable Use of Genetic Resources in Agriculture (2008-2013), and the Action Plan for Conservation of Genetic Resources in Agriculture (2009-2013) have expired, there is no clear plan for using these funds.

International agreements/conventions

- The UN Convention on Biological Diversity Montenegro was ratified in June 2006. According to it Montenegro committed to work on two important and challenging tasks in accordance with particular Montenegrin conditions and capabilities. First, the development of national strategies, plans or programs for the conservation and sustainable use of biodiversity and second, the integration of conservation and sustainable use of biological diversity into relevant sectorial and above sectorial plans, programs and policies.
- After independence (2006), Montenegro became a member of the following important International organizations:

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3 Agrobudget 2007-2017
• Food and Agriculture Organization of the United Nations (FAO) in 2008.
• European Cooperative Programme for Plant Genetic Resources (ECPGR) in 2009.
• An European Genebank Integrated System (AEGIS) in 2010.
• The International Treaty on Plant Genetic Resources (ITPGRFA), in 2010.

As a signatory of the ITPGRFA, Montenegro is committed to make available to the international community all species included in Annex 1, through the multilateral system of access and benefit sharing (MLS). Since the establishment, the Montenegrin Gene Bank has sent samples to a number of countries (Italy, Slovenia, Albania, Bosnia and Herzegovina, Croatia, and Macedonia). All samples were sent on a friendly basis, without signing any additional documents. Since 2013 these activities have been carried out through SMTA (Standard Material Transfer Agreement).

• After nomination for National Coordinator for Animal Genetic Resources in FAO (2008), Montenegro become a member state of the ERFP (European Regional Focal Point for AnGR), and the European Farm Animal Biodiversity Information System (EFABIS) where there is a national data base for AnGR.
• Memorandum of Understanding (MoU) related to the European Genebank Network for Animal Genetic Resources (EUGENA) signed between Ministry of Agriculture and Rural Development (as ‘Representative of the Government of the ERFP member state) and the European Regional Focal Point for Animal Genetic Resources (ERFP), that related to European Genebank Network for Animal Genetic Resources (EUGENA).
• An integral part of the signed memorandum was also the EUGENA agreement signed by the Ministry of MARD and of Biotechnical Faculty, which authorized the Biotechnical Faculty to collaborate with the EUGENA – European Network of Genebank for AnGR.

Needs for further legal enhancement

In the near future it is necessary to prepare new or update the old National Program of Conservation and Sustainable use of agricultural genetic resources with a new action plan.

To prepare and adopt regulations that have to derive from the Law on Livestock, concerning the recognition and protection of autochthonous breeds, creation of a register of autochthonous breeds, and establishment of breeding programs for these breeds.

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

In the last 15 years a large number of foreign donor support projects related to PGR have been implemented in Montenegro. In terms of significance and results achieved, the most important were the following:

• Fostering a Science-based Development of a sustainable Montenegrin Agriculture (FP7-REGPOT-AgrisMont, 2010-2013).
• Preservation and establishment of true-to-type and virus free material of endangered grapevine cultivars in Croatia and Montenegro (SEE-ERA.NET Plus Joint Call, HRV &MNE ENDANGERED GRAPES, 2011-2012).
• South East European Development Network on Plant Genetic Resources -SEEDNet (Project funded by the Swedish International Development Cooperation Agency, 2004-2011).

• Exploring, collecting and characterizing the local forms of industrial crops from SEEDNet area (Project funded by the Swedish International Development Cooperation Agency, 2009-2010).

• Collecting local landraces of maize and cereals (wheat, barley, rye, oat, millet and buckwheat) in South Eastern Europe (Project funded by the Swedish International Development Cooperation Agency, 2009-2010).

• Regional collecting expedition and ex-situ conservation of *Trifolium pratense, Festuca pratensis, Dactylis glomerata* and *Medicago falcata* (Project funded by the Swedish International Development Cooperation Agency, 2009-2010).

• Genetic structure of Dalmatian sage (*Salvia officinalis L.*.) populations: A model for a collaborative research on MAP genetic resources (Project funded by the Swedish International Development Cooperation Agency, 2008-2010).

• Characterization of local apple varieties (*Malus domestica*) from South East European region and the Collection and field evaluation of local plum (*Prunus domestica*) genetic resources from South East European Network (Project funded by the Swedish International Development Cooperation Agency, 2008-2010).

• Identification, characterization and conservation of old indigenous vine varieties in Eastern European countries (Project funded by the Swedish International Development Cooperation Agency, 2008-2010).

• Collection, characterization and regeneration of local kale (*Brassica oleracea var. acephala*) population germplasm from eastern Adriatic coast region for their conservation in gene bank (Project funded by the Swedish International Development Cooperation Agency, 2008-2009).


• The most important project among the above mentioned was certainly SEEDNet project (South East European Development Network on Plant Genetic Resources), which completely changed the situation in the sector of plant genetic resources in all participating countries. The aim of the project was to intensify and enhance the regional Balkan cooperation in conservation and sustainable use of plant genetic resources through a coordinated network of national programs for plant genetic resources. In the project implementation 12 countries of Southeast Europe participated. This project changed the understanding of genetic resources in the whole region, contributing to inventorying, conservation, regeneration, characterization, genetic identification, documentation, establishment of databases and strong regional cooperation. With the help of the SEEDNet project, a modern plant gene bank was founded at the Biotechnical Faculty in Podgorica in 2004. The Montenegro Gene Bank (MGB) received all the equipment necessary for cleaning, drying, and packaging of seeds, determination of moisture, cleanliness and health of seeds and labeling of samples. Additionally, it is equipped for long term storage of seeds (-20°C) and active collections storage (+4°C). During the SEEDNet project implementation, tissue culture and molecular identification laboratories were established, activities on inventory, morphological characterization, regeneration, genetic identification of indigenous species/varieties were significantly revived, and field fruit species collections were enhanced. All activities of the Montenegro Gene Bank are performed today in accordance with IPGRI procedures and standards. Implementation of the SEEDNet project was done through seven working groups: Cereals and Maize, Medicinal and Aromatic Plants, Vegetables, Fruit Crops and Vitis, Industrial Crops, Fodder Crops and Documentation and Information. The Montenegro Gene Bank has retained this structure even today.
Foreign donor support projects related to AnGR:

- Improvement and Establishment of Biotechnology in Higher Education, 2009-2011, Tempus CARDS 145040-2008-DEJPCPCR, financed by the EU.
2. GENETIC RESOURCES IN AGRICULTURE

2.1. OVERVIEW OF THE STATUS OF GENETIC RESOURCES IN AGRICULTURE

2.1.1. Plant genetic resources

The rich gene pool of Montenegro represents an important natural resource for food production and agriculture in general. The richness and diversity of Montenegro’s flora and fauna is a recognizable feature of Montenegro, especially if the relatively small size of country is taken into account. In Montenegro, 3,600 species and subspecies of wild vascular plants have been recorded so far. An index of the number of species per unit area in Montenegro is 0.837 and is one of the largest in Europe, determining the territory of Montenegro as one of the most important centers of floristic diversity in Europe.

Although significant results have been achieved in the last 15 years, the number of samples deposited in the national collection is still small. This is the result of a long-term lag in organized work on genetic resources, but also of the problems that this sector faces today. Given that Montenegro has signed the International Treaty, regular regeneration of species from Annex 1 is carried out in order to provide sufficient quantities of seed for distribution. Despite the lack of national funds, Montenegrin experts have managed to show through the numerous international projects the wealth of diversity that Montenegro has. Characterization and evaluation were carried out with the assistance of international experts.

Agricultural production in Montenegro is dominantly based on registered varieties and hybrids. Local varieties in Montenegro are mostly grown in remote rural areas, predominantly on small areas. The main reasons for their cultivation are their very good organoleptic and culinary characteristics, but also some specific biological characteristics (resistance to low and high temperatures, drought, various plant diseases, etc.). Due to the large distance from the city, producers are often unable to procure certified seeds and seedlings, and this is why they are forced to grow indigenous populations. Genetic resources today in Montenegro are mostly grown by older people, often for sentimental reasons. Traditional cultivars are cultivated exclusively in traditional production systems, most often in order to meet their own household needs, and to a lesser extent, to sell on
local markets. Due to lower yields, local cultivars are not competitive with modern varieties. This is perhaps the most important reason why many farmers have completely replaced a long time ago their traditional cultivars with elite germplasm.

Picture 3: Local populations of maize and pumpkin cultivated in association (Author: Zoran Jovovic)
The intensification of agricultural production in Montenegro, as well as in some less developed countries in other parts of the world, has led to a noticeable erosion of genetic resources. Recognizing the danger of extinction of a large number of local populations and varieties of the genus Triticum, after introducing high yielding Italian, French and Russian selections, the program of their protection started in 1956. By introducing wheat elite germplasm, the old varieties have been almost completely suppressed. Old varieties are grown on very small surfaces, mainly in the organic production system.

The indigenous maize populations are grown less and less in Montenegro. Their significance is not even close to the position they once held, nearly 20-30 years ago. Maize is grown on almost all of territory of Montenegro exclusively for human consumption (predominantly for flour production, and to a lesser extent for baking). In the central and northern part of the country (Bijelo Polje, Berane, Pljevlja) the most grown landraces are ‘jarik’, ‘jarik bijeli’- white and ‘jarik žuti’-yellow. Maize is commonly grown in association with bean or squash. In the southern part of the country, white corn (‘bjelopavlićki’ and ‘kukuruz bijeli’-white maize) is produced, while in the mountains (over 1,000 m altitude) populations with very short vegetation (‘osmak’, ‘brdski-mountainious’, ‘rovački’ and ‘moravac’). Maize is usually planted in gardens, although several producers grow domestic cultivars on larger areas - up to 1 ha.

It is estimated that the number of medicinal plants in Montenegrin flora is about 700, and that 300 of them are widely used in traditional and in official medicines. Having in mind aromatic plants as well, the overall number of these species would increases considerably. Gathering of indigenous medicinal and aromatic flora is the easiest, fastest, and the most common way of getting raw materials. Cultivation of these plants is present mainly in small family farms, but in recent years their production on plantations has been growing slowly. According to the Ministry of Agriculture and Rural Development the most exploited species in this group include Sage (Salvia officinalis), Juniper (Juniperus communis), Curry Plant (Helichrysum italicum), Bay Tree or Laurel (Laurus nobilis), Bearberry (Arctostaphylos uva-ursi), White or False Hellebore (Veratrum album), St. John’s Wort (Hypericum perforatum), Yarrow (Achillea milefolium), Autumn Crocus or Meadow Saffron (Colchicum autumnale), Linden (Tilia sp.), Dog Rose (Rosa canina), and Common Hawthorn (Crataegus monogyna).

In spite of the extraordinary natural potential, indigenous medicinal and aromatic flora is seriously endangered nowadays. Improper collecting and overexploiting are not the only threats, but also the lack of adequate law regulations and trade control. The most illustrative example for this would be yellow gentian (Gentiana lutea). In 1982 this species was put on the List of Protected Species, but constant and unplanned exploitation led to its complete extinction in the most of its known localities. Due to the increased demand, the wild population of immortelle is becoming increasingly threatened. Many of them disappeared a long time ago from their natural habitats, while others have been seriously endangered. It is estimated that now is the right moment for this very important medicinal-aromatic plant to be placed on the Red List of Endangered Plant Species.

In recent years, areas under indigenous medicinal plants have grown significantly in Montenegro. Immortelle is mostly cultivated on the plantations on about 100 ha and sage to 80 ha. In addition to them in the plantation are grown lemon balm - 2 ha, eastern purple coneflower - 1 ha and true lavender - 1 ha. Furthermore, on a smaller scale in home gardens are grown rosemary, dill, oregano, basil, amongst many others.

Due to very limited research carried out on the genetic resources of vegetables, there are no precise data on the extent of their cultivation. Of all vegetable species, the most important are...
beans that are grown on a small and large scale throughout the country and are distinguished by their great diversity. There are many varieties that differ according to shape, size, and colour of grains, as well as the length of vegetation. White-grained populations are dominant, but also varieties with different shades of yellow and green colour are present. In addition, there are also a large number of populations with brown, black, dark red grain, but also a combination of a large number of colours. The largest areas under this crop are located in the central and northern parts of the country. The largest bean areas have farmers who cultivate beans in association with maize. Smaller quantities of different beans populations can be found at local markets.

In addition to beans in Montenegro, onion ‘crmnicki’ and black kale are grown in large scale. Onion ‘crmnicki’ is predominantly grown in Crmnica (Municipality of Bar), and to a lesser extent in Podgorica and the coastal regions, in traditional production systems. It is distinguished by the recognizable purple colour of the outer leaves and has a very pleasant and specific taste. Despite the high prices on the market, the area under this local variety decreases considerably from year to year. The main reason for this is the relatively low genetic potential for yield, as well as high sensitivity to diseases. Unlike onion, black kale is grown on almost all of the territory of the country. It is mostly grown on courtyards, and only a small number of producers sell on market. It is characterized by a very pleasant and recognizable taste. It is used in the preparation of a number of national specialties. In the production of vegetables, in most cases, women have a major role. They are responsible for all activities, starting with the decision on which crops and varieties to plant and continuing through to the application of traditional knowledge.

Potato was brought to Montenegro more than 200 years ago. Continuous growing in very different agro-ecological regions and mikroregions - from the sea coast to the mountains, potato differentiated through time in early, mid and late characters (forms). Early forms were grown in coastal areas and river valleys of the Adriatic basin, medium early on hills and mountains up to 600 to 700 meters altitude, and late forms in the mountain areas. Research conducted in 1950’s in the area of Old Montenegro, eight local potato varieties were inventoried: ‘pitomi’ or ‘ruski krompir’, ‘rani bijeli’, ‘rani žuti’, ‘bijeli kasni’, ‘žuti kasni’, ‘italijanski’, ‘naški krompir’, and ‘švabica’. Due to intensification of agricultural production in Montenegro, a significant number of old potato varieties were lost, which led to serious erosion of genetic variability. Of old varieties of potatoes, the most common are: ‘ruska krtola’, ‘žuti krompir’, ‘ljubičasti šareni’ and ‘bambrez’. In addition to them, ‘koprivuša’, ‘maus’, ‘cvjetaš’, ‘domaća krtola’ and ‘stara krtola’ are grown. These varieties are mainly grown on small surfaces in remote mountainous areas. Recently, they have been increasingly encountered in organic production. DNA evaluation showed that of all the local varieties that are grown in Montenegro, only four of them (‘ljubičasti šareni’, ‘koprivuša’, ‘maus’ and ‘cvjetaš’) are autochthonous, while all other varieties are known ones.

Tobacco production is located in the municipality of Podgorica. Until 2003, production was based exclusively on the Herzegovinian type of tobacco (‘veliki hercegovac’ and ‘ravnjak’), when two new high-yielding American types of tobacco (‘Burley’ and ‘Maryland’) were introduced. Today, the share of domestic tobacco varieties has been reduced to only 15%.

In some areas of Montenegro, flax and hemp have been of great importance in the past. These two crops were grown solely for the production of canvases and ropes. During the period of intense industrialization, but also significant changes in the world textile market (the emergence of very cheap cotton factories from Third World countries), the area under these crops has significantly decreased, so in the 1980’s they completely disappeared from crop production. Inventarisation carried out at the beginning of this century did not find any local variant of these once-important textile plants.
So far there has been no study of fodder crop samples. For these reasons, there is no data on the extent and distribution of cultivation of this group of crops.

In the production of olive oil, the introduction of modern foreign varieties has been increasing in recent years, while the commercial exploitation of landraces has significantly declined. Of the local varieties of olives in production the most represented is ‘žutica’. It is mainly grown in extensive plantations, with a high crown. It presents an indigenous and very divergent olive population. It is characterized by relatively good resistance to diseases, especially to olive tumour (*Pseudomonas syringae pv. savastanoi*). It is also characterized by a long period of exploitation and combined use. In addition to the production of oil, it is used for processing as well. It has high oil content, 18-20%, reaching, in full maturity, up to 25%. One disadvantage is its alternative fertility. Varieties such as ‘barkinja’, ‘crnjaka’ and ‘drobnica’ are also grown (individual trees in extensive breeding).

In the production of olive oil, the introduction of modern foreign varieties has been increasing in recent years, while the commercial exploitation of landraces has significantly declined. Of the local varieties of olives in production the most represented is ‘žutica’. It is mainly grown in extensive plantations, with a high crown. It presents an indigenous and very divergent olive population. It is characterized by relatively good resistance to diseases, especially to olive tumour (*Pseudomonas syringae pv. savastanoi*). It is also characterized by a long period of exploitation and combined use. In addition to the production of oil, it is used for processing as well. It has high oil content, 18-20%, reaching, in full maturity, up to 25%. One disadvantage is its alternative fertility. Varieties such as ‘barkinja’, ‘crnjaka’ and ‘drobnica’ are also grown (individual trees in extensive breeding).

In the production of pomegranate and figs local cultivars are exclusively used. Recently the area under these two fruit species has considerably expanded. The most cultivated figs old varieties are: ‘petrovača bijela’, ‘rezavica’, ‘sultania crna’ and ‘sušilica’. A significant number of farms in the southern part of the country cultivate these varieties in plantations of 50-400 trees. Lately, these varieties have been grown increasingly in organic production. In addition to these, there are also ‘petrovača crna’ and ‘zimnica’, but to a much smaller extent (individual trees in the garden). In the production of pomegranate, indigenous species ‘slatki barski’ is dominant (80%), but also varieties ‘šerbetas’ and ‘dividiš meke kore’ (‘dividiš with soft peel’) are grown. It is cultivated in plantations of 100-1,000 trees. In addition to these, in the production, both ‘slatki crveni’ (sweet red) and ‘konjski zub’ (horse teeth) are present as individual trees (3-4).

Indigenous populations of continental fruit species (plum, apple, and pear) lost their major commercial significance a long time ago. New orchards are planted exclusively with new introduced selections. Today, local cultivars are grown exclusively in gardens in extensive production systems, predominantly in rural areas. Dominantly cultivated varieties of apples are: ‘pašinica’, ‘dulabija’, ‘senabija’, ‘šećerka’, ‘petrovača bijela’, ‘petrovača šarena’, ‘krstovača’ and ‘kožara’, and sporadically, ‘beljuha’, ‘bjelija’ and ‘konopljača’. Apple is mainly cultivated in extensive production in the continental part of the country, in gardens with 3-4 trees.

The cultivation of indigenous varieties of plums is related to the central and northern areas. All varieties of plums are cultivated for the production of rakia (local brandy), which is why they are all
called rakia varieties. The most cultivated varieties of plums are 'požegača', 'mednica', 'piskavica' and 'durgulja'. There are a significant number of households that grow 15-40 trees ('požegača' 30-40, 'durgulja' 20-30 and 'piskavica' and 'mednica' 15 trees, each).

The pear is grown for rakia production and for drying. In extensive production systems, several trees are usually cultivated mainly in home gardens. The dominant cultivars are: 'pećanka', 'kaličanka', 'turšijača', 'begar', 'lubeničanka', 'ječmenka', 'vidovača', 'sijerak' etc.

Efforts made in the implementation of SEEDNet projects for inventorying of fruit crops have resulted in the creation of two international monographs: The Balkan Apple pomology (described Montenegrin 26 varieties - 'pašinica', 'dulabija', 'senabija', 'šećerka', 'petrovača bijela', 'petrovača šarena', 'krstovača', 'kožara', etc.) and The Balkan Plum pomology (described 17 Montenegrin varieties - 'požegača', 'mednica', 'piskavica', 'durgulja', etc.).

Montenegro has a long tradition of vitis growing. Undoubtedly, viticulture and winemaking represent one of the oldest population occupations in the central and southern part of Montenegro. This is certainly the main reason for such a great wealth of germplasm in vineyard fields throughout Montenegro.

The viticulture and winemaking sectors of Montenegro are based on the cultivation of indigenous vitis varieties and wine from these varieties.

Given the importance of the vitis gene pool for the vineyards and winemaking sector considerable efforts were made towards its preservation. Through numerous national and international projects identification of indigenous and other domesticated varieties and studying of populations' variability is done. After genetic identification of important Montenegrin indigenous varieties (vranac, kratošija, krstač, žižak), and identification of Kratošija as zinfandel (primitive), very close genetic relationships (parent-offspring) were determined between the varieties Vranac and Kratošija.

Sustainable use of indigenous varieties of grapevine is at a very satisfactory level. The autochthonous variety Vranac is represented in about 80% area under wine varieties. In addition to Vranac, the autochthonous variety Kratosija has a great importance for the economy as well.

### 2.1.2. Animal genetic resources

Animal genetic resources (AnGR) or livestock biodiversity represents all species, breeds and strains of domestic animals that are used or potentially will be used for food and agriculture. From the aspect of food production, the most important species are cattle, sheep, goats, horses, pigs and poultry, but there are other species that are important for particular cultures and regions of the world.

General trends of development of livestock production imply uniformity of animal genetic resources, so that livestock biodiversity is endangered because of many old breeds and strains or varieties have been replaced by breeds with much higher performances. This process has been considered economically necessary but has led to the critical endangerment of many old - traditional breeds or populations. These populations are small and very specific in terms of their genetic and phenotypic characteristics. Some of them have even become extinct, while others have a very small population and are still at risk of extinction.

Many of the old breeds are not as productive as their modern counterparts, but they possess specific sets of genes such as genes for high fertility, resistance to disease, well adaptability to
live in different, mostly harsh climatic and economic conditions. The traditional breeds have been adapted over generations to satisfy the needs of farmers in the conditions of their local environment where they have used for produce typical local products, such as different autochthonous milk products, meat and traditional products from meat, different types clothes products etc.

All local breeds and varieties usually arise during a long-lasting evolutionary process under specific conditions of rearing and as such they have specific gene sets (disease resistance, good fertility, good maternal instinct, longevity, good adaptability to adverse nutrition and maintenance conditions, sustainability, etc.).

Montenegro, as a small country, has a relatively large number of populations / breeds of farm animals. The livestock sector has high economic importance in Montenegrin agriculture, with close to 50% of the share in the total value of agricultural production. During the last 50 years global trends have been present in the Montenegrin livestock sector, causing many changes.

Current status of animal genetic resources in Montenegro

Table 4: The status of diversity of animal genetic resources of Montenegro

<table>
<thead>
<tr>
<th>Species</th>
<th>Population size</th>
<th>Local (autochthonous)</th>
<th>Exotic or Introduced breeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>92,452</td>
<td>Busha</td>
<td>Holstein, Brown Swiss, Simmental, Tirolian Grey cattle</td>
</tr>
<tr>
<td>Sheep</td>
<td>194,636</td>
<td>Pivska or jezeropivska, Ljaba, Žuja, Sora, Sjenicka and Bardoka</td>
<td>Wurtemberg, Tsigaja, Romanovska</td>
</tr>
<tr>
<td>Goat</td>
<td>33,000</td>
<td>Domestic Balkan goat</td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>4,927</td>
<td>Montenegrin hilly horse</td>
<td>Arabian horse, Thoroughbred, Cold blood breed</td>
</tr>
<tr>
<td>Donkey</td>
<td>575*</td>
<td>Domestic Balkan donkey</td>
<td></td>
</tr>
<tr>
<td>Pig</td>
<td>24,950</td>
<td></td>
<td>Landrace, Duroc, Pietren</td>
</tr>
<tr>
<td>Poultry</td>
<td>606,225</td>
<td>'grasasta' and 'jarebicasta' hen</td>
<td>Hybrids of: Rhode Island, Plymouth rock,</td>
</tr>
<tr>
<td>Bees</td>
<td>48,007</td>
<td>* Apis carnica melifera</td>
<td></td>
</tr>
</tbody>
</table>

* Source: MONSTAT, Statistical Yearbook 2016

Local breeds have significantly decreased, especially local cattle, pig and poultry populations. In sheep and goat sectors there are still local breeds; however, the general trend is that the size of their purebred populations is decreasing.

Cattle population

Cattle production is the dominant branch of livestock production. About 50% of the total cattle population made more productive breeds (Holstein, Brown and Simmental) that have been introduced and permanently imported over the last 50 years, as well as a smaller share of Gray Tyrolean cattle that reared in Montenegro already for more than 100 years. The other 50% of the population make different crosses.
Busha breed is the only autochthonous or local cattle breed in Montenegro. Busha is the autochthonous breed of cattle of Balkan Peninsula originating from a special indigenous native form of the cattle called Bos Brachyceros Adametz. The Busha population has been the most numerous populations of cattle (approx. 95%) in Montenegro until the middle of the twentieth century. In the second half of the twentieth century, in the time of intensive development of cattle production, the Busha breed was crossed with the Tyrolean Grey breed, Brown Swiss and Simmental breed or just replaced by these much more productive breeds. Due to the constant negative trend in population size, the Busha breed is now in danger of extinction. According to the results of monitoring and estimation made by Biotechnical Faculty, the current number of Busha population in Montenegro is about 250 animals. Today, Busha are reared mainly in low developed villages that are far away from the urban centers and main roads. Due to risk of extinction of the Busha breed in Montenegro, as well as its importance for diversity of animal genetic resources it has been included in the program of in-situ (on farm) conservation since 2005.

Research on the morphological characterization of Busha has been conducted since the beginning of last century, and intensified during last ten years. The Busha breed in Montenegro is usually single colored with different level of pigmentation. There are black, red, dark or light brown and different light colors to the total white colored heads. According to the results of the latest investigation and monitoring of current population of Busha these animals are very small. The body weight of adult animals is 290 kg, height to withers 113 cm and chest circumference 157 cm on average. Considering the small body size, production capabilities of the Busha cattle are also modest. The milk yield is 1,000-2,000 kg in lactation of 300 days, depending on the conditions of breeding. Low productivity is one of the main reasons for the sudden decline in the population of this race.

Genetic characterization of Montenegrin population of Busha breed together with other Busha populations from the Balkan Peninsula on the basis microsatellite markers and SNPs has been conducted during last ten years. These results confirm the existance of many different populations of Busha in the frame of the meta-population of Busha cattle on the Balkan Peninsula.
Table 5: The population size, trends and the risk status autochthonous breeds by the species

<table>
<thead>
<tr>
<th>Species</th>
<th>Autochthonous / local breeds</th>
<th>Number of breeding animals</th>
<th>Trends</th>
<th>Risk status (FAO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Busha</td>
<td>≈ 250</td>
<td>↓</td>
<td>Endangered</td>
</tr>
<tr>
<td>Sheep</td>
<td>Pivska pramenka</td>
<td>≈ 2,500</td>
<td>↓</td>
<td>Endangered / vulnerable</td>
</tr>
<tr>
<td></td>
<td>Žuja</td>
<td>Up to 200</td>
<td>↔</td>
<td>Critical</td>
</tr>
<tr>
<td></td>
<td>Ljaba</td>
<td>≈ 1,500</td>
<td>↓</td>
<td>Endangered / vulnerable</td>
</tr>
<tr>
<td></td>
<td>Sora</td>
<td>≈ 1,500</td>
<td>↔</td>
<td>Endangered / vulnerable</td>
</tr>
<tr>
<td></td>
<td>Sjenička sheep</td>
<td>&gt; 5,000</td>
<td>↑</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td>Bardoka</td>
<td>≈ 2,500</td>
<td>↔</td>
<td>Stable</td>
</tr>
<tr>
<td>Goat</td>
<td>Balkan goat - red</td>
<td>&gt; 5,000</td>
<td>↓</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>Horse</td>
<td>Montenegrin hilly horse</td>
<td>≈ 1,500</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Donkey</td>
<td>Domestic grey donkey</td>
<td>&lt; 500</td>
<td>↓</td>
<td>Endangered</td>
</tr>
<tr>
<td>Pig</td>
<td>Śiška pig</td>
<td>** Extinct</td>
<td>X</td>
<td>Extinct</td>
</tr>
<tr>
<td>Poultry</td>
<td>Grašasta &amp; Jarebičasta</td>
<td>** No data</td>
<td>....</td>
<td>......</td>
</tr>
</tbody>
</table>

Sheep population

The highest genetic diversity of all livestock sectors in Montenegro is present in the sheep population. In fact, for many decades in the past, as well as today, Montenegrin sheep production was mostly based on the rearing of autochthonous breeds, which are very well adapted to local rearing conditions. Today, six autochthonous sheep breeds exist: Pivska or Jezero pramenka, Ljaba, Žuja, Sora, as well as Sjenicka and Bardoka. All autochthonous sheep breeds belong to the coarse wool group of sheep breeds named Pramanka. However, due to the negative trends and permanent decrease of the sheep population on the one hand, and the practice of unplanned crossing of these local breeds with breeds their purebred populations is drastically decreased. Some of them have become very small so there is a real risk of extinction (as Žuja breed).

During the 1970’s and 1980’s, numerous researches were carried out on the morphological characterization of all indigenous sheep breeds in Montenegro. In the last ten years, the morphological characterization has been done again, due to the changes that have taken place, especially in terms of body development. In the last three years, the genetic characterization of almost all breeds and sheep populations in Montenegro was done at the level of microsatellite markers, and partly on the level of genetic polymorphism of some proteins.

‘Pivska pramenka’ or ‘jezeropivska’ is the most typical Montenegrin autochthonous sheep breed that belongs to group of long tailed sheep. It originates from Ovis vignei arkar. The typical rearing region is an area of mountains Durmitor and Sinjajevina, and partly the central part of Montenegro. In the past it was the most numerous sheep breed in Montenegro. However, due to the decreasing number of the total sheep population, permanent crossing with other breeds, as well as high level of migration from mountain areas, the current purebred population of Pivska pramenka is decreasing and estimated to be at about 2,500 breeding animals with negative trends. Due to its importance this breed is included in the program of in-situ conservation.
This breed is characterized by a very strong body constitution, very well adapted to rearing in adverse climatic conditions in high mountains with long and very cold winters and extensive system of rearing. Its wool is coarse, mostly white colored, with open fleece, while the face and fore legs are colored with black speckles. All males and 50% of females are horned. The body size of this breed has changed over time due to improvement of rearing conditions (nutrition and selection). The average body weight in the past was about 55 kg, while today it is 65-70 kg. The level of production, to a great extent, depends on nutrition and way of housing. In good conditions, this breed reacts very quickly by increasing the performance of fertility, milk yield and growth of lambs. Milk production capacity of Pivska pramenka is quite good, with lactation milk yield at 95-105 kg. Today, the main product of the Pivska pramenka is lamb meat produced on mountain pastures, and milk processed into traditional dairy products (Durmitorski skorup and cheese – Prljo), well accepted on the market.

![Pivska pramenka](image)

'Žuja' is a characteristic pramenka breed, which originates from the Middle East. It came from there, most probably, during the period of the Ottoman Empire. This breed can be easily recognized from its characteristic yellow – brown face and legs, and because of that it is named “yellow face”. The rearing area of this breed is very limited, with the only areas been around Podgorica (Zetsko – Bjelopavlicka plain and the basin of Lake Skadars). There are two varieties, the so called 'Zetska žuja' and 'Piperska žuja'. Population of Žuja is rapidly decreased, those today there are only about 200 heads of purebred heads (150animals of Zetska zuja and 50 animals of Piperska zuja varieties). So, this sheep breed is in high risk of extinction – with critical status.

This breed is characterized by very good resistance and excellent adaptability to the very hot climate in the rearing area. In regards to body size, Žuja is one of the smallest sheep breed. It has a body weight of 35 - 40 kg, while withers height is 63 cm. Production capacity is relatively low and varies depending of quality of the grazing. The use of support measures for the conservation of genetic resources in the last ten years has contributed to the preservation of small population of Žuja breed. Due to its low production capacity and low economic competitiveness of its rearing, without support it cannot be preserved and Žuja would have already become extinct.
'Ljaba' breed is reared mainly in the south east part of Montenegro near to border of Albania (Ulcinj, Bar and Malesija plain in Podgorica municipality). Based on monitoring data, the total number of purebred breeding animals is estimated to about 1,500 heads, with the presence of decreasing trend due to migration from rural areas. Ljaba breed is well adapted to the Mediterranean climate and to scarce nutrition during dry summers and during winters when animals are fed inappropriate quantities of hay. This breed has white face and legs, but there are some animals with a long pale yellow speckle on the face. The wool is white and very coarse. The Ljaba breed has relatively good potential for milk production, with milk yield in the whole lactation of 90 kg.

'Sora' (also named 'Ruda') is a local sheep population that is sporadically reared in north-east part of Montenegro, especially in the municipality of Plav and Gusinje. Sora has been reared in this area for a very long time, according to some opinions even longer than the Sjenicka breed. The current population of Sora is relatively small (several hundred), but it seems to be a relatively stable population because of its quite good production potential, and the commitment of some farmers to rear just this breed. The main danger for this breed is crossing with other breeds, especially with Sjenicka breed that is more present, and decreasing number of breeders. This breed is characterized by good health, good adaptation ability to different weather conditions. The Sora are typically medium-large animals with compact body conformation and with long tail. The body is covered with white wool. Head skin, ear and lower parts of legs are white, spattered with numerous and specific small black speckles. The rams have strong triangular horns. This breed is characterized by square format with equal height at wither and body length (≈ 69 cm), while body weight is 60 kg in average. It is a dual-purpose breed, where meat is the main product, while after lamb weaning ewes are milked and the milk is processed into dairy products.
'Bardoka' breed is traditionally reared in Montenegro in the area alongside of border with Albania and Kosovo*, in the municipalities of Plav, Gusinje, and Podgorica, but its origin and the main area of rearing is north Albania. Population size of Bardoka breed in Montenegro is estimated at about 2,500 of purebred animals. It has white coarse-wool sheep, with white face and legs. The fleece is opened with pointed and long staples (25 – 30 cm) and with very coarse fibers. Average live weight of the ewes ranged from 50 to 55 kg, with height to wither of 65 cm. This strain is characterized by long duration of lactation, sometimes seven to nine months. The average milk yield in lactation is 110 kg, but sometimes it can produce up to 200 kg per lactation. High milk yield and processing of milk to dairy products are the main reasons this sheep breed is traditionally reared in these areas.

'Sjenicka' breed is one of the most numerous sheep breeds in Montenegro. The main breeding region is the north-east part of Montenegro (the municipalities of Rozaje, Plav, Berane, and Bijelo Polje), as well as the neighboring region in Serbia (Pester plateau and Sjenica). This breed has been crossed during a long period in the past with more productive breeds (Merinolandschaf), so today we can say it is an improved Sjenicka breed. The breed typically has white wool and white face, but black rings around eyes that look like eyeglasses, as well as dark muzzles and dark ears. All males are horned, but females are usually without horns. It is one of the largest sheep breeds in Montenegro. According to newest investigation, body weight of adult breeding animals is 70 -75 kg, with height to withers of 67 – 70 cm. Average milk yield in lactation ranged from 80 kg to 95 kg and level of production to a great extent depends upon the nutrition and way of housing. The main product is lamb meat, while the share of milk and milk products is relatively small.
Goat population

Domestic Balkan breed of goats is typically a primitive breed (originated from Capra prisca Adametz). It is mostly reared in the karst area of Montenegro (South-west part and the Coast) where natural preconditions for breeding other ruminant species (cattle and sheep) are significantly less favorable. The main characteristics are a rough constitution, and long, thick and shiny coat. According to coat color, there are several different strains of domestic Balkan breed such as red-brown, considered as authentic representative of domestic Balkan breed in Montenegro, reddish/bay; even black, white or speckled. The majority of heads (male and female) are homed. The Domestic Balkan goat breed makes up about 30% of the total goat population in Montenegro (about 8,000), while the share of the red variety is about 50%. In the last 15 years there has been a growing tendency to improve production capacity of indigenous populations of goats by crossing them with highly productive breeds (Alpine and Saanen), so that the share of crosses has been increased, while the population of purebred Domestic Balkan goat breed is rapidly reduced.

According to the investigation results, the average live weight of the breeding animals is about 45 kg, height to withers 65 cm, milk yield 140 kg with 3.4% butterfat content in lactation that lasted 217 days on average. Fertility is 1.2 to 1.3 kids per partum. In good conditions, this breed reacts very quickly by increasing the performance of fertility and milk yield.

Montenegrin hilly horse

The specific natural conditions in Montenegro for centuries have shaped and adapted the populations of the domestic hilly horse, which is a segment of the wider population of the Balkan hilly horse. In the past, the horse was a very important working animal and one of the main pillars of support to the existence of the Montenegrin population in rural areas. Due to wide usage of techniques and mechanization in agriculture and transport, the horse has lost its previous importance and its population has drastically decreased. As work animals they are still used in faraway and inaccessible areas, mostly for the pulling collected fire wood. The current population
of the Montenegrin hilly horse is estimated to be at about 2,000 heads, or 35% of the total horse population. In terms of exterior, the Montenegrin hilly horse belongs to the group of small horses/ponies with many similarities with the Bosnian mountain horse. It is characterized by its strong constitution, slightly rectangular body format, with average height to withers of 134.2 cm, body length 139.3 cm, body weight 314.8 kg and very good working capacity and the ability to carry a load of 112 kg at a gallop and 190 kg walking (Marković et al. 2016).

In recent years in the surroundings of Podgorica and Lake Skadar (which has favorable climatic conditions) it has happened more and more frequently that many horses have been released by their owners to stay all year around on pastures. They move freely, uncontrolled and freely reproduce (mating) among themselves. Thus, something what we could refer to as a ‘free-living’ population of Montenegrin hilly horses is becoming an important segment of the horse population in Montenegro.

Donkey population in Montenegro

The donkey is a very durable animal and with regard to nutrition, an undemanding farm animal; thus, it is commonly reared in the coastal areas and central parts of Montenegro. The economic importance of the donkey in Montenegro has changed over time. In the past, it was used only as a working animal in poorly accessible areas. However, due to the abandonment of villages and use of machinery, the population has drastically declined, especially over the last two to three decades. Based on the results of the Census of Agriculture, the existing donkey’s population is below 500 heads, so this species is now at risk of extinction.

It is the animals with grey to brown hair color that prevail in the total population, often with black dorsal stripe and occasionally having black rings around the lower part of the legs, while animals with dark to black and white hair are much less common. In terms of body size, it is a relatively small animal with the wither height 98 cm, body length 102 cm, chest circumference 117 cm and
body weight 130 kg. Today, the use of donkeys in work is minor, although use of donkeys for milk production is becoming popular and is promoted via different media.

**Pig production** in Montenegro is not as important as cattle farming or sheep breeding. Existing population in regard to breed structure and genetic resources are mainly crossbreeds between Landras and Large Yorkshires, and to a significantly smaller extent, breeding animals of Duroc and Pietrain, while the indigenous breeds of pigs from these areas, the so-called Siska pig, completely disappeared several decades ago.

**Poultry** population is about 600,000 hens. Alongside the chicken, light and heavy hybrids produced on the basis of Rodhajland and white Plymouth breeds, intended for intensive production of eggs and meat, in rural households there are populations of Domestic hens different colored (grašasta, jarebičasta or white and black colored strains). However, work on investigation and identification of this population began two years ago, so there is no data on their numerical representation as yet. Except for the non-defined population of the Domestic hen, the Kosovo* Longcrower, is reared in rural households near the Albanian - Kosovo* border. There are sporadic examples of growing turkeys, ducks and other types of fowl.

**Bees** - apiculture has a long and rich tradition in Montenegro. Different climate zones in the country, large areas covered with natural meadows and pastures, and vast karst regions with rich flora and plenty of honey plants provide excellent natural conditions for apiculture. Apis mellifera carnica with several local varieties is only indigenous and the only breed of honey bee that has been growing in our area for years.

### 2.2. CONSERVATION EFFORTS OF GENETIC RESOURCES

#### 2.2.1. Plant genetic resources

**In-situ and ex-situ conservation of PGR of Montenegro**

A collection of indigenous materials in Montenegro started in 1940’s, but it was done exclusively for scientific research and selection purposes. The first organized examination in Montenegro started in 1987 and covered vines, fruits, and wheat. The basis for the beginning of organized collection, preservation, study, exchange and use of plant genetic resources was the Strategy for the Technological Development of the Country, adopted 1987 in the Yugoslavian Assembly. Due to the lack of a clear program on the conservation and sustainable use of genetic resources, obtained results were far from expected and resulted in a significant loss of collected material. Two years later, through the project “Establishment of the gene pool for the Gene Bank needs of Yugoslavia”, these activities were resumed again. Unfortunately, due to the war and the breakup of Yugoslavia activities started on the project were suspended in 1992.

As a result of reasonable fear that part of the collected genetic material could have been permanently lost, their custody became the concern of the Agricultural Institute in Podgorica (now Biotechnological Faculty) since 1992. Modest financial support along with some other reasons, has led to the loss of a significant number of genotypes. Activities at the gathering and study of agrobiodiversity were minimal throughout that period of time. However, worth mentioning is that in the period from 2001 to 2006, as a short-term project assignment of the Federal Institute for Plant and Genetic Resources, researchers from the Faculty of Agriculture Novi Sad conducted several expeditions to collect wild wheat relatives from the Aegilops genus and local wheat populations from a number of localities in Montenegro. The aim of this project was to examine genetic base of
wild relatives and relationships with cultivated varieties based on cytogenetic and molecular study of the of wild relatives genome.

The situation in this field changed significantly in 2004 when the SEEDNet project (South East European Development Network on Plant Genetic Resources) implementation began, financed by the Swedish International Development Agency (SIDA). This support significantly strengthened technical and human capacities related to the collection, preservation, and study of plant genetic resources.

This project gave strong support to inventorying, conservation, regeneration, characterization, genetic identification, documentation, establishment of databases and strong regional cooperation. Thanks to the financial support of the SEEDNet project, a modern gene bank was founded at the Biotechnical Faculty in Podgorica in 2004. Montenegrin plant gene bank (MGB) has all the equipment necessary for cleaning, drying, and packaging of seeds, determination of moisture, cleanliness and health of seeds and labeling of samples. Additionally it is equipped for long-term storage of seeds (-20°C) and active collections storage (4°C). Also, tissue culture and molecular identification laboratories were established, activities on inventory, morphological characterization, regeneration, genetic identification of indigenous species/varieties were significantly revived, and field fruit species collections were enhanced.

All activities of the gene bank are carried out through seven working groups: Cereals and Maize, Medicinal and Aromatic Plants, Vegetables, Fruit Crops and Vitis, Industrial Crops, Fodder Crops and Documentation and Information.

The economic significance of genetic resources derives from their use. In order to increase the scope of their use, it is necessary that this material has as much data on use value as possible. In addition, it is important to possess sufficient information on genetic and phenotypic properties, but also to be well preserved. All of this significantly contributes to better ex-situ and in-situ conservation, as well as to its greater use. Having high quality information is of particular importance to institutions and individuals dealing with genetic resources. In this respect, a more active role of the research community is needed in order to obtain a clear estimate on the extent and distribution of agricultural genetic diversity at the national level.

In response to the pronounced loss of indigenous local populations and varieties of the genus *Triticum*, the program of their protection started in 1956. As a result of these activities, a collection of 200 cultivated and wild species of wheat was formed. A significant part of the collection consisted of indigenous populations from Montenegro (113 samples), 47 samples were collected from other areas of the former Yugoslavia, while 40 samples were received from Italy. The whole collected material was placed into four groups:

- *Triticum turgidum* (in this group there are 111 different populations, 80 are indigenous material, while others originate beyond the borders of Montenegro).
- *Triticum dicoccum* – spelt (27 and 8 indigenous populations collected from Herzegovina).
- A group of small wheat (six domestic and two from Herzegovina).
- Italian wheat (40 samples of known wild and cultivated species of the Triticum genus with several subspecies and varieties that are not grown in Montenegro, a collection was obtained from the Instituto Sperimentale per la cerealcoltura from Rome in 1969).

Due to inadequate storage and irregular regeneration, 20 accessions in this valuable collection have been irretrievably lost, so the collection holds 180 samples. The collection was kept at the
Institute of Field and Vegetable Crops (now the Center for Field, Vegetable and Forage Crops) until the Montenegro gene bank was formed. After many years of recess, activities for inventorying and collecting crops continued in 2008 within SEEDNet project activities.

In that period, the Montenegro gene bank has become richer by seven wheat accessions (Triticum aestivum L.). Also at the same time other species from this group were collected: 68 local varieties of corn (Zea mays L.), five of rye (Secale cereale L.), 10 of barley (Hordeum sativum J.), five of oats (Avena sativa L.), and six of buckwheat (Polygonum fagopyrum L).

Activities on the characterization and evaluation of wheat accessions have started. Currently, work has been done on einkorn and emmer accessions, and next year the characterization of turgidum and durum species will commence. Unfortunately, nothing has been done on maize accessions characterization so far. A significant number of samples of wheat and maize originating from Montenegro are kept at some institutes in Serbia. The Plant Gene Bank of Montenegro has no plans for their repatriation. For each accession in the working group for cereals and maize, passport data were made and transferred to the EURISCO database. Seed samples are stored at -20°C in MGB.

The loss of genetic diversity of medicinal plants has been caused by the loss of local populations due to irrational exploitation and their natural habitats as well. Medicinal and aromatic plants represent a very important segment of plant genetic resources, so their preservation requires a special approach that is closely related to the protection and preservation of the landscapes. The need to preserve these resources becomes more pronounced each day. The first activities with this aim were undertaken in 2008 (SEEDNet project) when the examination of natural populations of six selected priority species was done (Salvia officinalis, Hypericum perforatum, Origanum vulgare, Gentiana lutea, G. punctata and Satureja montana) on multiple sites in Montenegro (Lovćen, Orijen, Rumija, Piperi, Čemovsko polje, Kokoti, Rijeka Crnojevića, Bijelasica, Sinjajevina, Hajla, Visitor, Bogićevica, Velika i Durmitor). During the project, the first collection missions were carried out and 11 samples of wild sage populations were collected.

For all collected medicinal and aromatic varieties, complete passport data were made, morphological and chemical description is in progress as well as DNA characterization. Data on collected material can be found at the EURISCO database. In recent years, more attention has been given to studying the agronomic characteristics of these resources.
There has been no evidence of studying genetic resources of vegetables in Montenegro so far. The first inventory of the gene pool of vegetables in Montenegro was performed in 2007, also through the SEEDNet project. At a number of localities the following 13 vegetables species were inventoried and 45 samples collected: *Brassica oleracea* var. *acephala* - kale (9 accessions), *Brassica oleracea* var. *capitata* - cabbage (1), *Allium cepa* var. *cepa* - onion (3), *Petroselinum hortense* - parsley (1), *Latuca sativa* - lettuce (4), *Lycopersicum esculentum* - tomato (1), *Solanum melongena* - eggplant (2), *Abelmoschus esculentum* - okra (3), *Phaseolus vulgaris* - beans (11), *Vicia faba* - broad bean (6), *Pisum sativum* - peas (1), *Cucumis melo* - melon (1) and *Cucurbita pepo* - squash (3 accessions).

In this working group, detailed research is only done on local kale. For 12 samples, passport data is done, primary characterization and the evaluation of DNA. Due to very modest cultivation, only a small quantity of seed was collected. The amounts necessary for conservation (-20°C) will be provided through the seed multiplication.

Except for the inventory conducted in the middle of the last century, there was no organized preservation of the potato gene pool in this region until 2008. Activities on the conservation of germplasm of this very important culture re-started with the SEEDNet project. During the implementation of this project, 52 potato accessions were collected.

Description and evaluation of genetic material of the potato was carried out on in the field, according to FAO (IPGRI) standards and a sufficient number of potato populations were collected. For all collected accessions, passport data was collected (according to multi-crop passport
descriptors), and after registration in a national database, transferred into EURISCO database. In 2010 and 2011 in-field gene bank located in the municipality Danilovgrad (25 km away from Podgorica), primary characterization of all potato accessions conserved in the National Gene Bank was carried out. In order to identify duplicates and find unique genotypes for all potato accessions, morphological characterization and DNA evaluation was performed at the Agricultural Institute (Slovenia) and SASA Science and Advice for Scottish Agriculture (SASA) in Scotland in 2015 and 2016. By comparing the DNA of the all 52 Montenegrin potato accessions with SASA potato genotypes base of over 3,000 potato genotypes or 8,000 varieties, the existence of four unique genotypes was established. All others accessions have the status of a famous variety. The tubers of unique Montenegrin potato accessions are stored in a cold room at +4°C. Their regeneration is done every year in Podgorica (at the experimental field of the Biotechnological faculty), and on one more location outside of Podgorica. To ensure and preserve the existing potato gene pool from potential diseases and pests, the plan is to keep this collection in vitro as well. Also, the plan is to produce in the next year through the mini tubers of all Montenegrin unique varieties of potatoes.

In addition to potatoes, in this group of cultures there are also two tobacco accessions in the Montenegrin gene bank. They were collected during the collection missions carried out in 2009 and 2010.

The beginnings of fodder crops gene pool studies are related to the SEEDNet project in 2007. That year, as a result of activities at the national level, the seeds from seven local populations of alfalfa (Medicago sativa) were collected. In 2009 and 2010, within the same project, 23 wild populations of red clover (Trifolium pratense) and eleven populations of cocksfoot (Dactylis glomerata) were inventoried and enough seed for conservation (5,000-7,000) was collected. Apart from a few collecting missions, there were no other studies of the genetic resources of fodder plants in Montenegro. For all collected accessions of fodder crops complete passport data are made.

The Montenegrin gene bank includes eight very valuable field collection of fruit trees and vitis: olive (O. europaea), fig (F. carica) and pomegranate (P. granatum) (Center for Subtropical Cultures in Bar), plums (P. domestica) and apple (M. domestica) (Center for Continental Fruit, medicinal and aromatic plants in Bijelo Polje), vitis (Vitis vinifera) (Experimental field of the Biotechnical Faculty in Podgorica), collection of population of variety Kratošija (Experimental field of the Biotechnical Faculty in Podgorica) and National collection of autochthonous grapevine varieties, on Ćemovsko field (“13. jul Plantaze” property).

The Center for Subtropical Cultures in Bar, since its establishment in 1937, has been dedicated to research in the field of subtropical fruit crops. With the aim of studying the growth of these species in our climate zone, in the period from 1937 to 1954 the collections of the leading fruit species with great significance for local populations were formed: 72 varieties of figs, 57 species and varieties of citrus, 14 varieties of kaki, 43 varieties and clones of pomegranate, etc. Over time, due to various reasons (the return of land, building of vital infrastructure facilities, etc.), a significant part of this material was lost. The collection of various indigenous and long time present varieties of pomegranate and fig trees (12 varieties of figs and 21 varieties of pomegranate) was reformed in 2005 as an activity of the SEEDNet project.

About 300 km along the Montenegrin coast, and for over 2,000 years, olives trees have grown, and a relatively large number of varieties has subsequently developed, among which the most important include: ‘žutica’, ‘fran’, ‘lumbardina’, ‘crnjaka’, ‘drobnica’, ‘zinzulača’, ‘šarulja’, ‘sitnica’, ‘dužica’, ‘lumbardeska’, ‘barkinja’, ‘gloginja’ and ‘lupušica’. The presence of a large number of synonyms and homonyms significantly hinders and complicates the identification and classification of olive
cultivars. In addition to these recognized varieties, there are also many different individuals within the existing varieties as well as individuals who are completely different. The greatest difficulty in distinguishing genetic material has been the inability to apply the morphological characterization, as the morphological characteristics of the most important olives are influenced by environmental conditions.

For many decades the lack of interest in cultivation of old varieties of olives resulted in the introduction of foreign varieties of higher yield potential, fruit quality and oil content in the fruit, and their examination in Montenegrin coast conditions. Return to test the original, indigenous varieties of olives, took place in the late 1960s. After a long break in activities on the identification of local olive varieties, the 1990's saw a continuation, under the project the Yugoslavian gene bank. Then the studies of the olive gene pool and other agricultural crops were again almost aborted. The new investigation started again in 2004 with the SEEDNet project. The main emphasis is on testing old olive trees (trees older than 1,000 years) and clonal selection in the populations of the most common varieties. The research of morphological and molecular characterization of olive varieties was conducted by partner institutions in Italy and Slovenia. The application of modern protocols, and testing of new techniques (RAPD, SSR), confirmed the diversity recognized at a morphological level and also pointed to the differences that exist within the varieties (‘žutica’). This has opened new possibilities for deeper investigations and comparisons with the genetic material in the region and beyond.

In the framework of various international projects the molecular determination of figs accession was done.

The first study of continental fruits in Montenegro started in 1953 and was directed on the biological, physiological and technological characteristics of the continental varieties of indigenous fruit trees. Very soon after a number of collections were formed: apples (150 varieties), pears (49 varieties), plums (34 varieties), peaches (nine varieties), cherries (23 varieties), sour cherries (15 varieties), apricots (four varieties), strawberries (19 varieties), black currants (16 varieties), red currants (three varieties), raspberries (seven cultivars), and blackberries (three varieties).

Activities in studying continental fruit crop genetic resources was again intensified in 1989 within the federal project of the gene pool for the Yugoslavian gene bank but, due to the war in former Yugoslavia, were soon interrupted. At that time the inventory and collection of new genotypes of continental fruit crops were done: apples (eight varieties), brandy plums (seven varieties), cherry plums (five genotypes), pears (seven varieties), wild cherries (four genotypes) and, walnuts (two genotypes).

All tree collections of continental fruit varieties were destroyed by former owners in 1992 when the Act on returning farmland to former owners from public property came into force. On that occasion they destroyed a very valuable collection of indigenous varieties of small fruits, which in this volume did not have any other institution in the former Yugoslavia, as well as the collections of fruit rootstocks and the newly created hybrids of apple and pear. This significantly ruined the basis of continental fruit scientific research.

This situation lasted until 2008 when, thanks to the SEEDNet project, activities intensified again. In 2008, 200,9 and 2010, 79 old apple varieties and 44 varieties of old plum genotypes in-situ were inventoried on numerous sites.

For all inventoried accessions of apple, plum passport data and primary characterization of some important morphological characters is done. Passport data of important apples and plums
accessions are also in EURISCO catalogue. Field collections \textit{(ex-situ)} of apple (60 accessions) and plums (15 accessions) were formed in Bijelo Polje in 2010. Inclusion of other accessions in field collections of plums and apples will be completed later this year and next year.

The Montenegro Gene Bank has one of the richest collections of domestic, domesticated and introduced vitis varieties in the Balkans (this collection is in charge of the Centre for Viticulture, Wine and Fruit of the Biotechnical Faculty in Podgorica). The collection is located at the experimental field of the Biotechnical Faculty Lješkopolje, and it was created from an old collection that was built in the period since 1956 until 1960 and has been successively amended to date. The old collection had over 500 varieties, but a significant number has been lost due to already mentioned problems. During relocation of collections, which was done in 2002, 408 accessions were determined. In this collection, there are 203 old, 20 new, and 185 introduced vitis varieties.


In the period from 2008 until 2010 during the SEEDNet project implementation at eight sites in central and southern parts of the state, 15 accessions were marked \textit{in-situ} (interesting vine-stocks within the heterogeneous population of indigenous varieties). For all of them the characterization on the 21 character codes of OIV and DNA identification was made.

Within the previous research on the genetic diversity of grapevine in Montenegro, in total 520 vines (accessions) have been marked and sampled for identification. Confirmed genotypes of
autochthonous, neglected and indigenous grapevine varieties in Montenegro were vegetative propagated and with these grafts was formed National Collection of autochthonous grapevine varieties, on Ćemovsko field (“13. jul Plantaze” property). The formation of the collection began in 2016. So far, a total of 160 have been planted, and in the following period, more are to be planted.

Proper documentation of every vitis variety is kept. So far, characterization and primary evaluation of all varieties was performed on the 21 feature codes according to OIV. For hundred accessions the passport data have been made that can be found in EURISCO database.

Through the implementation of the SEERA project (Preservation and Establishment of True-to-Type and Virus-free Material of Endangered Grapevine Cultivars in Croatia and Montenegro) an ampelographic description and genetic identification with SSR analysis for 20 selected biotypes of neglected vitis varieties was done. The future plan is the production of virus-free planting material, which will serve for further multiplication.

All vitis varieties are photographed, their GPS coordinates are determined and sampled for molecular and sanitary analysis. Genetic analysis (molecular characterization) has been made for all 520 accessions, while sanitary control was done for 200 accessions.

2.2.2. Animal genetic resources

In-situ and ex-situ conservation of AnGR of Montenegro

By adopting the National Program and the Action Plan Conservation and Sustainable Use of AnGR the establishment of in-situ, and possibly ex-situ conservation program, was established as one of the key priorities for the next five-year period. This National program was based on the Strategy from 2006 and National program from 2008.

The estimated degrees of risk of some autochthonous breeds, as well as their importance, were defined as the priorities for inclusion in the in-situ conservation program. The National Program also defined that the Biotechnical Faculty is a national focal point institution - responsible for implementing the conservation program of farm animal genetic resources.

Implementation of the in-situ conservation program started in 2008, which means inventory and monitoring of breeders who rear pure breeds and fulfill the basic preconditions for inclusion in the in-situ conservation program on an annual basis. Preliminary analyses of the morphological characteristics of the selected animals are also carried out, while the genetic characterization of some breeds done later, depends on possibilities.

The in-situ conservation program includes farmers who have almost uniform breeds on the farm i.e. they dominantly rear the animals of certain autochthonous breeds. The minimum requirement for acceptance of the Busha cattle breed in the program of in-situ conservation is to have at least three to four females and at least one male for natural mating (without the presence of breeding males of other breeds on the farm).

The prerequisite for acceptance a sheep breed in the program is at least 70% of female breeding animals on farm are purebred in the first year and that this percentage will increase in the coming years. Since mating of animals is natural, the farmer can only keep purebred sires of autochthonous breed that are in the Program.

The annual budget of the Ministry of Agriculture (Agro budget) defines the amount of funds to be
committed for that calendar year, the amount of support per head of the autochthonous breed and the maximum amount per species of the farm animals involved.

Table 6: Review of implementation of the program “in-situ” conservation of animal genetic resources (in 2009 – beginning of the program implementation and 2016 – last year)

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Year</th>
<th>No. Herds - farmers</th>
<th>No. of female</th>
<th>No. of males</th>
<th>Ne (4NfNm/Nf+Nm)</th>
<th>Subsidies €/head</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSHA</td>
<td>2009</td>
<td>3</td>
<td>37</td>
<td>5</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>9</td>
<td>79</td>
<td>12</td>
<td>42</td>
<td>80</td>
</tr>
<tr>
<td>ŽUJA</td>
<td>2009</td>
<td>2</td>
<td>94</td>
<td>5</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>3</td>
<td>147</td>
<td>5</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>PIVSKA</td>
<td>2009</td>
<td>3</td>
<td>185</td>
<td>10</td>
<td>38</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>5</td>
<td>392</td>
<td>13</td>
<td>50</td>
<td>8</td>
</tr>
<tr>
<td>SORA</td>
<td>2009</td>
<td>2</td>
<td>223</td>
<td>7</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>4</td>
<td>325</td>
<td>11</td>
<td>46</td>
<td>8</td>
</tr>
<tr>
<td>LJABA</td>
<td>2009</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>2</td>
<td>145</td>
<td>6</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Donkey</td>
<td>2016</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td>7</td>
<td>50</td>
</tr>
</tbody>
</table>

In the previous years the amount allocated supported rearing of approximately 1,000 head of sheep (all breeds), 120 heads of Busha cattle and about 50 donkeys. The number of farms in the program depends on population size of each of the breeds, thus all available animals of Zuja sheep breed are included.

**Ex-situ conservation of AnGR**

Ex-situ program of conservation of AnGR in Montenegro (national GENE BANK for AnGR) has not been officially established yet. The capacities for establishing of ex-situ conservation and bank of genes in terms of conservation of semen, oocytes and embryos are limited, and indeed does not exist because there is no any public or private institution which deals with animal reproduction as a center for artificial insemination of farm animals - for collection, storage (cryo-conservation), and distribution of semen, oocytes and embryos. All semen used for AI of commercial breeds is permanently imported.

In the frame of the Department of Livestock Science of the Biotechnical Faculty and its laboratory for molecular genetic research, over the last five years it has created a collection of genetic materials or a small gene bank of somatic cells and DNA of the most of Montenegrin autochthonous breeds which are storages by freezing on - 40°C.
Table 7: Review of collected and storage samples of genetic materials (somatic cells and DNA) of AnGR

<table>
<thead>
<tr>
<th>Species</th>
<th>Breeds</th>
<th>Blood</th>
<th>Hair</th>
<th>DNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Busha</td>
<td>54</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Sheep</td>
<td>Plvska pramenka</td>
<td>155</td>
<td>x</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Bardoka</td>
<td>53</td>
<td>x</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Ljaba</td>
<td>48</td>
<td>x</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Zuja</td>
<td>55</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Sora</td>
<td>58</td>
<td>x</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Sjenička sheep</td>
<td>52</td>
<td>x</td>
<td>45</td>
</tr>
<tr>
<td>Goat</td>
<td>Domestic Balkan goat</td>
<td>60</td>
<td>x</td>
<td>32</td>
</tr>
</tbody>
</table>

On the basis of that collection, ERFP (European Regional Focal Point for AnGR) and EUGENA (European Network of Gene Bank of AnGR) invited Montenegro to join to EUGENA through signing the (memorandum of understanding) MoU. The Minister of Agriculture and Rural Development signed the EUGENA memorandum of understanding in April 2017 as well as the EUGENA agreement authorizing the Biotechnical Faculty to be the national representative that performs gene banks and cooperates with EUGENA.

2.3. SOCIO – ECONOMIC ASPECTS OF AGROBIODIVERSITY PROTECTION

Due to intensification of agricultural production, a significant number of local cultivars of agricultural plants and breeds of domestic animals have already been lost or endangered in Montenegro, which has led to serious erosion of genetic variability. Traditional cultivars, as well as local (autochthonous) breeds, today are mainly grown by older people in small volume and mostly in remote rural areas. These resources are often used in areas where the cultivation or rearing of the most commercial agricultural crops or breeds would not be economically viable.

Traditional cultivars are exclusively used in traditional production systems, mainly for household consumption, while only small quantities can be found at local markets. Recently, these products also found in stores of large retail chains, and often with the label of organic origin. The reason for the increased interest in products from genetic resources lies in the increased demand of consumers. As a consequence of the increased ecological awareness, in recent decades all over the world, there has been a significant increase in the demand for healthy agricultural products, produced by principles of organic production, including genetic resources. More frequent problems caused by plant diseases, pests and weeds have also been influencing increased interest in local varieties and ecotypes that have been grown for centuries in these areas and adapted to given climatic conditions and cultivation practices. Climate change is becoming ever more important for growing these cultivars. Adapting to these challenges will be significantly based on the genetic diversity of crops and domestic animals. By cultivating genetic resources, producers pay attention to avoiding different production risks rather than maximizing production.

The tendency of increased use traditional cultivars in organic production is noticeable, and the
main reason for this is the inability to procure organic seed (poor supply on the domestic market, high prices of imported seeds).

Some local breeds, especially local sheep breeds, still have an important role in Montenegrin livestock production and they are the main source of income for farmers in mountain areas. This is especially the case with local sheep breeds such as Pivska pramenka, Sora, and Bardoka, which are irreplaceable for the semi-extensive system of rearing in the specific environmental conditions. A similar situation exists with the Montenegrin hilly horse and Balkan donkey, which are still widely used as working animals for exploitation of firewood from inaccessible terrain, as well as for the transfer of other loads. Rearing of local breeds of all grazing domestic animals in high mountain areas highly contribute to maintaining the botanical composition and flora reach of mountain pastures, so they provide protection of ecosystems and typical pastoralism. It is particularly important for Montenegro due to the high share of pastures in the total agricultural areas (over 90%), especially in the karst area that could be used only by grazing and by rearing of local – autochthonous sheep and goat breeds.

Some local breeds are closely related with traditional dairy or meat products. For instance, the Pivka pramenka sheep breed closely related with production of traditional dairy product named “pivski or durmitorski skorup” as well as cheese “prljo”, then sjenicka sheep breed with production of sjenicki cheese, Bardoka sheep breed with production of Kuci cheese, as well as lamb meat and traditional dry meat product of sheep and goat meat named “stelja” and “kastradina”. All local breeds, together with their traditional products, are a very important segment of the total cultural heritage of Montenegrin rural areas. All these products are still well recognized on the market and reach good prices. The labeling and protection of origin of agricultural and food products, especially those related for autochtonous breeds or for traditional cultivars is a very important segment for better valorization and sustainability of breeds and products.

The intensive development of alternative types of tourism (agro and eco-tourism, hunting and fishing tourism, etc.) is a significant incentive for greater exploitation of agro biodiversity. Production of unique traditional products of recognizable quality and their placement through the tourist offer is becoming more and more interesting.

In addition, the aforementioned support for the sustainable use of genetic resources for food and agriculture must be more generous, as only this can provide an increase in the number of farms that actively use genetic resources, which would also lead to an increase in the efficiency of existing conservation on farms.

In these activities, men and women are equally involved. The men are in charge of all the tasks related to the use of large machinery, while the work of sowing, protection, harvesting and processing the products is significantly supported by women. The sale of products of genetic origin, especially on green markets, is mainly the responsibility of women.

The role for women in the production of traditional dairy products, traditional meals and handicrafts (products made of wool) is very important, almost indispensible, and in Montenegro it is usually said “these are the woman's jobs”, so the role of women in preserving tradition is crucial.
2.4. STATUS OF PUBLIC AWARENESS

Awareness raising activities in Montenegro are performed on three levels: governmental, farmer and on a scientific level.

One of the first and most important steps in raising awareness at the governmental level was the adoption of the Strategy of development agriculture and rural areas in 2006, where the conservation of agricultural genetic resources is defined as one of the priorities.

Thereafter, the adoption of the National Program of Conservation of Agricultural Genetic resources followed (in 2007) as well as the creation of permanent Agrobudget measure for the preservation of indigenous varieties and breeds of domestic animals (since 2008). As a result of these activities, another smaller budget line within the Phytosanitary Measures Program (Sector for Phytosanitary Affairs for PGR) was established in 2012.

Awareness raising activities at the scientific level are mostly realized through different project activities of researchers at the Biotechnical faculty.

In the last decade, researchers from the Biotechnical Faculty carried out the following activities:

- Round table’s or presentations were realized on different traditional manifestations: “Kostaniada” organized in honor of chestnut (Castanea sativa) held in Stoliv; “Days of Blueberries” held in in Plav; “Days of Wine and Fish” held at Lake Skadar; “Maslinijada” for promotion of olives and olive oil, held in old city of Bar, and “Days of Cornus Mass” organized in Niksic for the education of farmers and consumers on organized production of cornus mass.
- Salon of wine “In honour of Vranac”, held in Belgrade, was an opportunity to talk about Montenegrin autochthonous vine varieties and need for protection and utilization for new products of geographic origin.
- A promotion of PGR and work performed at Biotechnical faculty was presented at the Food Fair held in Budva.
- The International Symposium named after the famous Montenegrin botanist Radomir Lakušić, held in Bijelo Polje. Five scientific papers on autochthonous material (Cornus mass, walnut, myrabolane, wild species and apple) were presented.
- Pamphlet, calling the farmers to inform or to provide information (material) on autochthonous varieties in their possession (distributed during the Agricultural Fair).
- Guesting in the media, meetings of farmers and promotions of importance of preservation of genetic resources for food and agriculture.
- Education of high school students on the importance of PGR and gene banks. Some workshops and quiz programs were organized.
- In the curriculum of Plant Production - bachelor level of study, organized at the Biotechnical Faculty of University of Montenegro, a course named Plant Genetic Resources was introduced in 2010.
- In the curriculum of Livestock Production - bachelor degree of study, the subject Animal Genetic Resources has been included since 2009, while in the curriculum of postgraduate – master’s program of Livestock Science, the subject of Biotechnology in Animal Husbandry was introduced that is focused on the use of molecular genetic techniques for genetic characterization of AnGR.
• Through the realization of the project The Genetic Resources in Agriculture and Forestry of Montenegro (2015-2017), funded by the Montenegrin Academy of Sciences and Arts, there have so far been three forums held and a round table event on genetic resources in agriculture, their significance and the need for conservation. These events were attended by all stakeholders (decision-makers, scientists, farmers, and others).

• Promotion of local breeds reared in the area of Durmitor mountain and Kuci mountains as well as protection traditional dairy products (PDO) and its valorization through rural tourism where one of the main project activities in the project, Valorizing the Montenegrin Katuns through sustainable development of agriculture and tourism - KATUN (2015-2017) funded by the World Bank and the Ministry of Science. For that purpose, several workshops with farmers and other stakeholders organized, printed promoted fliers, and created new packages.

As a result of public awareness activities, working groups on the SEEDNet project involved new members from different faculties and NGO’s, and mutual expeditions were organized, showing the interest to be involved of as many people as possible to improve the realization of the project. During this period, a number of scientific monographs concerning PGR were published (given in Annex 2).

Unfortunately, after completion of the SEEDNet project, all activities on PGR have been significantly reduced and mainly limited to publishing and to a lesser extent to the characterization and evolution of the preserved samples.
3. CONCLUSIONS

Montenegro possesses an abundance of agrobiodiversity. Many plant varieties or local breeds face the risk of extinction. So far, some efforts have been for their preservation, investigation and sustainable use, but they are not sufficient and have to be enforced as soon as possible in order to prevent the loss of some of them.

Replacement of traditional crops with more productive cultivars as well as permanent decreasing of local breeds population together with their permanent crossing with more productive breeds are the main dangers for agricultural genetic resources in the sense of its conservation.

Emphasis must be placed on an integrated and holistic approach that ensures a better coordination of genetic resources conservation efforts with active involvement of all relevant stakeholders and national competent authorities (policy makers, researchers, farmers, agro-food, and other processing industries and consumers). It has to be the key of the successful conservation and sustainable use of genetic resources in agriculture.

Adopting the missing legislation, new National Program and the Action Plan is the top priority, as well as creation a more extensive budget support in the frame of Rural Development measures with precise plans to support farmers who maintain genetic resources on their property. Providing stable funding for maintaining the full working capacity of the Gene Bank of PGR and establishing a Gene Bank of AnGR are also issues with high priority.

Permanent work on the establishment of a sustainable use of genetic resources (through intensive promotion of the cultivation of traditional plant species and breeds of domestic animals and consumption of its products, promotion of breeding of genetic resources in organic production, protection designation of origin of genetic resources or its products, etc.) has to be established.

Intensify activities on inventoring and collecting of vegetables and fodder crops.

Continue with inventoring, studying and popularizing the sustainable use of the most important plant and animal genetic resources (vines, olives, apples, plums, pomegranate, fig, maize, wheat, etc.)

Intensify international cooperation in the field of genetic resources (participation in projects, obligations arising from international agreements, etc.).
4. PERSPECTIVES AND RECOMMENDATIONS

4.1. RECOMMENDATIONS FOR CREATION AND UPGRADE OF POLICY AND LEGISLATION

The preservation of genetic resources in agriculture or agrobiodiversity, for the first time has been defined as one of the priorities of Montenegrin agriculture by adoption of the first National Strategy for the Development of Agriculture and Rural Areas in 2006, that has been continued by the Second Strategy (2015). On the basis of priorities defined by the Strategy from 2006, shortly thereafter, the first National Program with an Action Plan for the Conservation and Sustainable use of Genetic Resources in Agriculture was adopted for the period 2008-2013, without its updating or adoption so far.

In the last decade, many law regulations have been adopted that are directly or indirectly related to genetic resources in agriculture, but it is necessary to adopt other important regulations and to continue to work on their harmonisation with the relevant EU regulations. Considering the current state of national policies, as well as adopted legislation and its harmonisation with relevant international documents in the forthcoming period, it is necessary to work on the following:

- To create a new National Program with an Action Plan for Conservation and Sustainable use of Genetic Resources in Agriculture (with two segments: for plant and for animal genetic resources). A new National Program has to be fully harmonized with Global Plans of Actions (for PGR and AnGR), issued by FAO. This document should create a new set of policies / measures, priorities and exact plans of activities on conservation of agricultural genetic resources in the future. This is very urgent, due to many changes that have happened in the meantime regarding the status and trends of some genetic resources.

- To harmonize attitudes and priorities regarding agro-biodiversity, as defined by the National Strategy of Biodiversity, that are under the responsibilities of the Ministry of Sustainable Development and Tourism, with activities and priorities defined by the appropriate strategic documents of the Ministry Agriculture and Rural Development that are directly responsible for AGR.

- To prepare and adopt additional legislation as Law on Plant Genetic Resources with Sub-laws or Rulebooks on Plant Gene Bank and other necessary regulations as well. On the basis of this legislation, the National List or Register of Protected Varieties, and the National List of Autochthonous Varieties has to be established.

- To prepare and adopt regulations or rulebooks deriving from the current Law on Livestock, that should regulate the way - criteria of recognizing indigenous breeds, establishing a register of autochthonous and protected breeds.

- As logical continuation of the previous step, is the creation and adoption of the breeding programs for the local breeds and establishing appropriate databases (herd books).

- To adapt legislation related to the protocol for recognition of varieties and distribution of seeds, etc.

- For the purpose of active communication with FAO commission for PGR it is necessary to nominate the national focal point for plant genetic resources who will be a representative in FAO, given that such person has not yet been nominated so far. In accordance with that, a submission of the state report about the status of PGR in Montenegro is necessary.
4.2. RECOMMENDATIONS FOR IMPROVEMENT OF THE INSTITUTIONAL CAPACITIES

Most activities related to the conservation of genetic resources in agriculture are under the responsibilities of different departments of the Biotechnical Faculty (University of Montenegro), which is, according to the previous National program, the National focal point. The scientific, technical and human capacities for these activities have been establishing and improving over a longer period of time. Most of them, through international cooperation and implementation of international projects (for example, the Gene Bank for PGR, or several specialized labs). A budget or some type of regular annual fund for maintaining and full functionality of these capacities has never been allocated. Because of that, as well as due to insufficient human capacities, some activities related to work on conservation of genetic resources in agriculture are considered occasional. Despite the many obstacles, researchers from the Biotechnical Faculty have completed the process of inventorying and other research activities succeeded in identifying a high number varieties of different agricultural plants and collect high number of seed, as well as to collect genetic materials of most autochthonous breeds.

For the purpose of regular and permanent functionality of these capacities it is necessary:

- To define status of the National Plant Gene Bank and provide its regular maintenance together with enhancing human capacities and provide regular financing.
- To strengthen technical and human capacities for ex-situ conservation of ANGR in terms of organizing of collection and cryo-conservation semen of autochthonous breeds which have resulted in the establishment of a Gene Bank for ANGR. If it is possible, try to organize this at a national level; if not, to try to establish cooperation with some institution(s) from nearby countries.
- Other institutions dealing with genetic resources also included in conservation work.

4.3. RECOMMENDATIONS FOR IMPROVEMENT OF AGROBIODIVERSITY CONSERVATION

Agricultural genetic resources in terms of local plant varieties and breeds of domestic animals are, in the case of Montenegro, mainly reared on small farms and in remote rural areas. These resources are usually used in traditional and extensive production systems, while in the intensive agricultural production they have been replaced with a small number of highly productive crops or breeds of animals or different hybrids. Intensification of agricultural production has caused erosion of agro biodiversity and additional efforts must be made to find more safe ways to secure their long-term conservation.

Farmers included in on-farm (in-situ) conservation and sustainable use of local breeds or crops are facing many challenges of which low yield and low competitiveness are the most significant. To become economically competitive, rearing of traditional breeds and crops varieties which are mostly low-yielding ones, particularly breeding activities to improve their productivity and values of their products are very often required. Farmers have to offer traditional products with high organoleptic and nutritional qualities and try to satisfy both the farmers’ needs and the consumers’ expectations. The achievement of this aim has to be the mutual task of all stakeholders (farmers, researchers, breeders and agro-food and other processing industries, NGOs, consumers, and decision makers) in processes concerning the conservation and sustainable use of agricultural genetic resources. The following measures will be required:
• To establish a register of farmers maintaining landraces, a register of autochthonous breeds, and a register of breeders.

• To continue with the implementation of the current in-situ conservation program and its widening in terms of the number of farms and number of animals per breed included in the program.

• To increase the financial support allocated for direct support to farmers (increase amount per head and per hectare) for in-situ conservation with the expansion of a scope of the animals included in the in-situ program and their number that is in accordance with EU recommendations.

• To find sustainable models of cultivation, which would stimulate producers to cultivate traditional crops and increase farm income and sustainability of production.

• To support programs for the development of new varieties adapted to given ecological conditions, that are based on the use of traditional varieties, local populations and wild relatives of cultivated plants.

• Establishing of ex-situ conservation of AnGR and officially establishing a gene bank for AnGR with the collection and cryo-conservation of semen of local breeds.

• Promoting of local breeds and their products in a much better way by using positive experience from other countries (organizing promotion manifestations, connections with tourism etc.).

Decision makers have to ensure appropriate conditions and together with institutions responsible for implementation (the Biotechnical Faculty amongst others) to coordinate all activities regarding conservation and sustainable use of genetic resources, including implementing relevant international standards.

4.4. RECOMMENDATIONS FOR IMPROVEMENT OF THE SCIENTIFIC AND PUBLIC AWARENESS

The role of researchers and competent authorities is to undertake activities in improving methodologies and tools in order to enhance the effectiveness of genetic resources characterization. Furthermore, they play an essential role in synthesizing and disseminating results and ensuring that genetic material and related information are accessible for practical uses. As already mentioned, the Biotechnical Faculty has enviable capacities for scientific research work. In addition, good cooperation with many international institutions has been established. In the past ten years, work on various projects has been used for morphological and genetic characterization of numerous autochthonous plant varieties and autochthonous breeds.

Therefore, as the agricultural genetic resources are a large and insufficiently investigated area, it is necessary to provide some funds from the national level (the Ministry of Science and the Ministry of Agriculture and Rural Development) for further research, especially genetic characterisation, investigation of nutrition values of different products origin from genetic resources. The role of researchers is very important, actually key in regard to the creation of new technologies, transfer of knowledge, therefore has to be recognized and supported.

Different types of promotion activities and much more public information generally strongly contributes to awareness raising regarding the importance of conservation and sustainable use of genetic resources in agriculture. Television films, campaigns, posters, leaflets and brochures, local competitions and exhibitions focusing on agrobiodiversity are very effective ways of spreading
knowledge about local crops and breeds.

In order to ensure sustainability of agricultural genetic resources and promote their cultivation, it will be necessary:

- To promote local varieties and breeds and their products in a much better way by using positive experiences from other countries (organizing promotion manifestations, connections with tourism, etc.).
- To intensify all awareness raising activities on the importance of conservation and sustainable use of genetic resources in agriculture (television films, campaigns, posters, leaflets and brochures, local competitions, and exhibitions focusing on agrobiodiversity).
- To promote the cultivation of traditional and under-utilized plant species in agricultural holdings.

4.5. RECOMMENDATIONS FOR IMPROVEMENT OF REGIONAL COOPERATION

Since South East European is geographically a relatively small area and with many mutual local crop varieties or local breeds (regional transboundary breeds or crops), which are sometimes used under the same names or with different names, so that close regional cooperation is necessary. According to the Global Action Plans for AnGR, regional collaboration for in-situ conservation is desirable for regional transboundary breeds and for transhumant livestock populations held by pastoralist communities that cross national boundaries.

In the case of SEE countries, the first step toward of enhancing regional cooperation could be establishing a regional network for transboundary local cultivars and breeds and joint work on promotion of their products and other specificities of genetic resources.

Creation of a regional breeding program for endangered local cultivars and animal breeds which are of regional significance could be a very applicable way of improving regional cooperation.
5. CASE STUDIES

Case study for plant genetic resources - success stories

The agro-cooperative "Vrbica" from Petnjica (small municipality in the north of the country) was founded in 1985. The main activities of this co-op are the production of crops and vegetable (cereals, potatoes and onions), purchase and sale of agricultural products.

It has all the necessary equipment for soil cultivation, sowing, plant care, harvesting and storing (six tractors, combine harvesters). In addition, it also has the necessary equipment for processing (cleaning, grinding and packing of cereals (the trier of cereals, three mills for the production of whole-grain cereals flour, flour packing equipment, etc.). This cooperative has sufficient storage capacities, namely three grain silos with a total capacity of 150 tons, and 350-tons potato storage.

Since 2007, production based on the principles of organic production and genetic resources has become the main activity of this cooperative. All local cereal populations represented in the production as genetic resources are part of the collection of the national plant gene bank.

Cooperative "Vrbica" owns a license for production according to the principles of organic production. Organic production of autochthonous cereal populations takes place on the surface of 15-20 ha: wheat 7-8 ha, 3-4 ha rays, barley 2 ha, oat 1-2 ha, buckwheat 2-3 ha and corn 0.5 ha. Production areas are located in mountain areas at an altitude of 850 to 1,350 m. It is interesting that this cooperative does not own its own land and so it is forced to rent the land.

Flour sale through large retail chains take place without major problems. Therefore, the plan is that the area under indigenous crops slowly spreads over the years.

In addition to the organic production of the cooperative, it also has conventional production of potatoes (5 ha) and onions (1-2 ha). In the past there have been attempts to switch to organic farming systems in these cultures, but due to persistent problems with diseases and pests and poor business results, it has been abandoned.

Case study for animal genetic resources - success stories

Sheep production at the family farm on the Durmitor Mountain

Sheep farm owner Radivoje Jakić lives in the village of Merulja, 10 km from Zabljak at an altitude of 1,600 m above sea level. This village belongs to the mountain masiv of Durmitor, which is characterized with very long and very cold winters. Since this area is very snowy, it sometimes happens that the roads to the farm are inaccessible for three months or more. This farmer has a sheep farm (usual flock size is between 130 – 150 breeding animals) and cattle farm with 3-5 cows. Sheep production is based on rearing only Pivska or jezerska pramenka, typical autochthonous breeds, reared for centuries in this region. This breed is very well adapted for rearing in such a cold climate. The main product of sheep production is lamb or lamb meat grown on local pastures, as well as traditional dairy products of sheep milk, from this region named “skorup”, and a specific type of cheese named “prljo”.

Each year he distributes to the market up to 120 lambs, about 200 kg of skorup and the same volume of the cheese prljo. The live body weight of lambs (usually six months old) is 45-50 kg with
an average price of about € 100/head. Traditionally the dairy product skorup reaches quite a good price on the market (€ 15 - 18/kg), while the price of cheese prljo is about € 4/kg.

The income received from sheep production (lamb and dairy products), together with some income received from selling of calves reared on farm, represents the only income of the household.

Having in mind that this farmer rears local sheep breeds typical for this region (Pivska pramenka), his flock has been included in the program of *in-situ* conservation of AnGR since 2013. Additionally, this household has been under the process of conversion to organic production since last year.

This is an example of sustainable rearing and use of local sheep breeds, despite the very demanding climate conditions.
ANNEX 1

STRUCTURE OF AGRICULTURAL PRODUCTION

Table 1: Overview of regions and municipalities (areas and population)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>km²</td>
<td>%</td>
<td>Figure</td>
</tr>
<tr>
<td>Coastal</td>
<td>1,591</td>
<td>11.5</td>
<td>145,847</td>
</tr>
<tr>
<td>Central</td>
<td>4,917</td>
<td>35.6</td>
<td>279,419</td>
</tr>
<tr>
<td>Northern</td>
<td>7,304</td>
<td>52.9</td>
<td>194,879</td>
</tr>
<tr>
<td>MNE total</td>
<td>13,812</td>
<td>100.0</td>
<td>620,145</td>
</tr>
</tbody>
</table>

Table 2: Montenegro’s macro-economic indicators for the period 2009 – 2015

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (mil EUR)</td>
<td>3,085.6</td>
<td>2,980.9</td>
<td>3,104.0</td>
<td>3,234.0</td>
<td>3,148.9</td>
<td>3,350.0</td>
<td>3,457.9</td>
<td>3,595.7</td>
</tr>
<tr>
<td>GDP per capita (EUR)</td>
<td>4,282</td>
<td>4,908</td>
<td>5,006</td>
<td>5,211</td>
<td>5,063</td>
<td>5,402</td>
<td>5,561</td>
<td>5,779</td>
</tr>
<tr>
<td>GDP growth in real terms (%)</td>
<td>6.9</td>
<td>-5.7</td>
<td>2.5</td>
<td>3.2</td>
<td>-2.7</td>
<td>3.5</td>
<td>1.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Share of agriculture, forestry and fisheries in GDP, %</td>
<td>7.4</td>
<td>8.3</td>
<td>7.7</td>
<td>7.9</td>
<td>7.4</td>
<td>8.0</td>
<td>8.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Share of population in rural areas in %</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
<td>36.8</td>
</tr>
<tr>
<td>Unemployed (% at the end of the period)</td>
<td>16.8</td>
<td>19.1</td>
<td>19.7</td>
<td>19.7</td>
<td>19.7</td>
<td>19.5</td>
<td>18.0</td>
<td>17.6</td>
</tr>
<tr>
<td>Employment, share of agriculture, forestry and fisheries in %</td>
<td>7.2</td>
<td>3.6</td>
<td>0.7</td>
<td>2.8</td>
<td>5.1</td>
<td>0.3</td>
<td>1.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Inflation rate by costs of living</td>
<td>1,226.4</td>
<td>1,027.8</td>
<td>1,157.7</td>
<td>1,382.6</td>
<td>1,389.4</td>
<td>1,390.1</td>
<td>1,388.1</td>
<td>1,539.2</td>
</tr>
<tr>
<td>Export of goods and services (mil EUR)</td>
<td>2,880.5</td>
<td>1,948.7</td>
<td>1,960.5</td>
<td>2,099.6</td>
<td>2,166.4</td>
<td>2,143.7</td>
<td>2,074.2</td>
<td>2,213.6</td>
</tr>
<tr>
<td>Import of goods and services (mil EUR)</td>
<td>-1,654.1</td>
<td>-921.0</td>
<td>-802.9</td>
<td>-717.0</td>
<td>-776.9</td>
<td>-683.2</td>
<td>-686.1</td>
<td>-674.4</td>
</tr>
</tbody>
</table>

Source: Statistical yearbooks, MONSTAT

Figure 1: Breakdown of harvested area by main crops; 2011

Source: Statistical yearbooks, MONSTAT
### Agricultural area by categories of use (in '000 hectares)

<table>
<thead>
<tr>
<th>Year</th>
<th>Agricultural area</th>
<th>Cultivated land</th>
<th>Ponds, reed beds and fishponds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Arable land and gardens</td>
<td>Orchard</td>
</tr>
<tr>
<td>2011</td>
<td>515.7</td>
<td>189.1</td>
<td>45.7</td>
</tr>
<tr>
<td>2012</td>
<td>222.9</td>
<td>71.6</td>
<td>7.7</td>
</tr>
<tr>
<td>2013</td>
<td>223.1</td>
<td>71.8</td>
<td>7.8</td>
</tr>
<tr>
<td>2014</td>
<td>230.3</td>
<td>74.4</td>
<td>8.7</td>
</tr>
<tr>
<td>2015</td>
<td>231.4</td>
<td>75.8</td>
<td>8.7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Arable land and gardens</th>
<th>Sown area</th>
<th>Fallow land and other arable land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Cereals</td>
<td>Industrial crops</td>
</tr>
<tr>
<td>2011</td>
<td>45.7</td>
<td>31.9</td>
<td>5.2</td>
</tr>
<tr>
<td>2012</td>
<td>7.7</td>
<td>7.4</td>
<td>2</td>
</tr>
<tr>
<td>2013</td>
<td>7.8</td>
<td>6.7</td>
<td>2.1</td>
</tr>
<tr>
<td>2014</td>
<td>8.7</td>
<td>7.7</td>
<td>2.4</td>
</tr>
<tr>
<td>2015</td>
<td>8.7</td>
<td>7.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle</th>
<th>Pigs</th>
<th>Sheep</th>
<th>Horses</th>
<th>Poultry</th>
<th>Beehives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Cows and heifers in calf</td>
<td>Total</td>
<td>Sows and first farrow sows</td>
<td>Total</td>
<td>Ewes for breeding</td>
</tr>
<tr>
<td>2011</td>
<td>87,173</td>
<td>62,199</td>
<td>21,398</td>
<td>2,945</td>
<td>208,771</td>
<td>172,924</td>
</tr>
<tr>
<td>2012</td>
<td>84,701</td>
<td>63,062</td>
<td>18,451</td>
<td>2,317</td>
<td>207,047</td>
<td>169,295</td>
</tr>
<tr>
<td>2013</td>
<td>89,058</td>
<td>65,591</td>
<td>20,572</td>
<td>1,601</td>
<td>190,843</td>
<td>153,450</td>
</tr>
<tr>
<td>2014</td>
<td>93,550</td>
<td>67,104</td>
<td>22,053</td>
<td>2,993</td>
<td>204,403</td>
<td>165,351</td>
</tr>
<tr>
<td>2015</td>
<td>92,452</td>
<td>65,893</td>
<td>24,951</td>
<td>2,699</td>
<td>194,636</td>
<td>155,543</td>
</tr>
</tbody>
</table>

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ANNEX 2

LIST OF REFERENCE FOR THE STATUS OF PLANT AND ANIMAL GENETIC RESOURCES

International monographs:


Chapter in international monographs:


National monographs:

M. Marković, Biljana Lazović, Božidarka Marković (2010): Životna sredina i održivi razvoj –
Professional books:

Papers - PGR:


Perović T., Hrnčić, S., Čizmović, M., Lolić, B., Đurić, G. and Delić, D. (2016): First Report of Fig Mosaic Virus, Fig Leaf Mottle-Associated Virus 1 and Fig Mild Mottle-Associated Virus Infecting Fig (Ficus carica) in Montenegro, Journal of Plant Pathology, 98 (3), 678, DOI: 10.4454/JPP.V98I3.066


Čizmović, M., (2001): Pomological and characteristics of one-crop fig cultivars (Ficus carica L.) in the Bar region, p. 1-83. Faculty of Agriculture, University of Novi Sad, Serbia and Montenegro (Master’s thesis).

**Papers - AnGR:**


Božidarka Marković, Milan Marković, Aleksandra Martinović, Dušica Radonjić (2012): Growth performances and carcasses traits of Bardoka suckling lambs raised in semi extensive system of production. International conference: Role of research in sustainable development of agriculture and rural areas, Podgorica – Montenegro, Book of abstracts, pg. 114.


Perspectives and Challenges of Sustainable Livestock Production, pg 124-132.


## ANNEX 3
### LIST OF INSTITUTIONS AND GOVERNMENTAL BODIES

<table>
<thead>
<tr>
<th>Institution</th>
<th>Ministry of Agriculture and Rural Development (MARD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td><a href="http://www.minpolj.gov.me">http://www.minpolj.gov.me</a></td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>Responsible institution for creation of policy and other legal regulations governing the field of agrobiodiversity and their implementation.</td>
</tr>
<tr>
<td>Capacity assessment (human and infrastructure)</td>
<td>The Directorate for Agriculture and Fisheries, Directorate for Rural Development and Directorate for Food Safety, Veterinary and Phytosanitary Affairs (Sector of Phytosanitary Affairs - Department of Seeds, Planting Material, GMO, Plant Variety Protection and Plant Genetic Resources in Agriculture) are responsible for the implementation of these activities.</td>
</tr>
<tr>
<td>Important specific actions undertaken by the institution</td>
<td>Although the development of Montenegro is based on the principles of an ecological and touristic country and thus based on the sustainable development concept, the strategies of sustainable use of agro biodiversity are not yet defined. The National Programme for the Conservation of Genetic Resources in Agriculture, and the Action plan for the conservation of genetic resources in agriculture are out of date. A rulebook on plant gene bank currently does not exist. It is necessary to create these documents in order to introduce Plant Gene Bank into the legal system. A legal framework will allow the Montenegrin plant gene bank to function to its full capacity and be prepared for the implementation of ITPGRFA.</td>
</tr>
<tr>
<td>Requirements for further enhancement of capacities</td>
<td>A separate section for PGR should be established in the Directorate for Agriculture and Fisheries and/or Division for Food Safety, Veterinary and Phytosanitary Affairs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institution</th>
<th>Biotechnical faculty Podgorica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact details</td>
<td><a href="http://http://www.ucg.ac.me/btf">http://http://www.ucg.ac.me/btf</a></td>
</tr>
<tr>
<td>Role in agrobiodiversity protection</td>
<td>The biotechnical faculty plays a key role in gathering, collecting, and studying plant genetic resources for food and agriculture. It is an authorized institution for all PGR related issues: inventory, collection, conservation, regeneration, characterization, evaluation, documentation and exchange of genetic resources. It also deals with education (the course on PGR on undergraduates has been established), PGR projects implementation, elaboration of M.Sc. thesis on PGR, participation in creation and implementation of national legislation, strategies and other studies and programs. The biotechnical faculty and its Department of Livestock science is an authorized institution – focal point institution, responsible for all activities related of AnGR.</td>
</tr>
</tbody>
</table>
### Capacity assessment (human and infrastructure)

The faculty has 150 employees, out of which 40 are Ph.D. holders. Scientific-research work at the Biotechnical Faculty was organized within 10 departments and eight multidisciplinary, multipurpose laboratories. It owns a central library with over 10,000 books. Beside the headquarter building there are eight departments situated in Podgorica, and two departments situated out of Podgorica. The Department of Mediterranean Fruit in Bar, with a spacious building in Bar and appropriate labs, and the department of continental fruit and aromatic plants in Bijelo Polje. The faculty possesses experimental fields in Podgorica (25 ha), Bijelo Polje (25 ha) and Bar (3 ha). All laboratories and cabinets are equipped with modern equipment and inventory necessary for quality work.

Plant gene bank is situated at the faculty (as part of Department for Crop and Vegetable Production). It is equipped for cleaning, drying, and packaging of seeds, determination of moisture, cleanliness and health of seeds and labeling of samples. Additionally it is equipped for long-term storage of seeds (-20°C) and active collections storage (4°C). Also, it possesses laboratories for tissue culture and molecular identification.

Laboratory for molecular genetic characterization of animal genetic resources is situated within the Department of Livestock Science. The lab is equipped for basic molecular analyses (centrifuges, electrophoresis, PCR thermocycler, gel analyzer, nano view DNA/RNA analyzer, incubators, thermoblocks, freezer, refrigerator, and other accessories.

Additionally, two freezers (-40 °C) are used for storage of animal genetic materials (blood, tissues, DNA). This is the starting point for establishing a gene bank of AnGR.

### Important specific actions undertaken by the institution

Collection of indigenous materials in Montenegro started in 1940’s, but it was done exclusively for scientific research and selection purposes. Since that time, the Biotechnical Faculty (earlier the Agricultural Institute and Biotechnical Institute) has been participating in all PGR activities and projects. The most important of them are: Inventory and collecting of PGR in 1970’s (funded by USA); Establishment of the gene pool for the Gene Bank needs of Yugoslavia in 1989 (funded by government of Yugoslavia); SEEDNet project (South East European Development Network on Plant Genetic Resources) in 2004-2010 (funded by SIDA); Preservation and establishment of true-to-type and virus free material of endangered grapevine cultivars in Croatia and Montenegro (SEE-ERA.NET Plus Joint Call, HRV &MNE ENDANGERED GRAPES, 2011-2012); East-West Collaboration for Grapevine Diversity Exploration and Mobilization of Adaptive Traits for Breeding (COST ACTION FA1003, 2012–2014); Fostering a Science-based Development of a sustainable Montenegrin Agriculture (FP7-REGPOT-AgrSciMont, 2010-2013), etc.

Department of Livestock Science is responsible for the implementation of the program for in-situ conservation of animal genetic resources since 2008. Researchers of this department participate at national and international projects related of genetic characterization and conservation of AnGR.

### Requirements for further enhancement of capacities

Since the Plant Gene Bank does not have any permanent employees, it is very important to define its unclear position at the moment and to further support it through the budget. Currently, all activities in the gene bank are executed on a purely voluntary basis.

Establishing the system of stable financing of the gene bank.

Enhancing human and technical capacities for implementation of program in-situ conservation and gene bank of AnGR, as well as budget allowance for these activities and for conservation of AnGR.
### Institution

<table>
<thead>
<tr>
<th>Contact details</th>
<th>“13. Jul-Plantaze” Podgorica</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.plantaze.com">http://www.plantaze.com</a></td>
</tr>
</tbody>
</table>

### Role in agrobiodiversity protection

- Inventory, locate and mark with GPS, photographing and collecting samples for analysis.
- Characterization and identification of grapevine genetic resources.
- Regenerations – propagation of selected genotypes (vegetative propagation of material - grafting).
- Realization of international projects and actions in order to identify autochthonous and other grapevine varieties.
- Contribution to a more complete valorization of the genetic resources of the viticulture sector in Montenegro and thus the strengthening of the diversity of the viticulture sector in Europe.

### Capacity assessment (human and infrastructure)

- Company has around 750 employees. Within the company are employed: 4 PhDs, 14 MSc, 148 graduates, 20 higher school diploma, 16 highly skilled workers, 252 high school diploma, 85 skilled workers, 81 semi-skilled workers, 130 low-skilled workers.
- Company has highly qualified and trained staff for ampelographic and amperometric research. They are also trained for molecular testing.
- Department for development has apparatuses for measurements of basic parameters and it possess all necessary equipment for experimental grape processing in small quantities for scientific and research purposes.
- Company has its own nursery production and the possibility of vegetative multiplication of its autochthonous material and preserving and protecting grapevine genetic resources.

### Important specific actions undertaken by the institution

- Participation in SEEDnet project: “Identification, characterisation and conservation of old and autochthonous vine varieties in Eastern European countries” (2009-2010)
- Participation in SEE.ERA.NET project “Preservation and establishment of true-to-type and virus-free material of endangered grapevine cultivars in Croatia and Montenegro” ERA 91/04 (2010-2012).
- Participation in ECPGR group “Increasing the efficiency of conservation of wild grapevine genetic resources in Europe” – InWiGrape project (2016).

### Requirements for further enhancement of capacities

- Procurement of equipment for analysis of genetic material at the molecular level and procurement of equipment for tissue culture.
- Also, it would be of great importance to improve equipment for ampelographic research: Program and computer equipment for amperometric measurements, digital Camera Magnifier, etc.

### List of NGOs, CSOs, Farmers Organizations

1. NGO: Green home Podgorica
2. NGO: Centre for Development of agriculture "Bijelo Polje"
3. NGO: Network for Rural Development of Montenegro, Niksic
# ANNEX 4a

## LIST OF NATIONAL COLLECTIONS - PLANTS

<table>
<thead>
<tr>
<th>National/entity collection</th>
<th>Conservation status</th>
<th>CROPS</th>
<th>ex-situ</th>
<th>in-situ</th>
<th>approximate % of the total crop samples</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No of samples</td>
<td>Completely documented</td>
<td>Characterized</td>
<td>Evaluated</td>
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<td><strong>CEREALS and Maize</strong></td>
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<td></td>
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<td><strong>FRUIT CROPS</strong></td>
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<td>Pomegranate</td>
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<td><strong>MEDICINAL AND AROMATIC PLANTS</strong></td>
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</table>
## ANNEX 4b

### LIST OF NATIONAL COLLECTIONS - ANIMAL

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

<table>
<thead>
<tr>
<th>Animal</th>
<th>Current Total</th>
<th>At Risk</th>
<th>Widely used</th>
<th>Lost (last 20 years)</th>
<th>At population level</th>
<th>At individual level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>I</td>
<td>L</td>
<td>I</td>
<td>L</td>
<td>I</td>
</tr>
<tr>
<td>Cattle</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Buffalo</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Sheep</td>
<td>4</td>
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<td>Goats</td>
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<td>Donkeys</td>
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<tr>
<td>Honey bees</td>
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<td>1</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- 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-vivo).
- 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.

6 Performance recording organized temporarily only for the purpose of conducting research.
7 Local goat breed is Domestic Balkan goat with more varieties, while the red variety is considered to be the typical Montenegrin.
8 Local chicken population was not researched enough. So far identified population of domestic hen and Kosovki pjevac.
ANNEX 5

LIST OF NATIONAL LAWS

List of national laws (including sanitary/phyto-sanitary/veterinary/origin of product/protection of product regulation)

• The Montenegrin Constitution (Official gazette No. 1/2007 and 38/2013),
• The Low of Nature Protection (Official gazette of Montenegro No. 51/2008).
• Law on the Seed Material of Agricultural plants, (Official Gazettes No. 28/06, 73/10 and 61/11).
• Law on the Plant Varieties Protection (Official gazette No. 48/07, 48/08, 73/10 i 40/11).
• Law on Origin Labels, Geographical Indications and Labels guaranteed traditional specialties of agricultural and food products (Official gazette 18/2011).
• The Act on Olive Oil Olive Oil (Official gazette No. 45/2014).
• Organic Agriculture Act (Official gazette No. 56/2013).
• Law on Identification and Registration of Animals (Official gazette 48/2015, 48/07).

List of national strategic and program documents:

• Strategy of Agriculture and Rural Development (2007-2013) and the National Program of Agriculture and rural development (2008-2013).
• The Strategy of Sustainable Development of Montenegro until 2030, adopted 2016.
• The Strategy of Biodiversity of Montenegro with the Action plan (2010-2015).

List of international agreements/conventions:

• The UN Convention on Biological Diversity Montenegro ratified in June 2006.
• Member of Food and Agriculture Organization of the United Nations (FAO) in 2008.
• European Cooperative Programme for Plant Genetic Resources (ECPGR) in 2009.
• An European Gene Bank Integrated System (AEGIS) in 2010.
• The International Treaty on Plant Genetic Resources (ITPGRFA) Montenegro signed in 2010.
• Member state of ERFP (European regional focal point for AnGR) and EFABIS data base in 2008.
• EUGENA - Memorandum of understanding with ERFP in 2017, together with EUGENA Agreement.

Review of past policies, strategies, programs and management practices – their implications for plant and animal genetic resources.

ANNEX 6
ACTIVITIES FOR RAISING PUBLIC AWARENESS

Activities done in 2007

- Preparation of “National Program of Conservation and Sustainable Use of the Genetic Resources in Agriculture (2008-2013)”.  
- Brochure “Sustainable Development”, containing the chapter: “Biodiversity Protection and Organic Production in Function of Agricultural Development”.  
- Pamphlet calling for farmers to inform or to provide information (material) on autochthonous varieties in their possession (distributed during the Agricultural Fair).  
- Participation in the manifestation “Kostaniada” in honor of chestnut (*Castanea sativa*) held in October in Stoliv, Boka Kotorska.  
- Participation in the manifestation “Days of Blueberries”, held in August in Plav.  
- Participation in the manifestation “Days of Wine and Fish”, held in December on Lake Skadar  
- Participation in the manifestation “Maslinijada” for promotion of olive and olive oil held in December in old city of Bar.  
- Guesting in the media and meetings of farmers in Berane and Bijelo Polje.  
- Published monograph: Porcu, K., Markovic, B. (2006): Catalog of West Balkan Pramanka Sheep Breed Types.

Activities done in 2008

- Preparation of “Action plan for conservation of the genetic resources in agriculture (2009-2013)”.  
- Mutual expeditions with new members from different faculties and NGOs  
- Brochure “PGR of Montenegro - Medicinal and Aromatic Plants”  
- Distribution of the brochure to stakeholders and farmers.  
- Participation in the manifestation “Kostaniada” in honor of chestnut (*Castanea sativa*) held in October in Stoliv, Boka Kotorska.  
- Participation in the manifestation “Days of Blueberries”, held in August in Plav.  
- Participation in the manifestation “Days of Wine and Fish”, held in December on Lake Skadar.  
- Participation in the manifestation “Maslinijada” for promotion of olive and olive oil held in December in old city of Bar.  
- Participation in the workshop on “Kartagena Protocol” organised by FAO in December.

Activities done in 2009

- Publishing two booklets on the “National Program of Conservation and Sustainable Use of the Genetic Resources in Agriculture” and “Action Plan for Conservation of the Genetic Resources in Agriculture” and distribution to stakeholders and farmers.  
- Participation in the manifestation “Kostaniada” in honor of chestnut (*Castanea sativa*) held in October in Stoliv, Boka Kotorska.
Activities done in 2010
- The modules “Plant genetic resources” and “Animal genetic resources” were introduced as elective subjects at the curricula of Biotechnical Faculty (Bachelor study programs).

Activities done in 2012

Publishing the monographs

Publishing the chapter in international monograph

Activities done in 2014

Publishing the monograph


Activities done in 2016

Publishing the chapter in international monograph

• Montenegrin Academy of Science and Art- organized forums and round table (three) abot genetic resources in agriculture, their significance and need for conservation.