MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT OF THE REPUBLIC OF SRSPKA

THE PROGRAM FOR CONSERVATION OF PLANT GENETIC RESOURCES OF THE REPUBLIC OF SRPSKA

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PREAMBLE

When we refer to genetic resources, first of all, we have in mind resources that are used for food and agriculture. They require permanent conservation, maintenance and reproduction in order to ensure diversity in providing food and access to farmers, selectors and researchers.

Nowadays, in the light of current issues, genetic resources have an important role. Global warming and climate changes are major problems at the moment. In terms of that a new challenge that mankind is facing is to create enhanced varieties that will be resistant to adverse environmental conditions - high temperatures, droughts, etc. while aiming at providing sufficient amounts of good quality food. Gene banks, as institutions that conduct conservation of genetic resources, offer a part of the solution through conservation of a great deal of various plants' traits in their collections. Besides the threats that global warming poses, the ones caused by genetic erosion are being emphasized more and more. The loss of diversity poses a serious threat to the whole mankind because it is a foundation of agricultural production that directly sustains lives of millions of people.

By adopting this Program that defines conservation and sustainable use of plant genetic resources, the Republic of Srpska is to date a unique example in the region when it comes to legal framework pertaining to activities related to genetic resources. This program represents crown result of the resumed activities on plant genetic resources. Moreover, by institutionalizing the Genetic Resources Institute at the University of Banja Luka along with the Republic Plant Gene Bank and Botanical garden, it can directly respond to challenges of the future.

A Plant Genetic Resources Committee has been founded within the Program and it is to propose short-term and long-term plans of action and initiate building up of legal regulations.

This Program provides a starting point for scientific research in this field, which has not been conducted systematically so far.

The second world report of the UN Food and Agriculture Organization (UN FAO), published in 2009, refers to an increasing number of preserved accessions, more programs adopted in the countries and more gene banks that have been established, to which the Republic Gene bank has also contributed with its collections and with this document too.

Having adopted the Program, the Republic of Srpska met one of the world imperative requirements - conservation of plant biodiversity, as well as fulfilled a moral obligation towards generations to come.

In the near future, the Program has to yield results in systematization of acquired knowledge and skills making them available to the world public.

Banja Luka, 2009

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1. INTRODUCTION

Plant genetic resources in agriculture include: local populations, genotypes, old and new varieties of: cereals, fodder and industrial plants, vegetables, medicinal, aromatic and horticultural plants, fruits and vitis as well as plant breeding material having real or potential value that bears functional inheritance units.

Biological diversity that is diversity among live organisms and diversity within different species as well as between species and ecosystems, is a significant resource for human existence and has a crucial role in sustainable development and rooting out poverty and hunger in the world.

Until today, science has determined the existence of around 1.4 millions of plant and animal species on our planet. Such diversity represents a sustenance foundation for the mankind in terms of food, medicine, and habitat. However, human activities - pollution of environment, urbanization, deforestation, drainage of land and other harm natural habitat of wild species to a great extent thus endangering their survival. On the other hand, mismanagement of agricultural production, forestry and fishing as well as poaching additionally speeds up this destructive process. More than 40% of the land is used for agriculture thus farmers have great responsibility in protection of biological diversity. By using cultivation techniques - technologies such as standardized and controlled use of pesticides, organic cultivation and crop rotation**,** farmers can maintain balance between sustainable development, yield increase and preservation of ecosystems. The UN Food and Agriculture Organization (FAO) estimated that around ¾ of genetic material of cultivated species were lost in the course of the last century. At a global level, plant species are preserved in gene banks and botanical gardens. Nevertheless, conservation of biological diversity at farms and in the natural surroundings, where species can adjust to new conditions while struggling against each other, is another major task.

Diversity of cultivated plant species serves as a starting point for biological diversity in agriculture. However, 90% of animal-origin foods which are being used to sustain world's population are made from only 14 species (mammals and birds) whereas 50% of energy value originating from plant species in human nourishment is made from 4 species: wheat, maize, rice and potato. By expanding food assortment and making it diverse, a great deal would be done to improve the quality of food and sufficient intake of nutritious and protective substances as well as phyto-nutrients which have proved to be important factors in prevention of many diseases in the last few years. By taking care of biological diversity we are taking care of millions of lives, nutrition and medicine, traditional and modern pharmacology.

The value and significance of plant genetic resources for sustainable production of food and future of the mankind were pointed out at the beginning of twentieth century. That is the time when the first collecting expeditions were organized and conducted by *Nikolai I. Vavilov* and *Harry V. Harlan* aiming to find, conserve and use plant genetic resources for research and plant breeding programs. *Vavilov* had continued collection work throughout '20s and '30s of the 20th century in USSR and in more than 50 countries in Asia, America, northern Africa and Europe. Plant material collected in those expeditions has provided foundation for creating the first germplasm collection. In the early '30s of the 20th century it became evident that traditional varieties and adapted

autochthonous populations started to be replaced by new, improved varieties and already then the first alarm was sent about the need to conserve genetic resources (*Harlan and Martini, 1936).* A systematic approach to germplasm conservation was initiated in Germany in the middle of the 20th century and later in other countries in the Western Europe. Having acknowledged the importance of plant genetic resources (PGR) in ensuring food safety for the world's population, the first *ex situ* collections were promoted by the international organizations in the '70s of the 20th century, especially by the FAO and by the International Board for Plant Genetic Resources (IBGR) as well as by the International Plant Genetic Resources Institute (IPGRI). The latter two are predecessors of today's Bioversity International. During this period international gene banks within the International Agricultural Research Center (IARC) were also established. Nowadays, there are approximately 1500 gene banks or collections of germplasm in the world, which hold around 6 million accessions (FAO, 1998).

2. LEGAL AND POLITICAL FRAMEWORK

Since the world community recognized the existence of property title over genetic resources in 1992, a number of changes ensued. Prior to the adoption of the Convention on biodiversity (CBD – Rio de Janeiro, 1992), plant genetic resources were common heritage of the mankind and exchanged in a completely free fashion. Due to a change following the CBD, the International Undertaking Foundation was founded, as a predecessor of The International Treaty on Plant Genetic Resources for Food and Agriculture – ITPGRA. Having established the ITPGRFA and the CBD, a certain paradigm was set down, especially caused by countries' insistence on their sovereign rights over biological diversity within their territory, as well as by the importance of fair and just distribution of benefit that resulted from the use of plant genetic resources. The CBD also appealed to countries to undertake measures for the efficient preservation of their biological diversity both in *ex situ* and *in situ* conditions.

The first world report on PGR status was prepared by the FAO in 1996. The Global Plan of Action (GPA) for conservation and sustainable use of plant genetic resources in food and agriculture (PGRFA) appeared in 1996 and it especially emphasized four out of its twenty priority activities central to *ex situ* conservation (FAO, 1996). The GPA appealed to the signatory states to apply more rational PGRFA conservation system based on better planning and greater cooperation and coordination of institutions while keeping the countries' sovereign rights over their PGRFA. This plan was to ensure reduction of conservation expenses based on scientific approach and financially sustainable resources. The ITPGRFA that went into effect in June 2004 has created multilateral system of approach and share of benefit in the field of PGRFA. The Article 16 of the Treaty especially underlines the participation and cooperation within the PGRFA networks. A recently established Global Crop Diversity Trust has enabled development of regional networks as well as specific strategies for every species, aiming at more efficient organization of *ex situ* conservation.

In regards with the aforementioned, several regional and sub-regional networks have been initiated across the world. They have aimed to promote greater distribution of responsibilities regarding conservation of PGR through development of joint activities that are to help reduce duplication and collection maintenance expenses as well as to improve the quality of conservation and to promote a rational conservation system at the regional level. In Europe (including Caucasus countries, Israel, Russian Federation and Turkey), the European Cooperative Programme for Plant Genetic Resources (ECPGR) has been promoted as a basis for cooperation in the field of PGR. This program has enabled better integration of the existing institutions involved in conservation and use of PGRFA.

In accordance with the CBD, every country's responsibility is to provide rational conservation and sustainable use of plant genetic resources. These competences and responsibilities are usually transferred onto the gene banks and are being carried out through national programs which include cooperation with other public institutions and other relevant partners in the country. National gene banks are often leading institutions for establishing wide-ranging national PGRFA programs, most often by responding to the need of linking conservation and communities using specific plant species. Almost all European countries have national PGRFA programs (IPGRI, 2006). National programs

and regional networks have been regarded as a suitable platform for implementation of the adequate international treaties such as GPA, ITPGRFA or particular CBD goals.

2.1. International Regulations

The fundamental international legal and political framework concerning agriculture is contained within the FAO. The following are central to plant genetic resources, namely The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) as well as FAO Global Plan of Action for conservation and sustainable use of plant genetic resources for food and agriculture (GPA). The inter-governmental Commission for plant genetic resources for food and agriculture was established at the FAO conference held in 1983. Right now, global system for conservation and use of plant genetic resources includes international agreements, technical mechanisms and global instruments at various degrees of development. Global Plan of Action is in line with Convention on Biological Diversity and Agenda 21.

The International Treaty on Plant Genetic Resources for Food and Agriculture which was adopted at the FAO conference in November 2001 by the means of Resolution 3/2001 is also worth a mention. This legal treaty encompasses all relevant plant genetic resources central to agriculture.

The following international provisions are relevant within the legal and political framework:

- FAO and CBD work programs on agro-biodiversity;
- FAO Guidelines on sustainable agriculture;
- The International Plant Protection Convention, Rome, 1951 (IPPC);
- Directive on Habitats – EU Council Directive 92/43/EEC of 21 May 1992 on conservation of natural habitats and wild flora and fauna;
- Agenda 21, 1992 (chapters 14 and 15);
- Convention on wetlands of international relevance, especially as habitats of marsh birds, Ramsar 1971;
- Convention on establishing the European and Mediterranean Plant Protection Organization (EPPO);
- Bern Convention, 1979, Convention on the Conservation of European Wildlife and Natural Habitats;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1976;
- WTO Agreement on Agriculture;
- The International Union for the Protection of New Varieties of Plants (UPOV)
- Contract on membership in The International Seed Testing Association (ISTA);
- The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)
- The World Intellectual Property Organization (WIPO)
- Cartagena Protocol.

The International Union for the Protection of New Varieties of Plants (UPOV) signed in Paris in 1961 represents the International Union for Protection of New Varieties of Plants with the seat in Geneva. UPOV's task is to provide and promote an effective

system of plant variety protection with the aim of encouraging development of new varieties of plants. The system offers protection to a plant variety breeder by the means of "plant breeder rights" if a variety meets requirements set out in the Convention. The convention provides *sui generis* kind of protection.

The Convention on Biological Diversity (UN CBD) adopted in Rio de Janeiro in 1992 went into effect on 29 December 1993. The Convention's main goals, which should be carried out in line with its relevant provisions, are as follows: conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from genetic resources thus enabling adequate access to genetic resources as well as the transfer of appropriate technologies taking into consideration all rights over these resources and technologies as well as adequate modes of funding.

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) – Marrakesh 1994/5, is an agreement on intellectual property rights' trade. It is administered by the World Trade Organization (WTO) and it sets down minimum standards for many forms of intellectual property. It is binding to all WTO members. The intellectual property right is the exclusive right of the author assigned to him for a definite period of time with the aim to receive support funds and funds for further research.

The Cartagena Protocol – Montreal 2001/2 refers to biosafety issues set down in the Convention on biological Diversity (CBD). The Protocol seeks to protect people's health and environment from the potential risks as a result of modern biotechnology.

WIPO– Geneva 2002 is the World Intellectual Property Organization. It demands origin certificate whereby the origin of material is confirmed. It looks into the ways to protect intellectual property and traditional knowledge as well as new ways of protection.

2.1.1. Agricultural Policy of the European Union

The Rome Agreement in 1958 established the foundations and general goals of the common agricultural policy of the European Community. The actual mechanisms of action were set down by six members of the European Union in 1960 through particular subventions and programs (European Community's Agricultural Policy – CAP). To carry out its goals and common agricultural policy, the European Union has set up a system of regulations by the means of funds in line with legislation. Two funds are significant: the European Agricultural Guidance Guarantee Fund EAGGF and the European Agricultural Fund for Rural Development EAFRD.

Within the Common agricultural policy and the aforementioned funds genetic resources have been dealt with using a number of regulations and directives of the Council. The key regulations are as follows:

- Council Regulation (EC) No *1290/2005* on financing of the common agricultural policy;
- Council Regulation **(**EC**)** No *1257/1999* on support for rural development;
- Council Regulation **(**EEC**)** No *2078/92* on agricultural production methods compatible with the requirements of the protection of the environment;
- Council Regulation **(**EEC**)** No *2081/92* on the protection of geographical indications and designations of origin for agricultural products and foodstuffs;

- Council Regulation **(**EEC**)** No *2082/92* on certificates of specific characteristics for agricultural products and foodstuffs;
- Council Regulation **(**EC**)** No *1467/94* on the conservation, characterization, collection and utilization of genetic resources in agriculture and
- Directive *98/44/EC* on the legal protection of biotechnological inventions.

The European Union legislation concerning seed and varieties protection is also very significant for plant genetic resources. The key regulations are as follows:

- Council Regulations **(**EC**)** No *1239/95, 1238/95, 1768/95* on variety breeder's rights;
- Council Regulation **(**EC**)** No *2100/94* on Community plant variety rights;
- Council Directive *98/95/EC* on the marketing of seeds of genetic resources;
- Directives *66/400/EC, 66/401/EC, 66/402/EC, 66/403/EC, 69/208/EC, 70/458/EC* and *70/457EC* on marketing seeds for specific plant species;
- Council Directive *2002/53/EC* on the common catalogue of varieties of agricultural plant species;
- Council Directive *92/33/EEC* on the marketing of vegetable propagating and planting material;
- Council Directive *68/193/EEC* on the marketing of material for the vegetative propagation of the vine;
- Council Directive *92/34/EEC* on the marketing of fruit plant propagating material and fruit plants intended for fruit production and
- Council Directive *1998/56/EC* on the marketing of propagating material of ornamental plants.

2.1.2. The European Union Nature Preservation Policy

The Habitats Directive – the EU Council directive *92/53/EEC* of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora is a cornerstone document of the European Union for protecting natural and genetic resources. The Directive offers main guidelines for protection of biological diversity. These guidelines aim to contribute to protection of biological diversity through conservation of natural habitats and wild fauna and flora in the European territory of member states that the agreement refers to.

Measures undertaken in accordance with these guidelines should be aiming at conservation and establishment of favorable situation regarding protection of habitats and wild plant and animal species which are of interest to the community.

Measures undertaken in accordance with this guideline shall also take into consideration the economic, social and cultural needs, both regional and local characteristics.

The directive deals with conservation of natural habitats and environment as well as protection of species.

2.1.3. The European Union Research Policy

An independent research policy supported by relevant funding and budget has existed in the member states of the European Union since 1993. Seventh Research

Framework Program FP 7 adopted in 2006, among other things, represents an important financial source for plant genetic resources research. The framework program has been operational since January 2007 and is to last until the end of 2013.

Also, another important program is the European Cooperative Program for Plant Genetic Resources (ECPGR) where member states conduct technical cooperation in long-term conservation and use of genetic resources.

2.2. Regulations in the Republic of Srpska and BiH

A constitutional basis for setting out the Program for conservation of plant genetic resources of the Republic of Srpska is contained in the Article 64 of the Constitution of the Republic of Srpska wherein " the Republic protects and supports: rational use of natural resources with the aim to protect and improve the quality of life and to protect and restore environment for the general benefit…" as well as in the Amendment XXXII, which replaced the Article 68 of the Constitution, wherein "the Republic defines and ensures: … 8) main objectives and directions of economic, scientific, technological, demographic and social development, agriculture and village development, use of facilities, policies and measures for directing development and goods reserves;… 13) protection of environment;".

Having in mind the constitutional organization of the Republic of Srpska and BiH as well as definitions contained in the CBD and the ITPGRFA, the ownership over all natural resources in BiH belongs to entities, and this includes plant genetic resources.

2.2.1. Legal Regulations in Agriculture

Having adopted *Strategy for Agricultural Development until 2015* the Republic of Srpska has clearly defined the long-term agricultural policy with its main objectives and principles. The Republic of Srpska has based its agricultural policy on international experiences, primarily those coming from EU countries as well as those ones that have been going through transition process and adjusting their agricultural policy with the EU standards. What should be taken into consideration, at this phase of development, is that not all the solutions that correspond to EU agricultural policy can be applied. Namely, the Republic of Srpska has to intensify support to its agricultural development, increase overall production and competitiveness, modify structure and improve quality so it would be prepared well to apply international standards successfully. In terms of that, strategy of agricultural development of the Republic of Srpska does not strictly determines policy principles concerning conservation and sustainable use of plant genetic resources but the need to develop sustainable agricultural production has been underlined, by the means of introducing and developing integral and organic production with the aim to protect people's health and environment.

The Law on Agriculture of The Republic of Srpska deals with objectives and measures of agricultural policy, beneficiaries, family farms, and institutional support to agriculture, running registries, monitoring and reporting in agriculture, and administrative and inspection supervision. In order to meet economic, land, ecological and social

conditions that agriculture is concerned with as well as to carry out sustainable development, agricultural policy objectives in the Republic of Srpska, inter alia, include rational use and conservation of natural resources, protection of environment and reinforcing integral and organic agriculture.

Measures of structural policy include support to: a) regions with more difficult conditions for agricultural development, b) agricultural development that shall not affect the environment and ensuring conservation of biodiversity, c) farming investments, d) professional agricultural training, e) young farmers, f) regional agricultural development, additional farming activities, g) farmers' associations, h) anti-hale protection system and other crop protection measures.

Support to agricultural development that shall not pollute and adversely affect the environment and that shall ensure conservation of biodiversity is intended for: a) stimulating integral and organic breeding that takes into account conservation of natural resources such as agricultural land and water and the environment in general, b) preservation of the environment in endangered areas and prevention of creation of infertile, untilled and unmaintained farming land and c) conservation of biodiversity in ecological systems.

Apart from this Law, relevant regulations that are related to the genetic resources field also include the Law on Seeds and Seed Material (*"The Official Gazette of The Republic of Srpska", number: 13/97*) and the Law on Seeds and Seed Material of Agricultural Crops of BiH (*"The Official Gazette of BiH", number: 03/05*) as well as the Law on Protection of New Crop Varieties of BiH (*"The Official Gazette of BiH", number: 46/04*). Except the Republic law, other two laws do not contain the appropriate by-laws.

The Law on Seeds and Seed Material of Agricultural Crops of BiH stipulates conditions for breeding, preparation for agricultural crops' seed and seed material marketing. It stipulates requirements for seed and seed material marketing, determines registration of varieties in the varieties' list, and examination of agricultural crop varieties for descriptive varieties' list as well as conservation of varieties which are to be taken off the varieties' list in gene banks.

Provisions of the *Law on Seeds and Seed Material of The Republic of Srpska* do not apply to the seed and seed material samples that a company and other legal entities, which deal with plant breeding in husbandry, vegetable, fruit and wine growing, buckwheat growing and forestry, breed, duplicate, receive or send to the other entity that deals with plant breeding activities in these fields of work aiming at scientific research and undertaking experiments to the extent of experimental purpose or for gene banks.

The Law on Protection of New Crop Varieties of BiH deals with the procedures of conservation of new crop varieties, acquiring and maintaining plant breeding right. In line with this Law, varieties of all genera and species of plants including hybrids between genera and species can be preserved. Conservation procedure and conservation applications registry as well as a registry are managed by the common commission for recognition of new varieties.

2.2.2. The Environment Protection and Nature Preservation Policy

The policy concerning protection and preservation of nature in BiH lies within the entities' power. In the Republic of Srpska, it is stipulated by the Law on Protection of Nature number: 01-020-572/02 of 29 July 2002. Among other things, this law determines restoration, conservation and sustainable development of plants, landscapes, natural resorts and other natural resources being part of the environment. The main goals of the Law are creating conditions for preservation of nature and sustainable development of nature and environment through restoration, protection, conservation and sustainable use of ecological balance in nature as well as reducing the use, overload and pollution of the species (animals, plants, fungi).

Preservation of species from the Red book is being done by the means of declaring the protected areas and including them into the "Protected areas of Europe". The Law on Protection of Nature does not contain the provisions on conservation of genetic resources.

Amendments and additions to this Law enabled a unique IUCN methodology to be defined for the whole of the Republic of Srpska. BiH joined the Convention on Biological Diversity on 26 August 2002 but has not ratified it yet.

BiH implemented the project aiming at preparing the document "*National Strategy and Plan of Action for protection of biological and landscape diversity of BiH*" with the plan of action for conservation of biological and landscape diversity (2008-2015) in line with the Article 6a of the Convention of Biological Diversity. The Strategy is based on the biological and landscape diversity study titled "Bosnia and Herzegovina – A Country of Diversity", which at the same time represents the First national report concerning the Convention. The project realization has started in January 2006 by the Ministry of Urban Planning and Environment of FBiH and continued afterwards by the Ministry of Environment and Tourism of FBiH. In addition, the project has defined that a high degree of gene and genetic resources diversity exist in BiH and they deserve more attention of BiH society than they do get currently. Prominent traditional biotechnologies should be used to develop the country and thus preserve knowledge and skills as well as the autochthonous gene-fund of BiH.

3. PREVIOUS WORK ON THE CONSERVATON OF PLANT GENETIC RESOURCES

The establishing of a Plant gene bank of Yugoslavia as a federal institution was planned during the eighties of the last century, within the Strategy of Technological Development of Yugoslavia. All BiH institutions also took part in that project. The following activities have been planned within the project: inventorying, collecting, identification, duplication, characterization and establishing of the Plant gene bank. Prior to the war (1992-1995), inventorying and collecting activities were mainly done as well as design of passport descriptors, which at the beginning of 1992 either remained with the head coordinator or were kept in the institutions that participated in the project. A number of documents were destroyed during the war. After the war (1995) new organization of BiH was established with two entities thus PGR activities were organized in a different way. At the beginning of this century, in the area of Southeastern Europe as well as at the territory of BiH, activities aiming at conservation and sustainable use of plant genetic resources, in accordance with CBD, FAO, GPA and ITPGRFA, were restored with the help of SIDA - Swedish Organization for technical support to developing countries.

In line with the aforementioned, conservation and sustainable use of genetic resources of agricultural and horticultural plants was initiated in BiH with the financial support of SIDA. This initiative will have been realized through a ten-year regional project of the SEEDNet "The Southeastern Europe Developing Network for Plant Genetic Resources".

The Ministry of Foreign Trade and Economic Relations of BiH accepted realization of the SEEDNet project (2004) with the agreement of the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska and the Ministry of Agriculture, Water Management and Forestry of FBiH. After that, agreements on financing of the first phase of the SEEDNet project (2004-2007) were signed between the Swedish Biodiversity Center (CBM) as the institution appointed for implementation and project coordination by SIDA and both entities' ministries. The Ministry of Agriculture, Forestry and Water Management of RS has transferred all the responsibilities regarding implementation and reporting on project to the Faculty of Agriculture in Banja Luka in accordance with the requirements of the financer. Namely, the project was to be implemented by professional and non-profitable institution with competent personnel. Due to this, signatory party of the second phase of the SEEDNet project (2008-2010) is the said faculty.

One of the main activities of the SEEDNet project is to establish national programs for conservation of plant genetic resources. Since 2005 the Government of the Republic of Srpska has allocated funds for maintenance of plant genetic resources as well as those to support project activities and to set out the Program for conservation of plant genetic resources of the Republic of Srpska (Program). The Program draft became an item of the agenda of the National Assembly of the Republic of Srpska in 2006. Based on the decision of the Ministry of Agriculture, Forestry and Water Management number 01-33-950-07 of 16 February 2007, a working group for drafting of the Program for conservation of plant genetic resources of the Republic of Srpska was formed.

In the course of the past activities of the SEEDNet project, a special organizational unit was founded at the Faculty of Agriculture - Center for genetic

resources of agricultural and horticultural plants, which also includes the Gene bank of the Republic of Srpska and biodiversity laboratory (founded and entirely equipped due to the SEEDNet project). Besides, construction of the Botanical garden is under way, being co-financed by the City of Banja Luka. It is located within the University compound named University town. (At this stage the Center for genetic resources of agricultural and horticultural plants is being re-registered as the Genetic Resources Institute, as a special organizational unit of the Faculty of Agriculture at the University of Banja Luka.) National working groups have also been established for six groups of agricultural crops: maize and cereals, fodder plants, fruit and vitis, vegetables, medicinal and aromatic plants and industrial plants.

By adopting the Program of the Republic of Srpska, legal framework is provided for further unhindered performance of all activities concerning conservation and sustainable use of plant genetic resources: inventorying and collecting; regeneration; *ex situ, in situ*/on farm conservation; documenting and information; increasing public awareness; evaluation. Institutionalizing all SEEDNet project activities i.e. the established and enabled capacities, through draft and implementation of the Program, durability and sustainability of the system is provided as well as linking these with other institutions in the Republic of Srpska, BiH and the region.

4. THE CURRENT SITUATION OF PLANT GENETIC RESOURCES IN THE REPUBLIC OF SRPSKA

The Republic of Srpska disposes with total of 25 053 km^2 of land. Out of the total territory of RS, 52% is agricultural land (0.93 ha per capita). Agricultural land share decreases in the land total from the north towards the south mainly due to the increasing degree of forests and less deep soil surface as well as decrease of tilled land in the agricultural land total. Tilled land covers 908 521 ha. The biggest tilled area is in Krajina region (390 947 ha), and the smallest is in Romanija region (38 457 ha).

Cereals, fodder plants, fruits and vitis, vegetables, oil plants, industrial plants and medicinal and aromatic plants represent significant part of the natural heritage that is biological diversity of the Republic of Srpska. Collecting and conservation as well as their use have been evident for centuries but in the manner specific to breeding conditions and use. The listed species contribute to livelihood, local market economy but also to cultural heritage especially in the poor rural communities.

4.1. Maize and Cereals

4.1.1. Maize

Maize originates from the South and Middle America therefore it does not have any wild relatives in Europe. Since the beginning of growing maize in our regions, depending on agro-climatic conditions of various localities, a number of maize ecotypes have been created with their specifics (grain color, cob shape, protein or starch content, etc.) thus their genetic variability is made distinctive. Through intensified use of maize hybrids since the middle of the last century, a great deal of ecotypes were stopped being grown, especially in the low lands. Some ecotypes have still remained in higher altitude areas where there are no conditions for successful growing of maize hybrids. No assessments have been made regarding the number of ecotypes that are still being grown in these areas in comparison to the pre-war situation. A number of maize ecotypes from our areas were collected prior to the last war and have been stored at the gene bank within the Maize Institute in Zemun.

In comparison to other cereals, maize covers the largest area in the Republic of Srpska, namely in the last three years maize was grown on around 140 000 ha, according to the data from the Statistics Institute of the Republic of Srpska. In the area of the Republic of Srpska, FAO medium early and medium late groups of hybrids are mainly represented.

Traditional nutrition in the Republic of Srpska includes many products based on the native maize populations. Native maize populations have been preserved in the areas where people did not migrate due to the war and they are interesting because their traits are higher moisture loss rate, great quality and short vegetation period. In our area, white, red and yellow flint maize populations can be found.

Nowadays, maize ecotypes that have been found are being duplicated; they undergo characterization and evaluation at the Agricultural Institute of the Republic of

Srpska and a part of the seeds of these maize ecotypes is stored at the Gene Bank within the Faculty of Agriculture in Banja Luka.

4.1.2. Cereals

Cereals have been grown in the Balkans and the whole Europe since the start of agricultural development. Most cereals originate from Europe, Asia and northeastern Africa thus it may be concluded that their wild relatives or forms exist even today. Over the time old varieties have been replaced by new, more productive and better quality varieties. To preserve some positive traits such as resistance to diseases, low temperatures, etc. which may be transferred by crossing, but also to preserve biological diversity, it is indispensable to conserve old varieties at gene banks.

In the Republic of Srpska, part of the old varieties of cereals may still be found in the higher altitude areas, which was ascertained by an expedition within the SEEDNet project when they found around dozen of old varieties of cereals in the area of Vlasic. Some varieties/ecotypes are grown for production of bread which has characteristic taste (wholemeal bread) and some for technical use (rye - mulch and production of saddles).

A nearly extinct, semi-wild two-rowed wheat *Triticum spelta* (Spelt wheat) was found in this area. A great deal of old varieties/ecotypes of cereals have been conserved and duplicated at the Agricultural Institute of the Republic of Srpska in Banja Luka whereas seeds of the newly-collected varieties are kept at the Gene Bank within the Faculty of Agriculture in Banja Luka.

Wheat is a strategic product of every country and by rule the most developed countries have substantial wheat production. Year in year out land sown with wheat in our Republic tends to decrease. Around 50 000 ha was sown in 2006. Both domestic varieties and those from the surrounding countries are being grown. Local populations can be found on the farms owned by people who have not left their properties, mainly in the mountainous areas of the Republic of Srpska. The main characteristics of these populations are high stalk, low lodging resistance, small grain, etc and to evaluate other traits collected material needs to be characterized.

Rye is one of the bread cereals sought after by mill-baking industry (for special kinds of bread) as well as an addition to forage. Local populations are mostly grown because there is neither variety seed produced here nor in the surrounding regions. Local populations can be found on the farms owned by people who have not left their properties, mainly in the mountainous areas of the Republic of Srpska. The main characteristics of these populations are high stalk, small grain, etc.

Growing *barley* in the Republic of Srpska is mainly conditioned by high soil acidity hence total barley land is relatively small: it ranges around 2 000 ha according to the Statistics Institute of the Republic of Srpska. Local varieties and those from the surrounding countries are being grown (two-rowed, six-rowed, intermediary, winter, spring, beer, and forage). Local populations can be found on the farms owned by people who have not left their properties, mainly in the mountainous areas of the Republic of Srpska. The main characteristics of these populations are high stalk, low lodging resistance, small grain, and to evaluate other traits collected material needs to be characterized.

As an acidophil crop, *oat* is suitable for growing in acid soils which prevail in the Republic of Srpska. Local populations and variety seeds are grown here. Variety seeds are produced here and in the surrounding countries. Varieties from Serbia and Croatia are present. Local populations can be found on the farms owned by people who have not left their properties, mainly in the mountainous areas of the Republic of Srpska. The main characteristics of these populations are high stalk, small grain, lower yield etc.

Area covered with triticale has been increasing year in year out. It can withstand soil acidity very well and may be a substitute for barley where it can not be grown due to the said acidity. Although it is primarily used as forage, due to its high yields, triticale is to be used in production of biodiesel in the future and may be grown in the areas where wheat can not successfully grow. We have local varieties, varieties from Europe, Serbia and Croatia, mainly hexaploid although there are also octoploid forms.

Buckwheat is a cereal because its grain is being used but it does not belong to the grass family**.** It is grown in the Republic of Srpska, in the mountainous regions, and is used for preparation of traditional food, in pharmaceutical industry, and bee pasture.

4.2. Fodder Plants

In comparison to total agricultural land of the Republic of Srpska (1 298 619 ha), natural meadows and pastures cover substantial area (622 655 ha, 48%) and represent significant natural habitats of biological diversity. More than half of meadow areas and nearly 2/3 of pasture areas are situated in the mountainous regions of the Republic of Srpska. More meadow and pasture areas as well as better quality of grass and hay in these regions as compared to the low lands are the key factors which make producers turn to livestock breeding. A lot of natural pastures are practically being used for organic production of meat (sheep farming) but the said production is marked by quite a lack of organization. Insufficient breeding of forage crops on the ploughed land, degraded pastures on eroded land, long winters, lack of state subventions, overall poverty as well as insufficient education are some of the reasons why nomadism with all its negative consequences has still been preserved in some of the areas of the Republic of Srpska (sheep shepherds in Manjaca, Vlasic). Rotational grazing pastures, sowing quality grass, introducing certification, and higher animal health control, investment in agricultural machines, facilities and slaughter houses are some of the measures which should lead to the improvement of production in this field.

Meadows and pastures in lowlands of the Republic of Srpska are often covered with wild plants and neglected having poor production potential. The conclusion is that vast capacities for production of fodder plants in the Republic of Srpska are being used only symbolically. Moreover, to achieve higher animal production, this field of work should be given more importance at the level of state stimulus policy.

Right now, in the Republic of Srpska there are not any scientific indicators relevant enough in terms of status of research and conservation of biological diversity of fodder plants, neither referring to selection, seeds, trade with labeled seeds, representation of ecotypes, etc. Based on the field research, field trips in a number of expeditions and inspection of the current state of the affairs, it is evident that the Republic of Srpska holds abundant biological diversity of fodder plants, namely wild relatives,

ecotypes and varieties imported from different parts of the world. No inventorying, systematization, description, characterization, chorology, etc, of the present fodder plants has been done therefore it is difficult to talk about the accuracy of any of the data apart from asserting there is an abundance of fodder plants which need to be inventoried and further processed so they could be preserved.

4.3. Fruits and Vitis

The first written records about fruit growing in the Republic of Srpska and BiH reach back to the Ottoman Empire period (*Vitolovic,* 1949), but the first registries and statistics concerning fruit growing were done during Austro-Hungarian Empire, from 1882 to 1896 (*Bubic,* 1977). Apart from apple and pear, plum was an important species. Prunes were a major export product of BiH and Serbia in the 18th century and until the appearance of Californian prune, the one from Serbia and BiH did not have any serious competition at the world market. At the time, a number of varieties from the east and the west were introduced in BiH. They got different local names in different regions. In addition, through spontaneous or planned hybridization and selection these varieties took part in creation of new autochthonous varieties. All of this contributed to the fact that this region, as well as all former Yugoslavia regions, has exceptionally plentiful fruit genetic resources. *Paunovic* and *Micic* (1997) list results of the earlier researches in this region according to which there are 124 registered wild fruit species and their relatives in the region of former Yugoslavia. However, although this region could have been marked as a primary gene center for some fruit species, due to the lack of systematic research in the past it is not practically mentioned in foreign literature as a region of Yugoslavia as a state or as one of the today's countries that have been established when the former state fell apart. What most often can be found in literature, in terms of fruit genetic resources in this region, is specified under the name the Balkans. In *Vavilov's* research and mapping the incidence for particular wild species and their relatives in Europe (1926), the Balkans is also only mentioned when referring to the countries of former Yugoslavia whereas other Balkan countries (Bulgaria, Romania, Greece, Hungary) were treated in detail (*Paunovic*, 1989). *Paunovic* and *Micic* (1997) assert that BiH region can be regarded as a gene center for wild fruit species and their relatives belonging to a number of genera: *Malus, Pyrus, Chaenomeles, Sorbus, Crategus, Mespilus, Eriobotrya, Prunus, Amygdalus, Juglans, Corylus, Castanea, Cornus, Morus, Sambucus, Fragaria, Ribes, Rubus, Rosa, Ficus, Punica, Zizyphus,* and *Citrus*.

Between the WWI and the WWII, more attention was devoted to improvement of fruit growing in BiH thus a lot of fruit nurseries and a number of agricultural schools were established in which collection orchards with native and newly-introduced varieties were created (*Bubic,* 1997). Nevertheless, after the WWII, these collection orchards did not receive appropriate treatment and mainly did not survive.

In the last decades of the last century, few researches of germplasm were done. During the broader expedition in the Balkans region conducted from 1976 to 1980, native varieties of pear (*Zwet et al,* 1978) were collected. In the area of Serbia, Kosovo and Metohija, Macedonia, Monte Negro and BiH 255 pear accessions have been collected. The material collected in these expeditions is stored in Corvallis and Kearneysville

(*Paunovic*, 1989). In the period from 1983 to 1985 research, collecting and conservation of *Prunus domestica* and *Prunus insititia* was conducted, when a detailed description of 64 accessions of native plums and *Prunus insititia L.* (*trnosljiva*) was also done (*Paunovic et al*, 1985).

The first significant activity similar in kind, after the 1992-1995 war, supported by the respective ministry, was initiated by the Faculty of Agriculture through its participation in realization of the SEEDNet project. A field collection of pome and stone fruit was established within this project. It is to be further expanded with other fruit species but also with their wild relatives. Besides work on national and regional programs concerning preservation of species and wild species accessions, this collection, as a kind of gene bank, will also serve as a material base for selection programs.

Situation is nearly the same in terms of activities regarding wine genetic resources. Wine is especially important for the eastern Herzegovina, a part of the Republic of Srpska where this crop is highly represented in the overall agricultural production. Although there is no collection of vitis varieties, there is interest to establish and locate it in this region which is intended to be done in the period to come.

4.4. Vegetables

Talking about biological diversity of vegetables, it is extremely important to underline a great number of species and vegetable ecotypes that have been created in various geographical and ecological conditions in the Republic of Srpska, from its low land, mountainous and hilly land all the way to the Mediterranean area.

Vegetable species originating from Mediterranean gene center (*Vavilov*, 1933) are as follows: Swiss chard, cabbage, celery, artichoke, leek, lettuce, onion, garlic, asparagus, parsley, parsnip, rhubarb, chicory, black salsify and dill. There are around 5 000 species which are used for food, out of which vegetables amount to around 1 200 species from 78 botanical families. Around 600 species are grown in the world whereas we have been growing around 20 to 30 species.

Vegetable growing in the Republic of Srpska is becoming more crucial. However, there is not any accurate data on actual areas where vegetable is grown. Vegetable growing is characterized by various types of cultivation (field, garden and protected facilities). Cultivation of vegetables mainly suffices for domestic needs and green markets while in a processing industry it partakes to a quite small extent. Namely, only 5 to 6 (less often 10) species are used for that purpose.

In the intensified vegetable cultivation (fields and protected facilities) foreign varieties and hybrids are represented that, having certain properties, meet the requirements of the market and modern cultivation technology. Neither have there been nor are there still any organized plant breeding activities concerning vegetable growing in the Republic of Srpska. That is the main reason why there are foreign varieties and hybrids used for the intensified production. Native varieties or populations or domesticated cultivars of some vegetable species are mainly grown in gardens. These varieties, cultivars or populations are grown by older people because of sentimental reasons or due to their specific traits (disease, low or high temperature resistance).

Some of the examples of old varieties and populations include:

a) *pasulj kukuruzar* (local bean variety) has been grown for more than 100 years and it is grown and planted together with native corn so-called *bjelcic* (*white maize*); it is mainly present in the mountainous areas where traditional growing has been maintained, b) *rastan, rastika* (smooth kale) is specific only to Herzegovina region where it has been grown since the old times, several varieties of this characteristic type of cabbage that has specific organoleptic properties are grown, c) *bijeli luk* (garlic) both spring and autumn is specific for its good preservation properties and d) *crveni luk –trebinjski jabucar* (onion) is specific for its disease resistance and good preservation.

These are only some of the examples of what we need to preserve. Conservation and collection criteria for a great number of vegetable species as an important diversity segment should be based on loss of genetic variability, origin, economic importance and nutritional value.

4.5. Medicinal and Aromatic Plants

Medicinal and aromatic plants represent substantial part of natural biological diversity heritage in the Republic of Srpska. Collection and use of these have been going on for centuries. These species contribute to people's health, local economy and cultural heritage especially in poor rural communities. Their role has become more significant in the last decade with the change in approach since these species have been marginalized in many ways and neglected by researchers. Uncontrolled picking and collecting of medicinal plants in our region, especially after the war, has led to genetic misbalance of populations and genotypes of particular species, even those that have been protected due to regulations. This has resulted in genetic erosion and extinction of many protected and endangered species which belong to medicinal and aromatic plants group. Therefore there is a need for prompt action in order to prevent the loss of particular endangered species as well as traditional knowledge that is still present in rural areas.

The main reasons due to which survival and diversity of medicinal and aromatic plants are endangered in our region are as follows: a) habitat destruction, b) overexploitation, c) changes regarding land use caused by agriculture and forestry activities and d) introduction of foreign, invasive species.

Modern modes of cultivation and processing of medicinal and aromatic plants have only just started. Cultivation has fair chances for success in providing sufficient amounts for local markets as well as for export of final or semi produce.

4.6. Industrial Plants

Growing industrial plants in the Republic of Srpska has been neglected throughout the last twenty years for no justified reason. The then significant processing capacities have been devastated while the new ones have not been developed. It has resulted in present situation when we have insufficient processing capacities, limited selection of varieties, low yields, etc. The current state of the affairs can be clearly depicted by data saying that the most important industrial plants (soybean, tobacco, rape and sunflower) cover approximately 2% average which is around 8 000 ha out of the

overall land sown in spring. The largest area with industrial plants is planted with soybean, around 63% average; tobacco around 18%; rape around 11% and sunflower around 3.7%. In the autumn crops, these plants cover around 1.5% average (all land sown with rape). Land sown with industrial plants in autumn has been increasing for the last few years. Potato is primarily used as a vegetable for both household needs and as forage, but there is a growing interest to produce it as an industrial plant. Area covered with this species ranges from 10 000 to 15 000 ha. We have local populations, landraces, new varieties from Europe and Serbia, mainly known for their important features.

An increase of cultivated land is conditioned with substantial increase of processing capacities.

5. MEASURES FOR PROTECTION OF PLANT GENETIC RESOURCES

The territory of present-day Republic of Srpska, as a part of Bosnia and Herzegovina, has been influenced by different civilizations through history. Over time, a large number of foreign germplasm from the east and the west was introduced in the territory of Bosnia and Herzegovina, while by spontaneous and planned hybridization the introduced germplasm took role in creating new autochthonous varieties. However, in absence of systematic research in the past, although this area could be marked as the primary gene center for some plant species, it is practically not mentioned in foreign literature.

`Taking into account the diversity of agroecological conditions and the impact of different civilizations throughout the history, it can be said that the Republic of Srpska is very rich in agrobiodiversity and can be considered as a gene-center of a number of cultivated species. The research conducted since 2004 prove this because a number of different accessions are found in the small area. Such a rich flora has not been the subject of systematic research and therefore it is necessary to establish a functional system for the sustainable management, of plant genetic resources of the Republic of Srpska. This program, with its recommendations and measures for the protection and conservation of plant genetic resources, is a key document and a basis for establishing and maintaining a functioning system for the sustainable management of plant genetic resources of the Republic of Srpska and connecting this system with the similar ones in the region and all over the world.

5.1. Maize and Cereals

5.1.1. Objectives

In order to promote the use of genetic resources, certain measures will be adopted for more intensive collection of genetic resources of maize and cereals, easier transfer of material, increase of the characterization and primary evaluation, the establishment of databases and the creation and building up and strengthening of gene banks. Training, research and development, information and documentation, consulting and activities related to public relations will be accelerated. The Republic of Srpska will take a more active role at the international level, especially through the work of the European Cooperation Programme for Crop Genetic Resources Networks – ECPGR.

It is necessary to provide support of relevant ministries of the Republic of Srpska Government, scientific, educational and professional institutions to facilitate that long-term conservation of biological diversity of maize and cereals becomes effective for future generations of the Republic of Srpska population.

5.1.1.1. Long-Term Goals

- Achieve long-term conservation of diversity of landraces and old hybrids of maize, then *in situ* and *ex situ* conservation of old varieties of cereals and their wild relatives.
- Strengthen the Gene bank within the Center / Institute for genetic resources, which will be financed by the Republic of Srpska Government for the purpose of long-term conservation of plant genetic material.
- Achieve that diversity of plant resources is useful according to appropriate measures, i.e. according to characterization, evaluation, documentation and separation of breeding potential.
- Contribute to conservation and restoration of ecosystems that are changed due to modern agricultural production, new hybrids introduction and/or introduction of genetically modified plant material.
- Establish transparency regarding the allocation of powers and responsibilities of republic and local authorities, and the deployment of individuals, organizations and institutions involved in conservation and utilization of plant genetic resources.
- Use and promote links that will lead to increased cooperation at the national, interstate and international level.
- Raise public awareness on the necessity of protection of plant genetic resources

5.1.1.2. Short-Term Goals

- Review and inventory of plant genetic resources of maize and cereals.
- Review of existing collections and assessment of genetic diversity of collections.
- Collecting and evaluation of new genotypes of maize and cereals.
- Include the use of molecular techniques for marking.
- Harmonization and finalization of phytosanitary measures and quarantine rules.
- Development of databases for collections with all the key details.
- Finalization of collection description (genotypes), including resistance characteristics chemical characteristics, etc.
- Assessment of purity and authenticity of the species, varieties and wild relatives of cereals, landraces and hybrids of maize.
- Preparation of the reserve collection (genotypes) of particular importance.
- Development of collection databases, which would include all key details, and their integration in the Center/Institute for genetic resources.
- Establishing links with similar centers or gene banks in the region and Europe to exchange data and/or genetic material of maize and cereals.
- Assessment and evaluation of the obtained data to identify collections and samples that have either unique or special importance to conservation in the Republic of Srpska.
- Enhancing public awareness about the importance of conservation of genetic resources through improving education at all levels, training, research and development support; visits to other gene banks.
- Promote on farm management of cereals and maize genotypes.
- Development of supervisory and administrative concepts.
- Collection and *ex situ* conservation of other valuable collections of cereals and maize.

5.1.2. Conservation Measures

FAO estimated that during the last century about 75% of genetic variability of crops had been lost worldwide (gene erosion), and that the loss of wild populations of plants continued rapidly. The risk of loss of plant genetic resources occurs at both levels, both within and between species. Changes in agricultural practices and development of intensive agriculture have posed and still do pose the greatest risk for genetic resources of cultivated plants.

The availability of genetic resources is not only limited by the loss of the material, but also by the loss of knowledge that is often related to individuals and which is not always preserved in written form. This includes knowledge on species, breeding and cultivars, on farm, harvesting, conservation and storage technologies, and also knowledge related to use and processing.

The knowledge on local adapted forms for sustainable use is under special pressure of disappearance. Breeding new selections in order to achieve higher yields and better adaptability to different conditions allows saving only a small part of genetic diversity. Some of the genetic resources that are not in use anymore are stored in *ex situ* gene banks, botanical gardens and other collections.

5.1.2.1. In Situ Conservation

The preservation in nature gives priority to the *in situ* protection and conservation, where species remain exposed to dynamic evolutionary processes of their ecosystems. This allows natural selection and the need to adapt to modified environmental conditions.

5.1.2.2. On Farm Conservation

On farm management provides dynamic conservation and use through the ongoing evolutionary processes. When the modern species are in question, this is in most cases guaranteed by the breeders. In addition to *ex situ* collections, conservation and possible future development of the old types of agricultural and horticultural plants are ensured, inter alia, in the historical agricultural museums under the open sky, the field reserves, the monasteries, private and school gardens providing there is isolating space.

However, in order to run this, it is necessary to institutionally connect farmers/institutions, which would grow and conserve ecotypes and old varieties of maize and cereals. That includes signing of a contract, with owners of households/farmers on one side and on the other with representatives of relevant ministries/institutions, with the definition of mutual rights and obligations for ensuring long-term durability of this form of conservation for these cultures.

5.1.2.3. Ex Situ Conservation

The collection, storage, reproduction, description and documentation of maize and cereals are currently being done at one of the locations of the Agricultural Institute of the

Republic of Srpska in cooperation with the Faculty of Agriculture in Banja Luka, where the newly established gene bank is located. Needs for conservation of genetic diversity of cereals and maize are far from being fulfilled due to the limited capacity of the *ex situ* methods.

Gene bank. Gene bank, as a form for storing plant genetic resources as seed or in vitro, plays a key role for the maintenance of genetic purity of ecotypes, varieties, hybrids of maize and cereals, and other agricultural plant species and their wild relatives for a longer period of time. Gene bank should be linked with other ways of conservation of plant genetic resources, such as *ex situ, in situ* or on farm.

Field collections. For field collections it is necessary to ensure quality soil with high-effective fertility and adequate infrastructure, along with a number of experts and workers to deal with duplication of existing collections and accessions. The funding sources must be of permanent nature, stipulated by laws. The maize must be provided with spatial isolation to avoid mutual crosses of ecotypes or hybrids from other production areas.

Botanical Garden. Storing maize in botanical gardens is not possible due to lack of spatial isolation. Ecotypes and cultivars of cereals can be grown in the botanical gardens because they are generally self-fertilized plants.

5.1.3. Recommendations

- Conduct expeditions in order to inventory and collect ecotypes and old varieties of maize and cereals at the whole territory of the Republic of Srpska.
- Ensure enough sowing areas for regeneration.
- Create a register of maize ecotypes, ecotypes and old varieties of cereals that are still kept in the Republic of Srpska.
- Establish phytosanitary seed storage methods and rules of quarantine.
- Test seeds for pathogens.
- Occasionally perform multiplication and regeneration of the collected accessions.
- Combine *in-situ* and *ex situ* conservation.
- Perform description of collections (genotypes).
- Undertake evaluation using molecular markers.
- Standardize the methods of evaluation.
- Assess the authenticity and purity of maize and cereals ecotypes.
- Prepare and maintain backup duplicate of genotypes of special importance.
- Create a database for collections that would include all key details, publish the same on the website allowing searching for key information.
- Create a database of information obtained through research at the level of molecular genetics.
- Make a contract with institutions in the country, region, Europe and the rest of the world on access to plant genetic resources of maize and cereals (transfer material).
- Support work on selection and cultivation of rare and neglected autochthonous ecotypes of maize and cereals.
- Develop markets for local varieties and promote them in terms of use as a health-wise safe food.

- Raise public awareness and education, and work to improve public relations for the purpose of better understanding of conservation and use of genetic resources of maize and cereals.
- Promote utilization of genetic resources of maize and cereals.

5.2. Fodder Plants

5.2.1. Objectives

It is necessary to conserve the abundant diversity of fodder plants in order to secure them from further erosion, protect ecological balance (environmental protection), for scientific and selection needs as a rich source of genetic variability necessary for the breeders of new cultivars, etc.

5.2.1.1. Short-term goals

- To visit a number of sites in order to make inventory of genetic resources of fodder plants.
- To collect as many accessions as possible
- To precisely enter and record all necessary data.
- To undertake description and store collected samples in the appropriate manner.

5.2.1.2. Long-Term Goals

- Preparation of the collected samples for long-term storage in gene banks.
- Evaluation, description and regeneration of collected accessions.
- Extraction of materials suitable for the purposes of selection or other scientific purposes.
- Exchange of material with similar institutions in the region and the world.

5.2.2. Conservation Measures

Preserving biological diversity of all plant resources should become the national interest through legislation, education, raising awareness about the importance of biological diversity, and all of that should be supported by adequate organization and material assets.

In order to achieve the objectives of preserving diversity of fodder plants following conservation measures are recommended:

5.2.2.1. Ex Situ Conservation

Ex situ conservation of forage plants will be implemented in the prescribed, planned and long-term defined way, according to previously defined rules and documents.

5.2.2.2. In Situ Conservation

In order to maintain the existing diversity of fodder plants *in situ* conservation methods should be fully respected on all aspects (mainly professional and scientific), but also in line with regulations, both national and international.

5.2.2.3. On Farm Conservation

On farm conservation measures are connected with the direct contacts with producers, and usually for maintaining and growing old varieties that are traditional at a certain location. There are often problems with harvests and economic effects therefore economic support to these producers is necessary.

5.2.3. Recommendations

- Inventory of the most important species of fodder plants and wild relatives, ecotypes etc.
- Collecting of accessions, passport processing, description and storage in the prescribed manner.
- Preparation of accessions, equipment and facilities for evaluation and other necessary research.
- Analysis for qualitative and quantitative seed traits.
- Define the minimum possible amount of seeds collected and ways of collecting, where possible.
- Establishment of a stable network of collaborators and farmers in the field in order to continue good cooperation.
- Defining the annual plans of the field sites and locations visits, as well as the number of collected samples.

5.3. Fruit and Vitis

5.3.1. Objectives

5.3.1.1. Long-Term Goals

- To identify, locate, inventory and assess the possible risks and threats to all species, ecotypes, varieties and populations of fruit crops and vitis, especially for those that are expected to be significantly used in the future.
- To provide conditions for development and implementation of various conservation strategies, as well as other actions needed for conservation and sustainable use of genetic resources of fruit crops and vitis.
- To improve and provide better understanding of the importance and impact of existing on farm conservation of fruit crops and vitis.

- To achieve more balanced relationship between *ex situ* and *in situ* conservation.
- To encourage the formation of public or private collections and other institutions as successful carriers of on farm selection and breeding processes.
- To give significant support to the process of preservation of the existing rare and valuable diversity in the existing *ex situ* collections of genetic resources of fruit crops and vitis.
- To develop and strengthen cooperation between national programs and national institutions to assist *ex situ* collections.
- To establish adequate infrastructure necessary for periodic regeneration of certain genotypes.
- To collect species, ecotypes and cultivars which may be under threat or which are already at the brink of their use.

5.3.1.2. Short-Term Goals

- To develop appropriate methods that will allow inventory and preservation of genetic resources of fruit crops and vitis.
- To improve knowledge on dynamics, methodology, effects and potential of on farm conservation.
- To establish and strengthen programs and networks for on farm management of varieties which are in use and genetic resources of wild relatives of fruit crop and vitis.
- To develop and define the role of gene banks, including support, in order to provide material for on farm programs.
- To define and develop a number of local on farm programs based on local knowledge and ways of maintaining, ensuring participation of local institutions in planning, maintenance and evaluation of such programs.
- To develop and strengthen local network that should be connected with the similar ones in Federation of Bosnia and Herzegovina and international systems, including existing *ex situ* FAO network within the FAO global system, in accordance with policies and strategies set by the Commission on genetic resources for food and agriculture.
- To promote access and exchange of information on genetic resources of fruit crops and vitis in accordance with relevant international treaties, including the CBD.
- To provide the necessary material for further multiplication and conditions for its preservation.
- To formulate a strategy, establish coordination mechanisms, identify location for regeneration, complete contracts required for formal cooperation between institutions, improve infrastructure, if necessary, and initiate activities related to the regeneration of the targeted species of fruit crops and vitis.

5.3.2. **Conservation Measures**

5.3.2.1. In Situ Conservation

The preservation in nature gives priority to the *in situ* protection and conservation, where species remain exposed to the dynamic evolutionary processes of their ecosystems.

Key characteristics of the *in situ* conservation are sustainable use of agricultural and forest lands and measures for the environment and nature conservation. This includes conservation of species and biotopes specific to a certain area. The analysis and inventory of existing resources is the first step in conservation and prevention of reduction of biological diversity of fruit crops and vitis. Traditional knowledge and skills are an important component in the process of inventory, and therefore require special attention and registration. Inventory, necessary education and infrastructure are carried out with financial and technical assistance provided by the republican institutions and authorities that are in charge of activities related to plant genetic resources of fruit crops and vitis.

The necessary steps for the implementation of *in situ* conservation of fruit crops and vitis:

- To collect and evaluate existing biological and ecological data, and collect data on the genetic diversity of priority species of fruit crops and vitis;
- To evaluate selected priority species populations;
- To examine the current plan of nature conservation and other conservation plans to determine their appropriateness for the integration of conservation of genetic resources of fruit crops and vitis;
- To create criteria for selection and design of protected areas for *in situ* conservation of fruit crops and vitis that will be approved at the national and international levels;
- To protect species in their typical phyto-sociological role for their natural location, or conditions specific to the species out of protected areas.

5.3.2.2. On Farm Conservation

Unlike the *ex situ* conservation, on farm management provides dynamic conservation and use through the ongoing evolutionary processes. Fruit species preserve greater variability in diversity because of their longer life cycle. In addition to *ex situ* collections, the monastery, private, school and museum gardens can serve for conservation and possible future development of the old type of fruit crops and vitis.

Private initiatives towards preservation of diversity of traditional varieties should be recorded and coordinated within the Program. According to the experiences of some countries, it is possible to include farmers in the preservation of diversity of fruit crops and vitis.

The competent institutions should consider how production, measures for economic development and other measures, as well as advisory services and research institutions can be put into the service of on farm management and promotion of biological diversity of fruit crops and vitis.

The Gene bank and other important institutions have to consider the identification of relevant varieties' genotypes that are necessary to regenerate and multiply for on farm management.

A significant role in on farm conservation should be given to agricultural advisory services that appear as intermediaries between farmers and scientific institutions and it is therefore necessary to conduct their education in this field.

Important place in the on farm is occupied by the producers of planting materials and nurseries. In terms of that it is necessary to make inventory and registries on nurseries

The necessary steps for implementation of on farm conservation of fruit crops and vitis are as follows:

- To make an inventory of fruit crops and vitis on the private lands and collect information on their cultivation and use;
- To create a database on potential partners for on farm conservation of fruit crops and vitis (scientific and research institutions, agricultural producers, nurseries, advisory services, private institutions, museums, academic institutions, NGOs, associations, etc.);
- To carry out socio-economic and socio-cultural research on the use and processing of fruit crops and vitis;
- It is necessary to develop a catalog of criteria for the introduction of suitable species and varieties for on farm conservation and management;
- To promote regional-specific products from specific ecotypes and species;
- To simplify procedures for the exchange of fruit crops and vitis genetic resources in the form of seeds, seedlings and products.

5.3.2.3. Ex Situ Conservation

Gene bank. One of the key approaches for *ex situ* conservation is a gene bank, where seed, tubers and other plant parts are long-term stored. Since the fruit crops are perennial, cross-pollinated plants, they can not be stored in seed collections because they don't have generative propagation. The germplasm of fruit crops and vitis can be saved in the gene bank by applying modern techniques of tissue and organ culture *in vitro* and by applying cryo-conservation. The results of use of cryo-conservation are prevention of germplasm losses due to phytosanitary impact, as well as reduction of efforts for conservation, which include maintenance of a field gene bank.

Field collections. The most common practice for maintenance and conservation of fruit crops and vitis germplasm are field collections and field gene banks. For now, field gene banks are the most suitable method for the conservation of fruit crops and vitis for the following reasons: vegetative propagation of these cultures, maintenance of field collections includes a set of fully developed individuals, which facilitates distribution of scions and materials for reproduction, collections are "live" herbariums that can be used for testing and identification of unknown species and genotypes. In order to protect the field collections (base collections) against negative environmental influences (temperature, precipitation, etc.), and phyto-sanitary impact, it is necessary to form a collection of duplicates at the location that is different from the location of base collection.

The necessary steps for implementing *ex situ* conservation of fruit crops and vitis are:

- To identify and describe the existing collections;
- To locate and eliminate unwanted duplicates at the level of collections especially when it comes to the pan-European and international duplicates;

- Conservation of the appropriate number of copies of genetically different types and species is necessary in order to provide or establish gene pool, especially for species that can not reproduce generatively but maintain vegetative reproduction;
- To establish a core collection of fruit crops and vitis;
- To establish a collection of duplicates (for safety reasons);
- To establish and optimize methods for *in vitro* conservation and cryo-conservation, i.e. explore the physiology of seeds and germination, physiology and organs development in such circumstances;
- To establish and improve phytosanitary methods, including quarantine rules;
- It is necessary to conduct permanent evaluation of all registered accessions according to the adopted descriptors;
- Cooperation on both national and international level is required for the purpose of duties allocation, and increasing the efficiency of *ex situ* conservation of fruit crops and vitis;
- It is necessary to establish a unique database for all levels of *ex situ* conservation.

Botanical garden. One of the *ex situ* conservation approaches includes botanical gardens. Botanical gardens keep regenerated accessions of fruit crops and vitis that show features of special interest, which are the ornament of nature and represent the history and culture. The fruit crops and vitis accessions are placed and preserved in a special place, for this purpose defined section of the botanical garden where the focus is on the global diversity of species, while the field gene banks give priority to the variability within the same species. All accessions in botanical gardens are followed by the appropriate records and documentation.

5.3.3. Recommendations

- Integration of information related to existing data on fruit genetic resources in a unified information system for genetic resources (ICBGR).
- Using cryo-conservation to establish reserve duplicates of existing genotypes for prevention of losses due to phytosanitary impact, as well as to reduce the efforts for conservation, which include maintenance of field gene bank.
- To focus the establishment, maintenance and update of the collection of genetic resources of grapevine on old, vulnerable ecotypes and the resistance holders.
- To assess the authenticity of varieties of grapevine, including the use of molecular makers.
- During the evaluation of genetic resources, put a special focus on experiments suitable for breeding (resistance and quality),
- Saving duplicates of particularly important genotypes (especially endangered ecotypes and the holders of resistance).
- To support the collection of old local varieties of fruit crops and vitis and valuable clones of traditional varieties of vitis in regions where vitis has been grown since ancient times.
- Expanding the genetic base through the collection and evaluation of wild species resistant to diseases.

5.4. Vegetables

5.4.1. Objectives

In order to promote the use of genetic resources, specific measures will be adopted for more intensive collection of genetic material of vegetable species, easier transfer of material, characterization and evaluation according to standard methods, the establishment of databases and creation of gene banks. Training, research and development, information and documentation, and counseling and activities related to public relations will be accelerated.

It is necessary to ensure support of relevant ministries of the Government of the Republic of Srpska, as well as scientific, educational and professional institutions in order to provide that long-term conservation of biological diversity of vegetables has the effect for future generations of the population in the Republic of Srpska.

5.4.1.1. Long-Term Goals

-To achieve long-term conservation of diversity of ecotypes and old varieties of vegetables and their wild relatives in *in situ* and *ex situ* conditions based on a well-prepared, scientific and inexpensive model.
- To achieve diversity of plant resources to be used according to appropriate measures, e.g. according to characterization, evaluation, documentation and separation of breeding potential.
- To achieve sustainable economic use of numerous ecotypes and varieties of vegetables in the Republic of Srpska.
- To contribute to the conservation and regeneration of ecosystems modified due to modern agricultural production and introduction of new hybrids and/or genetically modified plant material.
- To establish safety zones for a number of old cultivated plant species and ecotypes.
- To establish clonal archives in several regions in the Republic of Srpska.
- To establish transparency regarding the allocation of powers and responsibilities of republican and local authorities, and deployment of the individuals, organizations and institutions involved in conservation and use of plant genetic resources.
- To use and promote connections that may result in increased cooperation at all levels.
- To strengthen public awareness of the need for conservation of plant genetic resources.

5.4.1.2. Short term goals

- To make a review of existing collections.
- To collect and evaluate new genotypes of vegetable species.
- To assess the genetic diversity of collections.
- To include the use of molecular markers.
- To harmonize and finalize phytosanitary measures and quarantine rules.
- To create a database for collections with all the key details.
- To complete description of collections (genotypes), including characteristics concerning resistance, chemical characteristics, etc.

- To assess the purity and authenticity of species, varieties and wild relatives of vegetable species.
- To prepare reserve duplicates of genotypes of particular importance.
- To establish cooperation with similar centers or gene banks in the region and Europe to exchange data and/or genetic material of vegetable species.
- To encourage appropriate forms of education and training, visits to other gene banks, research and development.
- To promote on farm management of vegetable species.
- To collect and *ex situ* conserve other valuable collections of vegetable species.

5.4.2. Conservation measures

Genetic resources conservation is done in different ways, in accordance with the requirements of given species and capabilities of the country where the conservation is performed. Conservation of plant genetic resources, whether *in situ* or *ex situ*, must begin with inventory and reviewing of the existing state of genetic resources in the country.

5.4.2.1. In situ conservation

The preservation in nature gives priority to the *in situ* protection and conservation, where species remain exposed to the influence of the environment. *In situ* conservation should be focused on preservation and conservation of species specific to a certain area. Protected areas would have a key role in the *in situ* conservation. The reason for this is that some species (populations, ecotypes) grow only in specific agro-ecological conditions (smooth kale - eastern Herzegovina). There are no specific protected species, here or in the surrounding countries, that have special value in maintaining biological diversity of vegetables.

5.4.2.2. On farm conservation

Unlike *ex situ* conservation, on farm management provides dynamic conservation and use through the ongoing evolutionary processes. When the vegetable species are in question, this is in most cases guaranteed by the breeder. In addition to *ex situ* collections, conservation and possible future development of the old types of agricultural and horticultural plants are secured, inter alia, in the historical agricultural “museums under the open sky”, field reserves, monasteries, private and school gardens where isolating space is provided. One of the main goals of on farm conservation is to produce certain vegetable species in traditional way.

However, to perform this it may be necessary to institutionally connect farmers/institutions that would grow and keep vegetable ecotypes. That includes signing of contract, with owners of households/farmers on one side and representatives of relevant ministries/institutions on the other side with mutual rights and obligations for the security of long-term duration of this way of conservation of vegetable species.

5.4.2.3. Ex situ conservation

Plant gene banks are the main form of the *ex situ* conservation method. They are the required factor of preserving plant genetic resources in the national and global policy management. In this way, conservation and rational use of the gene pool of vegetable species implies its conservation in gene banks through the collection, characterization and storage (short and medium term) of seeds and planting material (in the form of seeds or *in vitro*).

Gene banks. Gene banks as a method of conservation of plant genetic resources in the form of seeds or *in vitro* have a crucial role in the maintenance of genetic purity of ecotypes, varieties, hybrids of vegetable species and other agricultural plant species and their wild or semi-wild relatives for a longer period of time. Gene banks have to be linked with other ways of plant genetic resources conservation, such as *in situ* or on farm.

In addition to seeds storage, gene banks should perform inventory, documentation, evaluation, characterization and data exchange with other gene banks in the region, Europe and the world.

Field collections. It is necessary to ensure quality soil with high-effective fertility and adequate infrastructure for field collections, along with a number of experts and workers to deal with duplication of the existing collections and accessions. The funding sources have to be permanent, stipulated by the laws.

Botanical Garden. Botanical garden has to be connected with the plant gene bank where the greatest part of the diversity of plant species from the territory of the Republic of Srpska would be shown.

5.4.4. Recommendations

- Collection and integration of existing data on genetic resources of vegetables and their wild relatives (data review of the former Gene bank of Yugoslavia, existing herbarium collections - National Museum of Sarajevo, etc.).
- Assessment of the authenticity of the collected populations, ecotypes and old varieties of vegetables using gene markers.
- Storing duplicates of genotypes of special interest (endangered, the resistance holders, etc.).
- Development and maintenance of field collections.
- Collection and storage of wild relatives.
- Standardization of evaluations methods.
- Education about the importance of vegetable diversity and diversity of agricultural plants in general, informing younger generations about the "old" species and manners of their use.
- Establishing and continually updating the database on vegetable species in the gene bank and
- Connecting with institutions in the country and the world to access their databases and finally transfer of the material.
- Engaging in the regional projects and creating joint collection plantations in order to describe some common vegetable species.

- Expanding the network of project collaborators (scientific, professional, etc.).
- Finding the model for preservation of significant materials in natural conditions - characteristic area for the material (on farm conservation, agreements with producers etc.).

5.5. Medicinal and aromatic plants

An effective conservation of genetic resources can be achieved by adequate combination of *in situ* and *ex situ* conservation methods, which have different advantages. *Ex situ* conservation methods are used in cases where it is necessary to take appropriate measures to preserve vulnerable populations, or when populations are too small to be preserved *in situ*.

5.5.1. Objectives

The status of the inventory of existing collections of genetic resources of medicinal and aromatic plants will be determined by National Program, as well as by strategies and policy guidelines for the development of their preservation, and guidelines for regional and international cooperation.
The program includes the following activities:
- Inventory of genetic resources of medicinal and aromatic plants;
- Collecting genetic resources of medicinal and aromatic plants;
- *In situ* and *ex situ* conservation;
- Description and evaluation of accessions of genetic resources of medicinal and aromatic plants;
- Building up storage facilities;
- Research of genetic resources of medicinal and aromatic plants;
- Development of appropriate legislation;
- Regulating the use and exchange of genetic resources of medicinal and aromatic plants;
- Informing the public about the importance of conservation of genetic resources.

5.5.1.1. Short term goals

This group of goals considers the following: inventory of existing conditions, identification of priority endangered plants, defining measures for their protection.

5.5.1.2. Long-Term Goals

Nature protection through the conservation zones is a very important instrument for the preservation of medicinal and aromatic plant biodiversity. Our primary goal should be to preserve and expand the existing network of protected areas. Although the protection of nature is often understood as a limitation concept based on the principles of prohibition, and not based on the principle of sustainable development, it is difficult to achieve the consent of local residents to declare localities where they live as protected

areas. Therefore the main priority should be the affirmation of modern management plans for protected areas.

5.5.2. **Conservation measures**

5.5.2.1. In situ conservation

In situ conservation programs have to be primarily based on experience of local communities, and certainly should not affect farmers to maintain the local population by applying measures that are not specific to the area. The goal of the *in situ* conservation is to support and encourage farmers to continue with the selection and maintenance of local populations.

Determining the size of the area, location and number of farmers for *in situ* conservation requires biological and social analyses and their integration. *In situ* conservation of genetic resources of medicinal and aromatic plants must begin with the inventory, the estimation of population size and structure, fragmentation and selecting populations that will be the protection core. Priorities and conservation measures will depend on the size and structure of the population, and existing or potential threatening factors. Their use should ensure the survival of each species, correspond to vitality and fertility, and create a sustainable age structure for the future. All objectives and measures should be clearly defined and documented. In parallel with *in situ* measures, *ex situ* collections should be established to multiply genetic material of medicinal and aromatic plants and to serve as gene banks.

The success of *in situ* conservation can not be measured only by the number of alleles or genotypes that are saved. It also can be and has to be measured by the number of farmers within the target area or a group that maintains and manages the populations according to local criteria and principles.

5.5.2.2. On farm conservation

In the on farm conservation, farmers or groups of farmers are active participants in maintaining natural agro-ecosystems, i.e. they are considered to be active subjects of conservation. They are the ones who maintain the existing status of biological diversity of local populations of medicinal and aromatic plants in conditions in which they have existed for centuries. This means that in addition to natural selection there exists a selection that is applied by farmers. On farm conservation is not a museum for conservation in the open, which means that those who decide on subsidies and local institutions have to facilitate the activities of farmers by implementing measures that will support this type of conservation.

Partners who should participate in on farm conservation should be farmers - as the most important component. In addition to training and promotion of their activities related to on farm conservation, some form of compensation for their activities has to be considered. It is necessary to help them in sales if their products are not sold on the local market.

5.5.2.3. Ex situ conservation

Activities on the conservation and use of gene pool of medicinal and aromatic plants imply *ex situ* conservation through the reproduction populations and superior genotypes, the establishment of specialized facilities, arboretums, living archives and clone tests. The aim of the establishment of such cultures is to establish populations that will maintain the original genetic variability to the greatest extent and allow for long-term adaptation to local conditions of the place where the planting is done.

Field collections. Field collections for conservation of genetic resources of medicinal and aromatic plants can be established with the perennial plants. When establishing field collections, the requirements of certain plants should be taken into account, especially those that come from Herzegovina (sub-Mediterranean region) due to the specific conditions necessary for their maintenance.

Botanical Garden. As in the case of the field collection, perennial medicinal and aromatic plants can be used for botanical gardens, and in the botanical garden a number of plant species can be planted, because plants that are used for vegetative propagation are not grown in the botanical gardens.

5.5.3. Recommendations

General recommendations for this program would be:
- To provide scientific basis for development, including significant funding for research;
- To organize active associations interested in the production and processing of medicinal and aromatic plants;
- To introduce the European and world standards in terms of product quality of medicinal and aromatic plants;
- To create legislation in the field of seed production and nurseries, production technology and processing.

In addition, the following should be ensured:
- Seed and nursery production;
- Permanent specialization of personnel both at home and abroad;
- Financial support and loans for new equipment, especially for processing capacities;
- Market development of these products, including exports of medicinal and aromatic plants, as raw material and processed.

5.6. Industrial plants

5.6.1. Objectives

- Inventory and collection of genetic resources of industrial plants within the territory of the Republic of Srpska.
- Long-term *in situ* and *ex situ* conservation of wild and cultivated plant resources based on scientific and economical principle.
- Multiplication and regeneration of genetic resources of industrial plants.

- To include other organizations and institutions in the conservation and use of plant genetic resources
- Promotion of joint activities that might arise from the cooperation at national, regional and international levels.
- Greater use of genetic resources of industrial plants.
- Preservation of the traditional knowledge on production and use of industrial plants.
- Raising public awareness on conservation of genetic resources of industrial plants.

5.6.2. **Conservation measures**

5.6.2.1. In situ conservation

Currently *in situ* conservation is the most feasible measure for conservation of wild plant species with potential value for agriculture, and wild species related to grown species. Conservation of genetic diversity of wild relatives of industrial plants in nature has the advantage over the other conservation methods because it allows natural selection and need to adapt to modified environmental conditions.
The necessary steps for the implementation of *in situ* conservation:
- To make a list of the wild relatives of industrial plants;
- To establish criteria for selection and design of protected areas for *in situ* conservation.

5.6.2.2. On farm conservation

The necessary steps for implementation of on farm conservation and defining measures of support:
- To review genetic resources of industrial plants and gather information about their cultivation and use;
- To conduct socio-economic and socio-cultural research on the use and processing of genetic resources;
- To promote the reproduction of seeds, production and distribution of traditional genetic resources that exist in small quantities in *ex situ* collections for utilization in on farm management.

5.6.2.3. Ex situ conservation

Gene banks. Plant genetic resources of industrial plants will be mostly conserved as the samples stored in seed gene bank for long-term storage.

Field collections. Field gene banks are commonly used for conservation of plant species that follow vegetative reproduction. Only few plant species of industrial plants can be maintained in this way, therefore this type of conservation is of minor importance.
The necessary steps for the implementation of the *ex situ* conservation and defining support measures:
- To identify existing collections;
- To locate and eliminate unwanted duplicates;

- Cooperation with various institutions aiming to establish a network for *ex situ* conservation;
- To provide long-term storage of seeds and plants; to develop methods of testing germination;
- To establish phytosanitary methods, including quarantine rules.

5.6.3. Recommendations

- To conduct expeditions over the whole territory of the Republic of Srpska in order to make inventory and collections.
- To ensure sowing areas for multiplication and regeneration.
- To develop a registry of varieties that are still grown in the Republic of Srpska (including information about the region where grown, the size of cultivated areas and primary use).
- To establish a phytosanitary seed storage methods and rules of quarantine.
- Testing seeds for pathogens.
- To make a description of collections (genotypes).
- To use molecular markers for evaluation, and execute standardization.
- To assess the authenticity and purity of varieties.
- To finalize description of collections (genotypes), including resistance characteristics, chemical characteristics, etc.
- To prepare and maintain a duplicate collection of genotypes of special importance.
- To create a database for the collections.
- To work on access to genetic resources of industrial plants (transfer material).
- To promote the selection and cultivation of rare and neglected indigenous varieties.
- To raise public awareness and work on education to improve public relations for the purpose of better understanding of the conservation and use of genetic resources of industrial plants.
- To promote utilization of genetic resources of industrial plants.

6. EDUCATION AND TRAINING ON THE CONSERVATION OF PLANT GENETIC RESOURCES

6.1 Situation Assessment

In order to ensure sutainable long-term use of plant genetic resources it is necessary, among other things, that society recognizes the need for highly qualified experts with a wide range of knowledge in agricultural research and selection. This is one of the key things for integration of plant genetic resources into existing systems. Decrease in number of students of agricultural sciences in last few years has resulted in lack of highly trained plant genetic resources professionals and staff specialized in seed plant researches, plant selection, taxonomy, systematic, biodiversity and bioinformatics.

The importance of education and training that aims at development and continuous improvement of preservation and use of plant genetic resources must be recognized widely. In the time when financial support for various agricultural projects is reduced, it is very difficult to provide sufficient funding for adequate trainings. The lack of well trained staff, evident at all levels, is one of the main problems. It is important to emphasize that university programs and short specialized courses on bio diversity, based on institutional requirements and initiatives, are organized very rarely. Moreover, there have not been any programs at all that combine technical training with training on management, policies and legal framework regarding plant generic resources.

6.2. Objectives

6.2.1. Long-Term Objectives

Provide education and training regarding all relevant activities related to conservation and sustainable use of plant genetic resources as well as management, and management policies in accordance to needs.

6.2.2. Short-Term Objectives

- To provide adequate local capacities for education and training about the conservation of plant genetic resources, and to set up efficient collaboration between all relevant institutions with related institutions in developed countries.
- To organize adequate short courses and education modules based on prioritized issues.
- To enhance the realization of education for local staff organized in developed countries.
- To encourage scientific institutions and agencies to get involved in plant genetic resources programs and suitable courses and programs on biological and biotechnical sciences
- To provide support for introduction of school subjects covering preservation of genetic resources in primary and secondary schools, and to organize seminars and training for public.

6.3. Policy/Strategy

Government and Republic Institutions have to recognize principles and importance of education about sustainable use and conservation of plant genetic resources for food and agriculture at all levels. The government and public institutions should be obliged to provide education and additional trainings for their employees in these fields.

6.4. Guidelines

It is necessary to provide support to development of institutions and/or programs in every region, which are willing to organize additional trainings and education about plant genetic resources and selection. Also, support should be provided to all students interested in doing their final thesis in relevant public institutions or within related programs.

Collaboration with academic institutions in developed countries should be promoted and supported. In order to maximize effectiveness of education programs and professional communication, access to internet and new information should be available at all times.

With the aim to develop specific segments of plant genetic resources preservation essential for sustainable food and agriculture, it is required to strengthen collaboration with regional institutions in developed countries.

Specialized programs and trainings focused on plant genetic resources conservation, management, policies and public awareness programs should be organized regionally on regular basis taking into consideration situation and needs on the grounds.

Transfer of new technological systems and achievements regarding conservation, characterization and sustainable use of plant genetic resources must be enhanced and regular. Successful realization of these programs requires assistance of public institutions, institutes in developed countries and international organizations.

6.5. Researches/Technologies

All research institutes should strive to adapt trainings and courses about PGR conservation to their regular activities and programs. Having in mind the amount of funds allocated by European Commission framework programs for environmental protection and sustainable use of natural resources, it is necessary for RS Ministry of Science and Technology to get involved in co-financing of institutions which compile applications for these activities in the course of its regular activities.

6.6. Coordination/Administration

All education courses should be organized in accordance with the Program for Conservation of Plant Genetic Resources and adapted to current activities within the region. In addition to that, advanced trainings and courses are to be created in collaboration with relevant regional academic consortiums and associations.

6.7. The Required Measures

In order to ensure successful realization of training and education programs the following measures should be undertaken:

- To establish plant genetic resources information system, which should fully support activities related to conservation and sustainable use of plant genetic resources for food and agriculture;
- To create the lists of currently financed researches, development and project model and to publish them in plant genetic resources information system;
- To enhance and create a new financial programs for bio diversity research, development and project model, by pointing out agro-biodiversity issues;
- The programs should emphasize conservation, integration and utilization of plant genetic resources, as a part of republic programs;
- To prioritize organization of trainings and courses about the conservation of plant genetic resources at the University of Agriculture. Plant genetic resource awareness programs should include courses organized at the highest education level related to agriculture;
- To arrange additional courses for education and trainings of staff engaged in agriculture and horticulture, whose work includes plant genetic resources conservation;
- To develop courses for further education of future researchers in biology, horticulture and agriculture, providing them with "specific modules" within block courses on subjects such as Taxonomy, Systematic, Genetic Resources, etc.;
- To pay special attention to training and education of female population in rural areas, who play important, yet not highly recognized, role in plant genetic resources conservation as well as passing down traditional knowledge;
- To create conditions for preparation and publishing of materials for trainings and education.

7. RAISING PUBLIC AWARENESS AND PROMOTION OF THE CONSERVATION OF PLANT GENETIC RESOURCES

7.1. Situation Assessment

To stimulate public awareness on the importance of plant genetic resources is an important factor for mobilization of the general public in regards with these issues. Also, this is the base for receiving necessary political support within state institutions, which would enable successful realization of the planned activities. Successful presentation of plant genetic resources conservation to target groups is the base for efficient realization of any conservation program.

Programs directed to raising public awareness should be simultaneously carried out on national and international levels. Public awareness programs at international level can set up collaboration through networking and connection with other countries, and exchange of information and experiences. On the other hand, national public awareness programs should facilitate efforts for integration of local community, local organizations and NGOs into the national activities related to the conservation of plant genetic resources, which should create stronger base for support to their conservation.

Excellent collaboration of international and local organizations in public awareness programs should increase efficiency and decrease expenses of project realization.

7.2. Objectives

7.2.1. Long-Term Objectives

To fully integrate public awareness into all activities related to the conservation of plant genetic resources through local, national, regional and international programs.

7.2.2. Short-Term Objectives

To set up mechanisms for coordination and successful realization of activities related to raising public awareness at all levels.

7.3. Policy/Strategy

Unlike the scientific approach and publishing information by the means of scientific papers, dissemination of information through public awareness programs about conservation and sustainable use of plant genetic resources is still incomplete and insufficient. This is the main reason why public awareness regarding this issue is still at a very low level. Therefore, it is important that entity policies and strategies acknowledge the role, which public awareness could play in the conservation and use of plant genetic resources. Raising public awareness, as a very important segment, must be included into creation of all republic activities in this field.

7.4. Guidelines

Programs for sustainable use of plant genetic resources should engage public awareness specialists with proactive attitude toward these issues. Also, staff involved in

various plant genetic resources programs should develop abilities for coordination of their program objectives and activities with wider context, which should finally result in creation of sustainable agriculture and development. They should establish promotional relationship with all participants in this field through utilization of popular promotional methods, previously defined by public awareness specialists.

Republic programs should be defined by protocols and procedures that are in accordance with regional and international programs of the kind. Besides, international protocols, procedures and missions should be adjusted to local conditions and priorities. However, it is very likely that large number of regional and global activities may provide a great platform for support of local public awareness strategies and activities. Furthermore, all of this could have considerable impact on cost reduction of local public awareness programs.

7.5. Researches/Technologies

Prior to the start of initiatives for raising public awareness it is necessary to carry out detailed researches on present situation and to review level and contents of information for target population. Analysis of potentials for utilization of new information technologies for public awareness programs, available and utilized at international level, should be continuously adapted to local needs and conditions.

7.6. Coordination/Administration

In order to rationalize and decrease costs of public awareness programs all the activities of relevant Republic authorities should be coordinated and harmonized to a certain degree, with related actions carried out on state and international levels. All available international programs, created by renowned international agencies FAO, UNEP, CGIAR, and other NGOs, including public sector, should be utilized for local public awareness programs. The connection with international associations and NGOs should facilitate exchange of relevant materials, and create opportunity for collaboration. In addition to that, all existing material and information should be available at Republic level to all Institutions and professionals showing interest, whose goal is to provide education and information for local population.

7.7. The Required Measures

In order to realize public awareness programs with success the following measures are required:

- To enhance PR with aim to improve comprehension of plant genetic resources conservation and utilization at all levels (republic, municipal, industrial, farmers' association, clubs) through various promotional activities: forums, community actions, promotion of national parks, botanical gardens, organized visits to demonstration facilities, etc.;
- Relevant state bodies should give credit and support to NGOs involved in projects related to raising of public awareness regarding plant genetic resources and crops conservation;
- Special attention should be dedicated to publication of materials about plant genetic resources conservation. Also, all materials should be arranged and edited in a mode adjusted for general utilization;

- Public awareness programs about plant genetic resources for agriculture and food, as well as the role that scientists, farmers, plant breeders, and the whole community play in their conservation, should be promoted in schools at all levels, and in specialized agricultural research and scientific institutions;
- Data bases of local institutions that maintain and document plant genetic resources, should be extended and secured on long-term basis;
- It is necessary to collect data and document *in situ* locations and *ex situ* collections at national level and to integrate them into Unique Information System for Plant Genetic Resources (JISGP);
- The information system should be regularly maintained and extended with new data;
- Local information systems should be progressively integrated into European and international information networks.

8. ORGANIZATION AND IMPLEMENTATION

8.1. Current Situation

The situation in the sphere of biological diversity is quite specific for numerous reasons. One of the key reasons is certainly a high number of various plant species which belong to different taxonomic categories and the complexity of their protection. Due to its geostrategic location, the Republic of Srpska is rich in genetic fund, which is surely a great national treasure. Various plant species are plentiful in our region, but they are also threatened by numerous factors. We can say without any doubt that the main perpetrator of the erosion of biological diversity is a man, which makes it our duty to protect the very same diversity.

To this day, there hasn't been a serious analysis of the endangered plant genetic resources, neither in the Republic of Srpska nor in BiH. The first steps towards it were made in the '80s of the last century in the Yugoslav Plant Gene Bank project, and the work that was started then has continued in 2004 in the project SEEDNet "South East European Development Network for Plant Genetic Resources" (SEEDNet Project).

As stated in Chapter 3, the « South East European Development Network» project resumed the activities on the collection, storage and sustainable exploitation of plant genetic resources. At the Faculty of Agriculture, the Center for Genetic Resources of Agricultural and Horticultural Plants was formed as an organizational unit of the Faculty, and is now undergoing a status change into the Genetic Resources Institute, as a separate organizational unit of the Faculty of Agriculture, at the University of Banja Luka, whose main part is the Gene Bank (henceforth the Center/Institute). Through the activities of the Project and with the support from the Ministry of Agriculture, Forestry and Water Management of the Government of the Republic of Srpska, the Gene Bank is equipped for medium-term storage and it accommodates an active collection. As stated, through the Project, the Center/Institute has been confirmed as the seat of the Gene Bank in the SEEDNet network. The SEEDNet network is recognized by FAO as one of the regional networks for the conservation of genetic resources. Until the end of 2007, seed collections consisting of the following accessions were left for storage at the Gene Bank: *Zea mays* L. (18), *Secale cereale* L. (7), *Avena sativa* L. (9), *Hordeum vulgare* L. (48), *Triticum aestivum* L. (182), × *Triticosecale* Witmacк ex A. Camus (27), *Hypericum perforatum* L. (3), *Thymus vulgaris* L. (2), *Salvia officinalis* L. (1), *Juniperus communis* L. (1), *Gentiana lutea* L. (1), *Helichrisum italicum* L. (1), *Phleum pratense* L. (2), *Dactylis glomerata* L. (1), *Trifolium pratense* L. (4), *Lotus corniculatus* L. (3), *Nicotiana tabacum* L. (3), *Linum usitatissimum* L. (4), *Cannabis sativa* L. (1), *Lathyrus sativus* L. (2), *Brassica oleracea* L. *var. acephala* D.C. (9), *Solanum lycopersicum* L. (1). *Capsicum annuum* L. (9), *Phaseolus vulgaris* L. (10), *Cucurbita pepo* L. (4), *Cucurbita maxima* L. (3), *Cucumis sativus* L. (1), *Brassica oleracea* L. *var. capitata* L. (3), *Brassica rapa* L. *ssp. rapifera* Metzg. (1), *Lycopersicum esculentum* L. (1), *Lactuca sativa* L. (2), *Allium porrum* L. (1) and *Hibiscus esculentus* L. (1). Perennial plants are kept in field collections and in the Botanic Garden. Field collection was founded on Manjaca and it contains the following accessions: *Malus* × *domestica* Borкh. (30), *Pyrus communis* L. (20) и *Prunus avium* L. (13).

In 2005, the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska established the line of support for the activities of the Project, and for the period 2008 - 2010 a budgetary support for the activities of the Project has also been planned. 6 working groups have been established at the Republic level according to the type of cultivars (fruits and vitis, medical and aromatic plants, industrial plants, fodder plants, vegetables and maize and cereal). The Project has provided postgraduate studies in the field of biodiversity management at the University of Agriculture in Uppsala, Sweden, for three persons from the Republic. All three persons are planned to work at the Centre /Institute. Majority of Republic coordinators went through several weeks of training in the field of *gene bank management*, which was held in the Nordic Gene Bank, Alnarp, Sweden. Furthermore, a documentation-information system has been established with the base of the Nordic Gene Bank (SESTO) as the basis. The first phase of the building of the Botanic Garden has begun, as well as the repair of the facilities for the needs of the Center /Institute. The activities on raising public awareness about the significance of PGR for the Republic of Srpska are being implemented through the work of the Republic working group for education and raising public awareness, which has organized a number of seminars, a summer school and prepared a number of publications about the significance of PGR and their conservation.

8.2. Objectives

8.2.1. Long-Term Objectives

- Full implementation of the Program.
- Coordination of activities among all participants in the adopted Program for Conservation of Plant Genetic Resources of the Republic of Srpska.
- Further inventory of plant genetic resources.
- Collection, storage, description, evaluation of the collected material.
- Proposal and support for the creation of the legal framework.
- Education and training in the field of protection of genetic resources.
- Development of information systems.
- Exchange of materials with partners from around the world and the region.
- Development of scientific selection and seed institutions and facilities.
- Detailed description of protected (explored) and unexplored areas, horographic maps.
- Public promotion (fairs, publications, media promotion, scientific gatherings etc.).

8.2.2. Short-Term Objectives

- Institutional, personnel and material strengthening of the Center /Institute.
- Establishing an information-documentation unit of the Centre /Institute.
- Establishing a Committee for plant genetic resources.
- Development of legal regulations for:
    - Management, conservation and access to genetic resources;
    - Protection of traditional knowledge;
    - Distribution of gain generated from using genetic resources and traditional knowledge.

- Positioning of the conservation of genetic resources as work of special interest and its material regulation through legal regulations.
- Public promotion of the Program.
- Development of a plan of action for the implementation of measures.

8.3. Implementation of the Program and Its Financing

For the purpose of the full implementation of the Program, a committee for plant genetic resources shall be established (Committee), consisting of 11 members. Members of the Committee shall be appointed by the Minister of Agriculture, Forestry and Water Management of the Republic of Srpska for the period of 5 years. Eight (8) members of the Committee are renowned scientists in the field of conservation of genetic resources and plant breeding; one member is a representative from the Ministry of Agriculture, Forestry and Water Management, another member is a representative of the Ministry of Science and Technology, and the third member is a representative of producers engaged in on farm conservation of genetic resources, as nominated by the associations involved in the Program. The tasks of the Committee are: a consulting role in proposing regulations in the field of conservation of PGR; monitoring of the implementation of the Program, development of a plan of action for the implementation of the measures of the Program.

The Committee shall be appointed by the Minister within three months from the day of the adoption of the Program.

The Committee shall make a Plan of Action for the implementation of the measures of the Program within three months upon the appointment of the Committee (Plan of Action foresees at least three years long actions).

In charge of the implementation of the Program is the Center/Institute established through the activities of the SEEDNet project as an organizational unit of the Faculty of Agriculture in Banja Luka.

Funds for the Program until 2014 shall be provided partly from the Project funds, and partly from the Budget of the Republic of Srpska, Ministry of Agriculture, Forestry and Water Management. In the overall Budget for years 2008 - 2010, funds allocated for the contribution to the project are: year 2008, 100 000 KM; year 2009, 150 000 KM and year 2010, 200 000 KM. Beside these resources, there is a possibility of co-financing of the Program from the funds for scientific–technology development of the Republic of Srpska, whereas realistic sources are also international funds intended for the conservation of biological diversity, primarily FP7 and FAO Global Crop Diversity Trust. When the financial support from the funds of the SEEDNet project (until 2015) ends, it will be necessary to provide regular funds in the Budget of the Republic of Srpska for the implementation of priority measures defined in the Plan of Action for the implementation of the measures of the Program.

The Center/Institute shall submit a report about the realization of the Program to the Government of the Republic of Srpska once a year, and to the National Assembly of the Republic of Srpska once every three years.

Authority responsible for regular monitoring of the implementation of the activities of the Program is the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, through the Department for Genetic Resources.

8.4. The list of Facilities, Companies, Organizations and Associations Significant for the Implementation of the Program for Conservation of Plant Genetic Resources in the Republic of Srpska

The main purpose of compiling a list of institutions and organizations is description of their responsibilities and future assignments in the implementation of the Program. Each institution, in accordance with its functional organization, shall cooperate with the Centre /Institute for Genetic Resources, for instance they shall work on inventory and collection, duplication, evaluation, selection, supervision, information, education, public relations, economic, political and social issues etc.

8.4.1. Ministries in the Government of the Republic of Srpska

Ministry of Agriculture, Forestry and Water Management conducts administrative and other expert work, which among other things includes protection and usage of agricultural land; protection of agricultural plants and products from disease transmitters, pests and weed; production and trade in seed and seed material, training of agricultural producers, production and improvement, dissemination of information through media and other communication channels about their work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Science and Technology, among other things, conducts administrative and other expert work involving scientific-research; the strategy of technological development of the Republic of Srpska; stimulation of fundamental, development, applied research; development of domestic investment technologies; innovation, development and upgrading of technologies; planning, preparation of programs and agreements on scientific-technical cooperation in accordance with the Constitution of the Republic of Srpska; dissemination of information through media and other communication channels about their work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Education and Culture conducts administrative and other work in the field of education and is responsible for all forms of education, prepares the program of educational cooperation with other countries and international organizations in the field of education in accordance with the Constitution of the Republic of Srpska and BiH. It does administrative and other work in the field of culture, and, among other things, is responsible for the protection and usage of cultural-historic heritage, as well as natural heritage. It disseminates information through media and other communication channels about its work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Finance, among other things, conducts administrative and other expert work, including the system of financing the general social needs; tax system, duties, voluntary contribution; the system of financing and forming development funds; assesses financial effects and gives opinion about drafts of laws and bylaws which have a financial component before the final draft or before they are presented at Government sessions; supervision of purposeful usage of funds of the Republic and social revenues as

stipulated by law; compensations, premiums, allowances, fees and investments from the funds of the Republic and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry for Economic Relations and Coordination, among other things, conducts administrative and other professional work, including improvement of economic relations with foreign countries, coordination of investment requirements through definition, promotion and realization of concrete programs and projects; monitoring and coordination of activities, which are the obligation of the Republic of Srpska towards the fulfillment of the requirements for joining the European integration processes; promotion of the potential of the Republic of Srpska abroad; dissemination of information through media and other communication channels about its work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Trade and Tourism conducts administrative and other professional work which involves trading of goods and services in the country and abroad; tourism and hotel/restaurant management; effects of the economic system and economic policies on the goods and services market; protection of consumers; inspectoral supervision; dissemination of information through media and other communication channels about its work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Urban Planning, Civil Engineering and Ecology performs administrative and other professional work which involves integral protection of the quality of the environment and its improvement through research, planning of management and measures of protection; protection of goods of general interest, natural resources, natural and cultural heritage; establishment of cooperation with relevant ministries and institutions from the Federation and BiH; dissemination of information through media and other communication channels about its work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

Ministry of Public Administration and Local Self-government performs administrative and other professional work which involves political organizations, social organizations and citizens' associations; the system of administrative services in the administration of the Republic of Srpska and local self-government; political territorial organization of the Republic of Srpska, inspectorial supervision in the field of governance and local self-governance; dissemination of information through media and other communication channels about its work and does other work in accordance with law and other regulations of the Republic of Srpska and BiH.

8.4.2. Educational, Scientific and Professional Facilities and Institutions

University of Banja Luka. Pursuant to the Article 14 of the Statute, the University of Banja Luka, within the scope of higher education, performs scientific-research, artistic, expert–consulting and publishing work. As regards activities on the conservation

of plant genetic resources, members of the University of Banja Luka of special importance and contribution are as follows:

Faculty of Agriculture opened in 1992. Currently, the Faculty employs over 100 lecturers and other personnel, and in the current academic year it has over 800 enrolled students. Main activities of the Faculty are: organization of undergraduate, graduate and doctoral studies, scientific research, professional work and provision of other services. There are three departments at the Faculty: Plant Production, Animal Production and Agrarian and rural development with 7 study programs. Postgraduate studies are organized in 7 scientific fields with 15 specializations. Courses are held in accordance with the norms of the Bologna Declaration. Apart from that, the Faculty works on applications and implementation of various scientific research and professional projects at the national and international level, such as TEMPUS projects, FP projects etc. One of the most significant projects implemented by the Faculty is the project «South East European Developing Network on Plant Genetic Resources 2004 – 2014. - SEEDNet» - (http://seednet.geminova.net/). This project has special significance in the conservation of plant genetic resources because the main goals of this project are collection, long-term storage and sustainable use of plant genetic resources. A number of associates in the field of plant sciences are involved in the implementation of this project. An organizational unit of the Faculty is the «Center for Genetic Resources of Agricultural and Horticultural Plants ».

Center for Genetic Resources of Agricultural and Horticultural Plants (Center/Institute) was formed as an organizational unit of the Faculty of Agriculture of the University of Banja Luka where its seat is located. Within the Center there is: *Plant Gene Bank* and the laboratory for biodiversity. The Center is now undergoing a status change into the Genetic Resources Institute, as a special organizational unit of the Faculty of Agriculture of the University of Banja Luka, whose main part is the Gene Bank. Therefore, the Center is equipped for the implementation of the Program for Plant Genetic Resources in the following ways:

- Protection and sustainable use of plant genetic resources;
- Annex to the Plant Gene Bank for long term storage of plant germplasm;
- Scientific research in the field of plant genetic resources;
- Testing of genetic values of new varieties.

Faculty of Mathematics and Natural Sciences Banja Luka. At this faculty special significance is given to education of staff in two study programs: 1) biology and 2) ecology and environmental protection. *Department of Biology* is organized in three programs where scientific research is done and courses are organized in relevant fields. Staff educated at this Department is of great importance for the advancement of the conservation of plant genetic resources. Of special importance is its contribution to the quality of classes and the possibility of organizing courses on the significance of the conservation of plant genetic resources in primary and secondary schools. *Department of Ecology and Environmental Protection* has the first cycle of undergraduate studies, which lasts for four years, and the second cycle, which lasts for one year. The first cycle of studies has two degree programs: bachelor’s degree in ecology and professor of ecology

and environmental protection. The goal of the studies is to enable ecologists to be educated not only as teachers but also for various other jobs of high complexity in the field of environment.

University of East Sarajevo. University of East Sarajevo is autonomous, scientific, educational and arts facility comprised of faculties and art academies whose founder is the Republic of Srpska. The seat of the University is in East Sarajevo. Contribution to the activities on the preservation of plant genetic resources is made by the Faculty of Agriculture of the University of East Sarajevo through the involvement of its associates in the implementation of the «South East European Developing Network on Plant Genetic Resources 2004 – 2014 - SEEDNet» project.

The Agricultural Institute of the Republic of Srpska, Banja Luka. It was founded in 1947 and it is an institution with the longest experience in the field of improvement and the selection of plants in the Republic of Srpska. Activities of the Institute are as follows: maintenance of its own gene–collection of plant material for the needs of creating new varieties, lines and hybrid cereals, corn and forage plants; research in the field of agro techniques and nutrition of the above species; production of higher categories of seed of agricultural plants; soil fertility control, development of plans for the usage of agricultural land in GIS; control of the seed quality, assessment of health of living plants and plant products, health control of seedlings and seed material. Main role of the Institute in the realization of the Program will be in the regeneration of the seed collections.

The Republic Institute for the Protection of Monuments and Cultural Heritage, which focuses its work on the protection of cultural goods located on the territory of the Republic of Srpska, that is, on their conservation and proper treatment. Cultural goods include mobile and immobile goods of great importance for the cultural heritage of each nation such as: monuments, architecture, artistic or historical, religious or lay, archeological sites, constructions of historical or artistic interest, works of art, manuscripts, books and other objects of artistic, historical or archeological interest, as well as scientific collections, important collections of books, archives or reproductions of the above mentioned goods. Proper treatment of those goods means sustaining from their inadequate usage, usage of their means of protection, as well as their immediate environment for the purpose which might expose these goods to devastation or damage. This includes promotional activities as regards the conservation and the usage of plant genetic resources, as well as traditional knowledge and skills.

The Republic of Srpska Institute of Statistics is a Republic administrative organization of the Republic of Srpska with the main task to produce official statistics for all categories of users, from the Government and other authorities, to business systems, scientific institutions, media, wide public and individuals. These activities include collection, processing and dissemination of information in the field of agricultural production, which refers to land, structure of usage of agricultural land, distribution and diversity of cultivated plant species, areas under crop, total yield and yield per unit area.

Hydro-meteorology Institute of the Republic of Srpska (RHMZ), within its activities, which are carried out in accordance with laws, as well as in accordance with the regulations of the World Meteorology Organization, for the needs of numerous users (ministries, commercial subjects, media and the public) daily publishes meteorology bulletins, that is, reports which contain review and forecast of weather conditions, hydrology, seismology and ecology bulletins. Also, continuously published are regular monthly, seasonal and annual bulletins. In the event of extraordinary conditions (atmosphere disorders, floods, earthquakes, increased air pollution, etc.) RHMZ publishes special bulletins. As regards fields with genetic potential, the Institute has an important role in the development of those fields by providing preventive forecasts of unfavorable weather conditions, which could endanger survival and development of particular species. Forecast of drought seasons is also very important, as well as the forecast of flood waves, strong winds in the summer, which could contribute to further drought.

Local communities should be interested in preserving plant genetic resources for food and agriculture, because there is a small number of agricultural producers, mainly from rural areas, who are involved in the agricultural production on their personal property for their own needs or for the local market. They are directly involved in conservation and use of plant genetic resources, especially through on farm measures of conservation.

Agency for Providing Professional Services in Agriculture, which operates within the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, performs professional and other work related to: providing expert advice, knowledge, instructions and practical skills to agricultural producers. It collects and processes information at all levels of agricultural production, establishes efficient market information system with the purpose of collecting and analyzing data in order to provide timely information to all agricultural subjects. It presents new varieties and hybrids of cultivated plants, incidence of plant diseases and pests, transfers knowledge about agricultural production with the purpose of protecting healthy environment and the plant genetic potential of the Republic of Srpska. It enhances development of rural areas and the improvement of life in the countryside and forming of various kinds of agricultural associations.

Agricultural Institute in Bijeljina deals with seed production, approbation of plant cultivation, research and verification of seed quality, seed improvement, macro and micro experiments of cereals and plant protection, etc. These activities are complemented with laboratory research. In modern laboratories the following activities are being carried out: soil fertility research, analysis of the quality of mineral fertilizers, analysis of pesticide formulation, fodder quality analysis, physical-chemical analysis of foods, as well as microbiological analysis of foods and items of general use.

Agricultural high schools educate staff interested in the following educational profiles of IV and III degree: veterinary technician, agricultural technician, food

technician; florist-gardener, baker and butcher. They are interesting in connection with programs of collecting old varieties and traditional knowledge and skills.

8.4.3. Nongovernmental Organizations and Enterprises

Society for the Protection of Rare and Endangered Plant Species of the Republic of Srpska was founded on 25 March 2003 in Banja Luka. Program goals of the Society are association of citizens and organizations for the purpose of raising awareness about the need for protection of rare and endangered plant species in the Republic of Srpska and BiH; development and enhancement of work on registering rare and endangered plant species and mapping locations of habitats, collection of seeds, reproduction parts (root, rhozome etc.) or plants, for their reproduction and preservation of germplasm (genetic potential); development and improvement of plantation production as a potential alternative to the disappearance of rare and endangered plant species; to develop research activities through various projects and project activities; organizing educational activities for producers in plantations, collectors of wild and medicinal herbs, drying and packaging of collected herbs; provision of other kinds of assistance to plant breeders in order to raise awareness about the significance of the protection of rare and endangered plant species, and coordination of activities of members of the Association of mutual interest and other activities related to the protection of endangered and rare plant species.

Society for Medicinal Herbs of the Republic of Srpska founded on 22 December 1999 with the seat in Banja Luka. Main goals of the Society are development and enhancement of the work on mapping, protection and collection of medicinal herbs; development and enhancement of cultivation, processing and trade of medicinal herbs; enhancement of the development of the production of medicinal herbs in the Republic of Srpska; provision of assistance in controlling the quality of medicinal herbs, etc.

Scientific Fruit-growing Society of the Republic of Srpska is a citizens' association founded on 07 July 1999 on the voluntary basis, as a nongovernmental, non-profit organization. Previous activities of the Society entirely correspond to program principles, which are: work on the development of fruit growing, dissemination and acquiring of new knowledge, application of new knowledge in practice, work on the protection of indigenous gene fund of fruit trees through their collection and observation, proposition of new varieties of fruit for cultivation, as well as the organization of gatherings with themes from fruit growing, specialist lectures, courses, expert discussions and expert instructions in the field. In the previous period the association had a notable activity in the field of publishing, cooperation on international and local projects related to the development of fruit growing and the organization of scientific and professional symposiums and seminars. Also, an important activity of the association was permanent field work, through various lectures and short courses on fruit growing, supported by local communities: Banja Luka, Novi Grad, Prijedor, Dubica, Gradiška, Nevesinje, Doboj, Rogatica, Brcko, Kakanj, Laktasi, Bugojno, Gradacac, Mostar, Prnjavor, Cazin – Kladusa, Teslic, Celinac, etc. Since its founding, except for the membership fee, which was symbolically charged only at joining, the association was financed from donations and activities within its programs and projects: Fund for the Development and Improvement of the Countryside of the City of Banja Luka, the City of Banja Luka, the

Ministry of Agriculture, Forestry and Water Management and the Ministry of Science and Technology.

The mission of the *Society for the protection of consumers of the Republic of Srpska – Blue Sphere* is strengthening of the civil society through education, promotion of democracy, strengthening of nongovernmental organizations, creation of partnerships between civil, business and governmental sector, protection of consumers and support to active citizens' status. Sphere of consumer protection is realized through raising consumers' awareness**,** promotion and protection of consumers' rights, winning back consumers' trust in domestic companies and domestic products, etc.

Society of Agronomists of the Republic of Srpska founded in 1996 in Banja Luka, was reorganized in 2005 when a new Statute was passed, which is still in effect. Its activities are, among others, work on the status/promotion of agriculture as the most important economic resource of the Republic of Srpska; identification and registration of agronomists of the Republic of Srpska; participation in the drafting of the strategy of development of agriculture of the Republic of Srpska; its professional and social work contributes to raising awareness about the importance of protection and improvement of human environment; starts initiatives, gives its opinion about laws and other norms in the field of agriculture; does other work in the field of agriculture in the spirit of positive legal regulations.

Society for the Protection of Trees - ARBOR MAGMA, Banja Luka is a free and a voluntary citizens' association with the main goal and task to map, study, protect and improve dendroflora of the RS and protected natural resources where valuable samples of dendroflora live.

The program is also open for all other associations whose work involves or will involve usage of PGR, as well as others, which are not named on this occasion: *Youth Environmental Organization „Juznjacko plavo nebo"* Trebinje; *Academic Association „Eko-logik"*, Banja Luka; *Citizens' Association for Rural Development „AgroNet"*, Banja Luka; *Drin-tim*, Visegrad; *Youth Council Rogatica*, Rogatica; *Environmental-ethnology Movement „Dimitor„*, Previja; *Environmental Movement Zelenkovac*, Podrasnica; *Futura plus*, Teslic; *Solidarnost za jug*, Trebinje; *Center for Environment*, Banja Luka; *Center for Development of Herzegovina*, Trebinje;, *Youth Organization Gradiška*, Gradiška and *Environmental Association EKO PUT*, Bijeljina, etc.

9. LITERATURE

1. Dardic, M.; Lukic, R.; Savic, D.; Dimitric, R. 1997: Poljoprivredni resursi i poljoprivredna proizvodnja Republike Srpske.// *Agroznanje*. 2, str.36-43.
2. Djuric, G.; Tomic, L.; Gataric, Dj..; Komljenovic, I.; Todorovic, V.; Kondic, D.: Cvetkovic, M.; Markovic, D. 2008: Biljni genetski resursi u Republici Srpskoj. XIII Strucno-naucno savjetovanje agronoma Republike Srpske: Teslic (11.03-13.03. 2008). Poljoprivredni fakultet Banja Luka. The Republic of Srpska, BiH.
3. Misic, P. D. (1987) Opste oplemenjivanje vocaka. Nolit. Beograd.
4. Pencic, M. 2005: Biljni geneticki resursi: izabrani radovi. Jugoslovenska inzenjerska akademija. Beograd.
5. Adamič, et al. 1963: *Jugoslovenska pomologija - jabuka*. Beograd: Zadružnaknjiga str.218.
6. Access and Rights to Genetic Resources: A Nordic Approach. 2003: Nordic Council of Ministers. Copenhagen. Danmark.
7. Beck-Mannageta, G. 1903: *Flora Bosne, Hercegovine i Novopazarskog Sandžaka: Gymnospermae i Monocotylodones: I dio*. Sarajevo: Državna štamparija.
8. Bubić, Š. 1977: *Specijalno voćarstvo*. Sarajevo: Svjetlost.
9. Dhillon, B. S; Dua R. P.; Pratibha Brahmi; Bisht I. S.; 2004: On-farm conservation of plant genetic resources for food and agriculture.// *Current science*, Vol. 87, No. 5, p.p.10
10. Diedrichsen, A. 2007: *Ex situ* collections of cultivated flax (*Linum usitatissimum* L.) and other.//*Genetic Resources and Crop Evolution*. Volume 54, No.3, p.p.354-366.
11. Domac, R.1967: *Ekskurzijska flora Hrvatske i susjednih područja* . Zagreb: Medicinska naklada.
12. Đurić, G.; Tomić, L.; Pašalić, B.; Radoš, Lj.; Mićić, N. 2007: Fruit germplasm in Republika Srpska: Inventory, collection and conservation. 18th EUCARPIA genetic resources sections meeting. Piestany, Slovak Republic.
13. Đurić G.; Tomić L.; Cvetković, M.; Gatarić, Đ.; Mandić, D.; Marković, D.; Kondić, D. 2008: Plant genetic resources in Republika Srpska (BiH). First European Horticultural Symposium. Vienna, Austria.
14. Engels J.M.M.; Visser, L. 2003: A guide to effective management of germplasm collections. IPGRI. Rome, Italy.
15. Farm Management Manual. 2002: *EU Extension service project in BiH*, p. 324.
16. Konvencija o zastiti evropske flore i faune i prirodnih stanista, 1982. (Bernska konvencije) (http://www.ecnc.nl/)
17. Lewis, J.S. 2007: Aspects of the evolution of *Nicotiana tabacum* L. and the status of the United States Nicotiana Germplasm Collection.//*Genetic Resources and Crop Evaluation*. Volume 54, No.3, p.p. 727-740.

18. Ministarstvo poljoprivrede, šumarstva i vodnoga gospodarstva Republike Hrvatske. Pravilnik o očuvanju i korištenju biljnih genetskih resursa te načinu rada i uređenju banke biljnih gena poljoprivrednog bilja. Zagreb, 30. rujna 2004.

19. Paunović, S.; Stanković, D.; Madžarević, P.; et al. 1985: The plum genotypes in Yugoslavia: exploration, collecting, conservation and exchange of hexaploid species of Prunus domestica L. and Prunus insititia in Yugoslavia. Čačak. Roma: Faculty of agronomy. IBPGR/FAO

20. Paunović, S.; et al. 1989: *Formiranje banke gena voćaka Jugoslavije* . Čačak: Univerzitet u Kragujevcu Agronomski fakultet Čačak.

21. Paunović, S.; Mićić, N. 1997: Gene centres of wild fruit tree species and their relatives in SFR Yugoslavia. Biological and Technikal Development in Horticulture. International Horticultural Scientific Conference: Lednice (9.9.1997-12.9.1997). Brno. Lednice. Mendel University of Agriculture and Forestry. Faculty of Horticulture

22. Solis J.S.; Ulloa D.M;. Rodriguez, L.A 2007: Molecular description and similarity relationships among native germplasm potatoes (*Solanum tuberosum* ssp. *tuberosum* L.) using morphological data and AFLP markers.// *Electronic Journal of Biotechnology*. Vol.10, No.3.

23. Šilić, Č. 1996: Spisak biljnih vrsta (*Pteridophyta* i *Spermatophyta*) za Crvenu knjigu Bosne i Hercegovine. //*Glasnik zemaljskog muzeja Bosne i Hercegovine*. (PN), N.S., 31, str. 323-367

24. The international treaty on plant genetic resources for food and agriculture. 2002: Food and Agriculture Organization of the United Nations.

25. The International Network of *Ex Situ* Collections under the Auspices of FAO Avalible from www.fao.org/ag/cgrfa/exsitu.htm

26. Vieira, R.F.; Skorupa, L.A. 1993: Brazilian medicinal plants gene bank. //*Acta Hort*. 330, p.p.51–58.

27. Vieira, R.F. 1999: *Conservation of Medicinal and Aromatic Plants in Brazil*. ASHS Press, Alexandria, VA.

28. Vitolović, V.1949: *Specijalno voćarstvo*. Beograd: Poljoprivredno izdavačko preduzeće.

29. Zwet van Der, T.; Stankovic, D.; Ristevski, B. 1987: Collecting Pyrus germplasm in Yugoslavia.// *HortScience*.22, p.p. 15-21.

30. www.ipgri.cgiar.org/bioversity_redirect.html

31. www.ukcia.org/industrial/hemp/biodiversity.html

INDEX OF ABBREVIATIONS

BI. *Bioversity International*
CAP. *European Common Agricultural Policy*
CBD. *Convention of Biological Diversity*
CITES. *Convention on International Trade in Endangered Species of Wild Flora and Fauna*
EAFRD. *European Agricultural Fund for Rural Development*
EAGGF. *European Agricultural Guidance Guarantee Fund* (
ECPGR. *European Cooperative Programme for Plant Genetic Resources*
EPPO. *European and Mediterranean Plant Protection Organization*
FAO. *Food and Agriculture Organization*
FP7. *Seventh Research Framework Program*
GCDT. *Global Crop Diversity Trust*
GPA. *FAO Global Plan of Action*
IARCS. *International Agricultural Research Centres*
IBPGR. *International Board for Plant Genetic Resources*
IPGRI. *International Plant Genetic Resources Institute*
ISTA. *International Seed Testing Association*
ITPGR. *International Treaty on Plant Genetic Resources*
ITPGRFA. *The International Treaty on Plant Genetic Resources for Food and Agriculture*
IU. *International Undertaking*
IUCN. *The World Conservation Union*
RAMSAR. *The Convention on Wetlands*
SEEDNet. *South East European Development Network*
TRIPS. *Trade-related Aspects of Intellectual Property Rights*
SIDA. *Swedish International Development Cooperation Agency*
UPOV. *International Union for the Protection of New Varieties of Plants*
UNEP. *United Nations Environment Programme*
WIPO. *Word Intellectual Property Organization*
WTO. *World Trade Organization*
PGR. *Plant Genetic Resources*
PGRFA. *Plant Genetic Resources for Food and Agriculture*

APPENDIX

MANDATE AND PRIORITY LISTS FOR PARTICULAR GROUPS OF PLANTS

Mandate list – species that exist and are used in the region/state in agriculture and horticulture, or their wild relative is in addition an indigenous species having special value for biotechnology, as well as landscape plants, medicinal and aromatic plants, and industrial plants, and autochthonous plants used anywhere in the world. These species are referred to as mandate species and have been approved for long-term conservation.
Priority list – i.e. target species. These species are targeted by working groups and are focus of their activities during a certain period of time.

1. MANDATE LIST

2.1 Maize and Cereals

1.1.1 *Aegilops neglecta* Req.ex Berto.

1.1.2 *Aegilops speltoides* Tausch. –

1.1.3 *Avena fatua* L. – Wild oat

1.1.4 *Secale montanum* Guss. – Mountain rye

1.1.5 *Triticum turgidum* L. – Rivet wheat

1.1.6 *Triticosecale* Withmacк.- Triticale

1.1.7 *Fagopyrum escuoletnum* Moench. - Buckwheat

1.1.8 *Triticum monococcum* L. – Einkorn wheat

1.1.9 *Triticum aestivum ssp. spelta* L. – Spelt wheat

2.2 Fodder plants

1.2.1 *Agrostis alba* L. – White bent
1.2.2 *Bromus arvensis* L. – Filed brome
1.2.3 *Lathyrus pratensis* L. – Meadow vetchling
1.2.4 *Lotus tenuis* W. et K. – Narrow-leaf bird's-foot trefoil
1.2.5 *Lotus uligunosus* Schк. – Greater bird's-foot trefoil
1.2.6 *Lupinus luteus* L. – Yellow lupine
1.2.7 *Medicago lupulina* L. – Yellow trefoil
1.2.8 *Medicago sativa* L. – Alfalfa
1.2.9 *Melilotus albus* Med. – Melilot (Sweet clover)
1.2.10 *Melilotus officinalis* (L.) Pall. – Yellow sweet clover
1.2.11 *Onobrychis viciaefolia* Scop. – Esparcet
1.2.12 *Phleum pratense* L. – Timothy
1.2.13 *Poa annua* L. – Annual meadow grass
1.2.14 *Poa pratensis* L. – Common meadow grass

1.2.15 *Poa trivialis* L. – Rough bluegrass
1.2.16 *Setaria viridis* (L.) P. B. – Green bristle grass
1.2.17 *Trifolim arvense* L. – Hare's foot trefoil
1.2.18 *Trifolium campestre* Schreb. – Field clover
1.2.19 *Trifolium fragiferum* L. – Strawberry trefoil
1.2.20 *Trifolium pratense* L. – Red clover
1.2.21 *Trifolium repens* L. – White clover
1.2.22 *Vicia cracca* L. – Bird vetch
1.2.23 *Vicia faba* L. – Faba bean

2.3 Fruits and Vitis

1.3.1 *Castanea sativa* Mill. – Sweet chestnut

1.3.2 *Cornus mas* L. – Cornelian cherry

1.3.3 *Corylus avellana* L. – Common filbert

1.3.4 *Corylus colurna* L. – Turkish hazel

1.3.5 *Corylus maxima* Mill. – Giant filbert

1.3.6 *Crataegus monogyna* A.L. - Hawthorn

1.3.7 *Crataegus nigra,* A.L. – Black hawthorn

1.3.8 *Crataegus oxyacantha,* A.L. – Red hawthorn

1.3.9 *Cydonia oblonga* Mill. - Quince

1.3.10 *Ficus carica* L. - Fig

1.3.11 *Fragaria moshata* Duch. – Musk strawberry

1.3.12 *Fragaria vesca* L. – Woodland strawberry

1.3.13 *Fragaria viridis* L. – Green strawberry

1.3.14 *Fragaria* x *ananassa* Duch. – Garden strawberry

1.3.15 *Juglans nigra* L.- Black walnut

1.3.16 *Juglans regia* L. - Walnut

1.3.17 *Malus baccata* L. – Siberian crab apple

1.3.18 *Malus* x *domestica* Borkh. – Orchard apple

1.3.19 *Malus dasyphylla* Borkh. -

1.3.20 *Malus pummila* – Paradise apple

1.3.21 *Malus sylvestris* L.- European wild apple

1.3.22 *Mespilus germanica* L. - Rosaceae - Medlar

1.3.23 *Morus alba* L.- White mulberry

1.3.24 *Morus nigra* L.- Black mulberry

1.3.25 *Olea europea* L. – Olive

1.3.26 *Prunus amygdalus* Batsch – Common almond

1.3.27 *Prunus armeniaca* L. - Apricot

1.3.28 *Prunus avium* L. – Sweet cherry

1.3.29 *Prunus cerasifera* Ehrh. – Cherry plum

1.3.30 *Prunus cerasus* L. – Sour Cherry

1.3.31 *Prunus domestica* L. – European plum

1.3.32 *Prunus insititia* L. - European plum

1.3.33 *Prunus mahaleb* L. – Mahaleb cherry

1.3.34 *Prunus padus* L. – European bird cherry

1.3.35 *Prunus persica* L. - Peach

1.3.36 *Prunus spinosa* L. -Blackthorn

1.3.37 *Prunus webbii* Spach. – Wild almond

1.3.38 *Punica granatum* L.- Pomegranate

1.3.39 *Pyrus amygdaliformis* Vill. – Wild pear

1.3.40 *Pyrus communis* L.- Common pear

1.3.41 *Pyrus domestica* Borкh –Common pear

1.3.42 *Ribes alpinum* L. – Alpine currant

1.3.43 *Ribes aureum* Pursh – Golden currant

1.3.44 *Ribes grossularia* L. - Gooseberry

1.3.45 *Ribes multiflorum* L.- Manyflower currant

1.3.46 *Ribes nigrum* L.- Black currant

1.3.47 *Ribes petraeum* Wulf. – Red currant

1.3.48 *Ribes rubrum* L. – Cultivated currant

1.3.49 *Ribes uva-crispa* L. – European gooseberry

1.3.50 *Rosa canina* L. – Dog rose

1.3.51 *Rosa pendulina* L. - Rose

1.3.52 *Rosa rubiginosa* L. – Sweetbriar rose

1.3.53 *Rubus caesius* L. – European dewberry

1.3.54 *Rubus canescens* DC. - Tomentose blackberry

1.3.55 *Rubus discolor* Weihe & Nees – Himalayan blackberry

1.3.56 *Rubus fruticosus* L. – Shrubby blackberry

1.3.57 *Rubus idaeus* L. – American red raspberry

1.3.58 *Sambucus nigra* L. - Elderberry

1.3.59 *Sorbus aria* L. - Winterbeam

1.3.60 *Sorbus aucuparia* L. - European mountain ash

1.3.61 *Sorbus domestica* L. - Service tree

1.3.62 *Sorbus torminalis* L. - Checkerberry

1.3.63 *Vaccinium myrtillus* L. – Bilberry

1.3.64 *Vitis - idaea* L. - Vaccinium – Cranberry

1.3.65 *Vitis vinifera* L. - Vitaceae wine grape

2.4 Vegetables

1.4.1 *Allium cepa var. cepa* L. – Onion

1.4.2 *Allium cepa var. aggregatum (var.ascalonikum)*L.– Shallot

1.4.3 *Allium cepa var. proliferum (var. viviparum)*L. – Garden onion

1.4.4 *Allium ampeloprasum var. ampeloprasum* L. – Broad-leaf wild leek

1.4.5 *Allium ampeloprasum var. kurrat* L. – Rocambole

1.4.6 *Allium ampeloprasum var. porrum* L.– Leek

1.4.7 *Allium fistulosum* L.– Welsh onion

1.4.8 *Allium sativum* L. – Garlic

1.4.9 *Allium schoenoprasum* L. – Wild chives

1.4.10 *Asparagus officinalis* L. – Asparagus

1.4.11 *Daucus carota* L.– Carrot

1.4.12 *Apium graveolens* L. – Celery

1.4.13 *Petroselinum hortense* Hoffm.– Parsley

1.4.14 *Pastinaca sativa* L.– Parsnip

1.4.15 *Anethum graveolens* L.– Dill

1.4.16 *Foeniculum vulgare* Mill. – Fennel

1.4.17 *Lactuca sativa* L. – Lettuce

1.4.18 *Cichorium intybus* L. – Chicory

1.4.19 *Cichorium endivia* L. – Cultivated endive

1.4.20 *Taraxacum officinalis* L. – Dandelion

1.4.21 *Brassica olleracea var. capitata* L.– Head cabbage

1.4.22 *Brassica olleracea var. gemifera* L. – Brussels sprout

1.4.23 *Brassica olleracea var. acephala* L.– Kale

1.4.24 *Brassica olleracea var. botrytis* L.– Cauliflower

1.4.25 *Brassica olleracea var. italica* L. – Broccoli

1.4.26 *Brassica olleracea var. gongiloides* L. – Kohlrabi

1.4.27 *Brassica olleracea var.gemmifera* L.– Brussels sprout

1.4.28 *Brassica rapa ssp. rapifera* L.– Turnip

1.4.29 *Brassica napus ssp. naprobrassica* L.– Rape

1.4.30 *Raphanus sativus var. radicula* L.– Radish

1.4.31 *Raphanus sativus var. maior* L.– Spanish black radish

1.4.32 *Armoratia lapatifolia* Gilg.– Horseradish

1.4.33 *Cucumis sativa* L. – Cucumber

1.4.34 *Cucumis melo* L.– Cantaloupe

1.4.35 *Citrulus vulgaris* Pang.– Watermelon

1.4.36 *Cucurbita maxima* Duch.– Squash

1.4.37 *Cucurbita pepo* L. – Zucchini

1.4.38 *Cucurbita moshata* Poir– Pumpkin

1.4.39 *Lagenaria vulgaris* Mol.– Bottle gourd

1.4.40 *Pisum sativum* L.– Garden pea

1.4.41 *Phaseolus vulgaris* L. – Kidney bean

1.4.42 *Vicia faba* L. – Faba bean

1.4.43 *Vigna unguiculata* L.– Blackeyed pea

1.4.44 *Lathyrus sp*. – Sweet pea

1.4.45 *Beta vulgaris ssp. esкulenta* L.– Beetroot

1.4.46 *Beta vulgaris ssp. cicla* L.– Swiss chard

1.4.47 *Spinacia oleracea* L.– Spinach

1.4.48 *Atriplex hortensis* L.– Garden orache

1.4.49 *Hibiscus esculentus* L.– Okra

1.4.50 *Zea mays sacharata* L.– Sweet corn

1.4.51 *Rumex acetosa* L.– Garden sorrel

1.4.52 *Rumex patientia* L.– Patience dock

1.4.53 *Rheum undulatum* L.– Rhubarb

1.4.54 *Lycopersicon esculentum* L.– Tomato

1.4.55 *Capsicum annuum* L.– Pepper

1.4.56 *Solanum melongena* L.– Eggplant

2. 5. Medicinal and Aromatic Plants

1.5.1 *Hypericum perforatum* L. – Cantarion

1.5.2 *Origanum vulgare* L. – Oregano

1.5.3 *Salvia officinalis* L. – Sage

1.5.4 *Tanacetum cinerarifolium* (Trevir.) Sch.Bip. – Pyrethrum

1.5.5 *Arctostaphylos uva ursi* L. – Bearberry

1.5.6 *Helichrysum italicum* L. – Immortelle

1.5.7 *Juniperus communis* L. – Common juniper

1.5.8 *Thymus vulgaris* L. – Thyme

1.5.9 *Vaccinium vitis idea* L. – Lingonberry

1.5.10 *Colchicum autumnale* L. – Autumn crocus

1.5.11 *Phoeniculum vulgare* L. – Fennel

1.5.12 *Carum carvi* L. – Caraway

2.5 Industrial plants

1.6.1 *Linum usitatissimum* L. – Common flax

1.6.2 *Linum brevimulticaulia* L. – Oil flax

1.6.3 *Cannabis sativa* L. – Hemp

1.6.4 *Cannabis sativa* L. *ssp. spontanea* – Wild hemp

1.6.5 *Nicotiana tabacum* L. – Cultivated tobacco

1.6.6 *Nicotiana rustica* L. – Aztec tobacco

1.6.7 *Solanum tuberosum* L. – Potato

1.6.8 *Helianthus tuberosus* L. – Jerusalem artichoke

1.6.9 *Faba vulgaris* L. – Faba bean

1.6.10 *Brassica rapa* L. и *Brassica napus* L. – wild relatives of cultivated oil rape

2. PRIORITY LISTS

2.1 Maize and Cereals

2.1.1 *Avena sativa* L. - Oat
2.1.2 *Hordeum vulgare ssp. vulgare* L. - Barley
2.1.3 *Secale cereale* L. - Rye

2.1.4 *Triticum aestivum ssp. aestivum* L. em Tell- Wheat
2.1.7 *Zea mays* L.- Maize
2.1.8 *Panicum miliaceum* L. – Broomcorn millet

2.2 Fodder plants

2.2.1 *Dactylis glomerata* L. – Orchardgrass
2.2.2 *Festuca ovina* L. – Sheep fescue
2.2.3 *Festuca pratensis* Huds. – Meadow fescue
2.2.4 *Festuca rubra* L. – Red fescue
2.2.5 *Lolium multiflorum* L. – Italian ryegrass
2.2.6 *Lolium perenne* L. – Perennial ryegrass
2.2.7 *Lotus corniculatus* L. – Bird's-foot trefoil
2.2.8 *Medicago falcata* L. – Yellow Lucerne
2.2.9 *Trifolium alpestre* L. – Pruple-globe clover
2.2.10 *Trifolium montanum* L. – Mountain clover
2.2.11 *Trifolium pannonicum* L. – Hungarian clover
2.2.12 *Trifolium rubens* L. – Red trefoil
2.2.13 *Vicia sativa* L. – Garden vetch

2.3 Fruits and Vitis

2.3.1 *Ficus carica* L. - Fig
2.3.2 *Juglans regia* L. - Walnut
2.3.3 *Malus x domestica* Borкh – Orchard apple
2.3.4 *Malus sylvestris* L. – European wild apple
2.3.5 *Prunus avium* L. – Sweet cherry
2.3.6 *Prunus cerasifera* Ehrh. – Cherry plum
2.3.7 *Prunus cerasus* L. – Sour cherry
2.3.8 *Prunus domestica* L. – European plum
2.3.9 *Prunus persica* L.- Peach
2.3.10 *Pyrus communis* L. – Wild pear
2.3.11 *Pyrus domestica* L. - Common pear

2.4 Vegetables

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2.4.2 *Allium cepa var. aggregatum (var.ascalonikum)* L.– Shallot
2.4.3 *Allium ampeloprasum var. porrum* L.– Leek

2.4.4 *Allium sativum* L.– Garlic
2.4.5 *Allium schoenoprasum* L.– Wild chives
2.4.6 *Brassica olleracea var. acephala* L.– Smooth kale
2.4.7 *Brassica rapa ssp. rapifera* L.– Turnip
2.4.8 *Brassica napus ssp. naprobrassica* L. – Rape
2.4.9 *Cucumis melo* L.– Cantaloupe
2.4.10 *Cucurbita maxima* Duch.– Squash
2.4.11 *Cucurbita pepo* L.– Zucchini
2.4.12 *Cucurbita moshata* Poir.– Pumpkin
2.4.13 *Lagenaria vulgaris* L. – Bottle gourd
2.4.14 *Phaseolus vulgaris* L.– Kidney bean
2.4.15 *Vicia faba* L.– Faba bean
2.4.16 *Lathyrus sp*. L.– Sweet pea
2.4.17 *Hibiscus esculentus* L.– Okra
2.4.18 *Lycopersicon esculentum* L.– Tomato
2.4.19 *Capsicum annuum* L. – Pepper

2.5 Medicinal and Aromatic Plants

2.5.1 *Gentiana lutea* L. – Great yellow gentian

2.5.2 *Primula veris* L. – Cowslip primrose

2.5.3 *Acorus calamus* L. – Flagroot

2.5.4 *Arnica montana* L. – Mountain arnica

2.5.5 *Convallaria majalis* L. – European lily of the valley

2.5.6 *Drosera rotundifolia* L. – Roundleaf sundew

2.5.7 *Hyssopus officinalis* L. – Hyssop

2.5.8 *Leontopodium alpinum* Cass. – Edelweiss

2.5.9 *Iris germanica* L. – German iris

2.5.10 *Teucrium montanum* L. – Mountain germander

2.6 Industrial Plants

2.6.1 *Linum usitatissimum* L. – Common flax

2.6.2 *Linum brevimulticaulia* L. – Oil flax

2.6.3 *Cannabis sativa* L. – Hemp

2.6.4 *Nicotiana tabacum* L. – Cultivated tobacco

2.6.5 *Solanum tuberosum* L. – Potato

2.6.6 *Faba vulgaris* L. – Faba bean.

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