SLOVENIA:

COUNTRY REPORT TO THE FAO INTERNATIONAL TECHNICAL CONFERENCE ON PLANT GENETIC RESOURCES

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CHAPTER 1
Slovenia and its Agricultural Sector

1.1 GEOGRAPHICAL LOCATION AND CLIMATE

The Republic of Slovenia is located between the northern 45° and 46° parallel and between the 13° and 16° eastern meridian. The surface area measures 20,251 km^2 and it has 1,965,986 inhabitants. The capital is Ljubljana (268,681 inhabitants in 1991).

Slovenia spans 163 km from the northern to the southern border and 248 km from the eastern to the western border. The western border with Italy is 202 km long, the northern border with Austria 324 km, the eastern with Hungary 88 km and the south-eastern with Croatia 546 km. The Adriatic coastline is 47 km.

In the north and north-western part of Slovenia lie the Alps, in the southwest the Adriatic Sea, in the east the Pannonian plain, and in the south there are the Dinaric Mountains. The highest mountain, Triglav, is a part of the Alps and is 2,864 m high. The majority of the Slovenian landscape is hilly, only in the east and south east are there plains, which especially occur along rivers. The longest river in Slovenia is the Sava (945 km) followed by the Drava (707 km), Mura (438 km), Kolpa (292 km), SoΦa (138 km) and Savinja (102 km). Karst phenomena are found in the central, south-eastern, south, south-western, western and north-western parts of Slovenia. This includes over 6,500 karst caves and precipices (among which the kocjanske caves are a UNESCO world heritage site) and the ephemeral lakes, such as Cerkni ko lake and Planinsko lake.

Slovenia has three main climatic areas: the Mediterranean, the Alpine and the Pannonian, with eight pedoclimatic regions: the Submediterranean, the Subpannonian, the Pannonian, the Subalpine lowland, the Subalpine highland, the Alpine, the Alpine highland and the Karst highland.

Some meteorological data for these regions are given in Table 1.

Table 1: Names of regions, ranging from the warmest to the coldest

Region	Yearly sum of temperatures (C)	Yearly sum of precipitations (mm)
Mediterranean	3,800-5,000	800-2,000
Subpannonian	3,400-3,800	950-1,350
Pannonian	3,300-3,400	700-1,000
Subalpine lowlands	3,100-3,300	1,150-1,170
Subalpine highlands	2,900-3,200	1,150-1,500
Karst highlands	2,900-3,300	1,300-1,950
Alpine	2,800-3,300	1,500-2,800
Alpine highlands	2,200-2,300	1,900-2,400

1.2 LAND USE, SOCIO-ECONOMIC STRUCTURE

Forests cover more than 50% of the land surface and in the last 20 years, from 1971 to 1991, woodland has increased by 4%, while pastures have been abandoned and grown over. According to data from 1991, the total agricultural land covers 43% of Slovenia's surface area (19.7% meadows, 11.3% arable land, 2% orchards, 1% vineyards and 9% pastures). The conditions for agricultural production in Slovenia are unfavorable. Only 28% of agricultural land is flat, and as such, suitable for cultivation, while 72% of all agricultural land is located in areas which are limited by topography: hilly, mountain and karst regions. Unfavourable conditions seriously affect the competitive and adaptive ability of Slovenian agriculture.

In the last thirty years, the total area of agricultural land has fallen from 938,000 ha in 1960 to 866,000 ha in 1990, which corresponds with the increase in forested area and unproductive land used for urbanization and infrastructure. According to land-use data there are only 799,000 ha of agricultural land, which is less than shown by statistics.

In Slovenia 83% of agricultural land is privately owned. The 1991 census showed that an average private farm had a 5.9 ha surface (including woodland), 3.2 ha of agricultural land and 2.5 ha of arable land. An average cattle farmer had 5 head of cattle or 3 cows per farm.

Two agricultural reforms and the law limiting land ownership have caused farming to be performed on small and dispersed land, and presents the biggest problem to agricultural policy-makers.

According to the 1991 census, only 12% of farms are full-time farms, i.e. farming is their only source of income, while others are part-time farms. Only 3% of farmers for whom farming is the only profession have an agricultural education.

The agrarian share of the population has decreased from 31.3% in 1961 to 7.6% in 1991. The active agrarian share of the population in 1991 was 11.5% of the total population.

1.3 MAIN AGRICULTURAL PRODUCTION

Year to year variations in production are typical for Slovenian agriculture.

In 1990, animal husbandry represented more than one half of the gross value of agricultural production, field crops 40% and permanent plantations 6 to 8%.

Fodder is produced on 310,000 ha (90% of the total meadow area) and on 132,000 ha of pastures (65% of pasture land). The use of pastures has decreased in recent years.

Field and vegetable crops cover 247,000 ha, but the average yields are rather low. Rapid development of animal husbandry caused the increase of land used for grain maize and silage maize from 18% in 1970 to 40% in 1990. In the same span, the decline in land used for wheat was from 26% to 19% and for potatoes from 17 to 12%.

Certified seeds were used on only 50% of fields. A great proportion (80 to 90%) of seeds were imported from different countries. Only 50% of wheat seeds, 30% of potato seeds and 20% of the grass and vegetable seeds originated in Slovenia. The latter proportion is decreasing along with the potato seed production, the main cause being viruses, especially the Y necrotic ring spot. Seed potato was produced on 455 ha (7,931 tons altogether) in 1986 and in 1994 only 1,563 tons were harvested on 80 ha. The increasing seed production of winter wheat is illustrated in these figures: 3,915 tons were harvested on 833 ha in 1986 and in 1994, 10,160 tons of seeds were produced on 1,675 ha.

Orchards cover 36,000 ha, of which 90% are private and extensive, and the fruits are mostly processed. Only 4,200 ha are intensively planted orchards, being composed of 56% apples, 13% pears, 11% peaches, 10% cherries and

sour cherries and the rest of other fruit species. The yields from these orchards are stable and their quality is adequate for export.

The macro-regional analyses done in the mid-seventies showed that 32,500 ha of agricultural land was suitable for vineyards, but only 21,500 ha, or 65%, are now used for the production of 100,000 to 130,000 tons of grape, giving 80 million litres of mostly quality wine, also for export. Because of 30 years of selection, quality plants were used in new vineyards.

Hop of good quality and pleasant aroma and recognized on the world market is grown mainly for export. The planted area covers about 2,500 ha and the gross yield is between 3,500 to 4,000 tons of hop. Certified hop plants were used since the year 1956.

Cattle raising is the most common type of production on Slovenian farms. In the gross income of animal husbandry, 50% comes from cattle, 30% from poultry and 20% from pig production. The remainder of animal production (sheep, goats, rabbits, horses, apiculture) represents less than 0.5% of the gross value of agricultural production in Slovenia.

Milk production became more intensive in the late sixties and was very intensive until the mid-eighties, when growth of production stopped completely.

Pig and poultry production are found mainly on state farms, and is intensive. Only a small proportion of farms breeding pigs is specialized and market oriented. Private farms raise poultry mainly in cooperation with specialized poultry enterprises.

1.4 FOOD BALANCE, ECONOMIC STATUS, INTERVENTION, FOOD INDUSTRY

The average index of self-sufficiency in 1994 was 84%. There is an important surplus in hop, poultry and milk, but a huge deficit in bread grains, sugar, edible oil and feed concentrates.

The financial status of our agriculture is generally poor since we have an unbalanced price policy and the prices of agricultural products do not follow general inflation.

Since 1981, Slovenia has applied a continuous system of subsidies. Only in recent years have subsidies been functioning as a factor of structural change, compensation for low income from agricultural production in unfavourable conditions and the development of agricultural infrastructure.

The level of production in food industry generally exceeds the domestic demand and the future development will depend mainly on its adaptability to the world market situation.

1.5 AGRICULTURAL DEVELOPMENT FEASIBILITY STUDY

According to the 'Strategy of Slovenian Agriculture' which was passed in the Slovenian parliament in May 1993, the main goals of Slovenian agricultural policy are the following:

- stable production of quality and cheap food and food security;
- preservation of population density, cultural regions and agricultural land, protection of agricultural land and water from pollution and misuse;
- permanent increase of competitiveness;
- guaranteed parity income for above-average producers.

The concept of agricultural development represents a combination of the eco-social and free-market concepts.

According to the natural and socio-economic circumstances in Slovenia, agriculture cannot be oriented towards mass production. The production policy will therefore be aimed at the diversity and quality of products. Diversity will be ensured by stimulating the development of organic and other alternative types of agriculture.

1.6 FOREST AND FORESTRY IN SLOVENIA

Forests cover 53% of Slovenia, with a total growing stock of 208.5 million (10^6) m^3. The sustainable management of forests on the basis of multiple functions and co-natural forest management has long tradition, due to the large Karst area and labile forest ecosystems, in which any clearcutting would have resulted in degradation and erosion of deforested land. The first forest

management plan that explicitly stated that forests are to be managed in a sustainable way was written in 1771.

Slovenia is in the state of transition to a market economy, while forestry is in the process of intensive reorganization regarding new forms of forestry organizations and of forest ownership. In 1980, *circa* 64% of forests were state-owned and *circa* 36% were private forests. At the moment, the denationalization process is underway. It is estimated that after the process is completed, only 15% of the forests will be owned by the state. In 1990, 44% of private owned forests were smaller than 5 ha, 41% were between 5 and 20 ha and 15% were bigger than 20 ha. However, even these size classes represent the total forest area per single owner and this area is usually divided into several smaller parcels.

The regulatory framework for the protection and management of forests in Slovenia is based on the Forest Act of 1993. It determines the protection, silviculture, exploitation and use of forests as renewable natural resources with the aim of ensuring their co-natural and multi-purpose management in accordance with the principles of protection of the environment and natural resources, long term and optimal functioning of forest ecosystems, enabling all their functions. The bases for forest management are the Programme of Development of Forests in Slovenia, forest management plans and detailed silvicultural plans.

The potential forest types in 1990 included: beech forest on carbonate bedrock (26.9% of forest area), acidophilous beech forest (17%), forest of beech and silver fir (15.3%), forest of beech and oak (10.9%), forest of oak and hornbeam (7.9%), thermophilous broadleaves forest (5.1%), silver fir forest (4.5%), mountainous beech forest (3.9%), pine forest (3.5%), oak forest (3%), spruce forest (1.3%), forest of willow and alder (0.6%), noble broadleaves (0.1%).

The growing stock in 10^6 m^3 per ha in the year 1990 was 108.6 for coniferous and 99.9 for broadleaf species. For eight tree species this represented: spruce 68.7, silver fir 24.7, larch 2.4, pine and other conifers 12.8, beech 62.7, oak 16.5, noble broadleaves 6.0, other hardwood broadleaves 11.6, softwood broadleaves 3.1 x 10^6 m^3/ha.

The area which is naturally regenerated annually is *circa* 6,500 ha. Only 625 ha are regenerated annually with reproductive material from forest nurseries. In 1995, the following structure of seedlings was used: all coniferous species represented 1,253,850 seedlings and all broadleaf species 704,485 seedlings.

Of all seedlings, 54% were Norway spruce, 0.7% silver fir, 4.1% larch, 1.6% Scots pine, 2.5% Austrian pine, 0.1% Douglas fir, 11.1% beech, 2.9% sessile oak, 6.9% common oak, 4.7% sycamore, 5.2% common ash, 3.7% common alder, 0.3% wild cherry, 0.1% lime, 0.1% rowan, 0.1% common walnut, 0.2% black walnut, 0.3% red oak, 0.1% manna ash, 0.1% grey alder, 0.3% poplars and a few hundred seedlings of horse chestnut, black locust and crab apple.

CHAPTER 2
Indigenous Plant Genetic Resources

The diversity of the Slovene flora is due to the diversity of pedoclimatic characteristics. There are four different types of flora in Slovenia: the Central European-Alpine (30% of the territory) in the north, the Mediterranean in the south-west (10%), the Pannonian in the east (30%) and the Illyric-Dinaric in the south (30%). According to the division made by a group of botanists from the Floristic Section of the Biological Society under the leadership of Dr. M. Wraber, six phytogeographical regions can be found in Slovenia: the Alpine, the Prealpine, the Subpannonian, the Dinaric, the Predinaric, and the Submediterranean.

Richness of the Slovene flora was presented in different written documents and books from the following authors: Mattioli 1500-1577 and Clusius 1526-1609, Scopoli 1728-1788 (Flora Carniolioca), Hacquet (1738-1815), Wulfen (1728-1805), Hladnik (1773-1844), Fleischmann (1805-1867), Graf (1801-1838), Frayer (1802-1867), Tommasini (1794-1879), Sendtner (1813-1859), De≡man (1821-1889), Kra an (1840-1907), Plemel (1820-1875), Paulin (1853-1942), Justin (1901), Piskernik (1885-1967), Mayer (1952). The list of ferns and flowering plants in Slovenia (Mayer, 1952) included 3,300 indigenous plant species, from which *circa* 120 genera represent indigenous trees, shrubs and other woody species (Mayer, 1958). The new Register of Flora in Slovenia (Trpin and Vre , 1995), produced on a CD, includes also introduced species.

2.1 FOREST GENETIC RESOURCES

Of the **forest tree species,** *circa* 70 species are indigenous in Slovenia. These comprise (* marks the **endangered, vulnerable or rare** species in terms of IUCN categories, "marks the species being in its **geographical borderline** and occuring in limited numbers in Slovenia): silver fir *(Abies alba)*, common larch *(Larix decidua)*, Norway spruce *(Picea abies)*, Scots pine *(Pinus sylvestris)*, Austrian pine *(Pinus nigra)*, mountain pine (*Pinus mugo)*, Arolla pine"* *(Pinus cembra),* common yew* *(Taxus baccata)*, bay laurel"* *(Laurus nobilis)*, wild cherry *(Prunus avium)*, mahaleb cherry *(Prunus mahaleb)*, bird cherry *(Prunus padus)*, medlar* *(Mespilus germanica),* common crab apple*

(Malus sylvestris), wild pear* *(Pyrus pyraster)*, almond-leaved pear* *(Pyrus amygdaliformis)*, rowan *(Sorbus aucuparia)*, whitebeam *(Sorbus aria)*, wild service tree* *(Sorbus torminalis)*, true service tree* *(Sorbus domestica)*, Judas tree"* *(Cercis siliquastrum),* common laburnum *(Laburnum anagyroides),* Scotch laburnum *(Laburnum alpinum),* Alschinger laburnum *(Laburnum alschingeri)*, small-leaved lime *(Tilia cordata)*, broad-leaved lime *(Tilia platyphyllos)*, terebinth pistachio" *(Pistacia terebinthus),* lentisc pistachio" *(Pistacia lentiscus),* sycamore *(Acer pseudoplatanus)*, Norway maple *(Acer platanoides)*, field maple *(Acer campestre)*, Montpelier maple" *(Acer monspenssulanum),* coarse-leaved maple" *(Acer obtusatum)*, Tartar maple"* *(Acer tataricum)*, common Holly *(Ilex aquifolium)*, common alder *(Alnus glutinosa),* grey alder *(Alnus incana)*, silver birch *(Betula pendula)*, downy birch *(Betula pubescens)*, common hornbeam *(Carpinus betulus)*, oriental hornbeam *(Carpinus orientalis)*, European hop hornbeam *(Ostrya carpinifolia)*, sweet chestnut *(Castanea sativa)*, common beech *(Fagus sylvatica)*, common oak *(Quercus robur)*, sessile oak *(Quercus petraea)*, Turkey oak *(Quercus cerris),* downy oak *(Quercus pubescens),* false-cork oak"* *(Quercus crenata),* holm oak"* *(Quercus ilex)*, common walnut *(Juglans regia),* aspen *(Populus tremula)*, white poplar *(Populus alba),* black poplar *(Populus nigra)*, white willow *(Salix alba),* goat wilow *(Salix caprea),* violet willow *(Salix daphnoides),* hoary willow *(Salix elaeagnos),* crack willow *(Salix fragilis),* bay willow *(Salix pentandra),* common osier *(Salix viminalis)*, common fig" *(Ficus carica)*, southern nettle-tree"* *(Celtis australis),* Wych elm *(Ulmus glabra)*, smooth-leaved elm *(Ulmus minor)*, European white elm *(Ulmus laevis)*, common ash *(Fraxinus excelsior)*, manna ash *(Fraxinus ornus)*, narrow-leaved ash *(Fraxinus angustifolia),* olive" *(Olea europaea)* and phillyrea"* (*Phillyrea latifolia).*

A long list of **shrubs** are indigenous in different regions in Slovenia. These include: several juniper species *(Juniperus communis, J. oxycedrus*", J. macrocarpa*", J. sabina*, J. sibirica)*, willows *(Salix purpurea, S. cinerea, S. retusa, S. aurita, S. triandra etc.* - 22 *Salix* spp. trees and shrubs in total), green alder *(Alnus viridis)*, hazel *(Corylus avellana)*, common barberry *(Berberis vulgaris)*, common box *(Buxus sempervirens)*, several ericaceous shrubs *(Arctostaphylos uva-ursi, A. alpina, Calluna vulgaris, Erica carnea, Arbutus unedo"*, Rhododendron ferrugineum, R. hirsutum, R. luteum*, Loiseleuria procumbens, Rhodotamnus chamaecistus, Andromeda polifolia*, Vaccinium myrtillus, V. vitis-idaea, V. gaultherioides, V. uliginosum, Oxycoccus palustris, O. microcarpus)*, common lavender *(Lavandula angustifolia),* rosemary *(Rosmarinus officinalis),* rose-shrubs *(Rosa* spp. - 18 species), blackberrys *(Rubus* spp. - 28 species), sorbus (*Sorbus chamaemespilus*), bladder senna (*Colutea arborescens*), spiraea *(Spiraea* spp - 4 species), snowy mespilus *(Amelanchier ovalis)*, hawthorns *(Crataegus monogyna, C. Laevigata, C. curvisepala)*, cotoneasters *(Cotoneaster tomentosus, C. integerrimus)*, blackthorn *(Prunus spinosa)*, broom *(Genista*

spp. - 9 species), sarothamnus *(Sarothamnus scoparius)*, spartium *(Spartium junceum)*, scorpion senna *(Coronilla emerus, C. emeroides, C. coronata, C. vaginalis, C. varia, C. cretica, C. scorpioides)*, cytisus *(Chamaecytisus hirsutus, C. purpureus, C. ciliatus, C. ratisbonensis, C. supinus, C. austriacus)* and relatives, myrte"* *(Myrtus communis)*, sea buckthorn* *(Hippophae rhamnoides)*, young fustic (*Cotynus coggygria)*, bladdernt tree *(Staphylea pinnata)*, daphneas *(Daphne alpina, D. blagayana*, D. cneorum*, D. laureola, D. mezereum, D. striata)*, dogwoods *(Cornus mas, C. sanguinea)*, common ivy *(Hedera helix)*, spindle tree *(Euonymus europaeus, E. latifolius, E. verrucosus)*, Christ's thorn *(Paliurus spina-christi)*, buckthorns *(Frangula alnus, F. rupestris, Rhamnus cathartica, R. saxatilis, R. fallax, R. pumila)*, mistletoes *(Loranthus europaeus, Arceuthobiium oxycedri, Viscum album, V. abietis)*, wild currants *(Ribes uva-crispa, R. petraeum, R. alpinum)*, honeysuckles *(Lonicera xylosteum, L. nigra, L. alpigena, L. caerulea, L. etrusca, L. caprifolium)*, twin flower*" *(Linnaea borealis)*, guelder rose *(Viburnum opulus)*, wayfaring tree *(V. lantana)*, laurestine *(V. tinus)*, elder (*Sambucus abulus, S. nigra, S. racemosa)*, butcher's broom *(Ruscus aculeatus, R. hypoglossum)* and others.

In Slovenia not much attention has been given to distinguished **races** of forest trees regarding special management regimes. In the common larch *(Larix decidua)*, the alpine variety (var. *alpica*) with red wood is the most widespread, while the variety imported from Sudeti (var. *sudetica*) grows in the lowlands. Several varieties of Austrian pine (*Pinus nigra*) were used for the establishment of seed orchards (var. *viletta, corsicana* and *austriaca)*. In Slovenia, the most widespread variety is var. *austriaca*. A minor relict Austrian pine race, restricted to the rocky slopes of Kamnik Alps and Karavanken, was described as ‘cretovec’. The descriptions of two races of common beech (*Fagus sylvatica)* were underway in the sixties after the structure of the crown, as part of work by the former forest geneticist M. Brinar, but were not finished. Recently the influence of air pollution on the genetic structure of beech populations was investigated. A special race of silver fir *(Abies alba)* resulted from the genetic studies and breeding programme from the sixties, the so called 'Brinar’s fir’ (similar to var. *fastigiata)*. It is propagated by cuttings, as it originates from a single adult tree.

Recently, the genetic structure of eight slovenian silver fir populations revealed an agreement with geographical distribution in Europe for several isozyme loci. Also some rare aleles were discovered. A variety of clonal material of Norway spruce was derived from single or a few isolated trees with interesting characteristics, for example *P. abies* var. *monstrosa* and *P. abies* var. *virgata,* which were found in nature. A great variety of economically important races is known from Slovenia, as seed sources from past centuries were not well defined.

At the moment, the main research activities are directed towards the identification of the indigenous spruce populations and their genetic characteristics in Slovenia. Offspring tests of populations of spruce and of sycamore (*Acer pseudoplatanus)* from polluted areas are also in progress.

2.2 WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Many wild species are indigenous and can be used as food, for example *Primula carniolica*, which has up to 530 mg/100 g of vitamin C.

In many parts of Slovenia, different ecotypes of grasses and clovers can be found in natural pastures. *Mycelis muralis, Lactuca serriola, Cichorium intybus* are some of the wild relatives of crop plants.

2.3 LANDRACES

Slovenia belongs to the Mediterranean and to the European gene centres.

There are many autochthonous populations which were named according to the place from where they originate. Here are some examples: the lettuce *Ljubljanska ledenka* (also included in the European cultivar register under the name *Laibacher Eis*), the cabbage *Ljubljansko, Ka eljsko, Blo ko, Zalo ko,* the corn lettuce *Ljubljanski*, the carrot *Ljubljansko,* the onion *Ptujska* and *Gribeljska*, the garlic *Ptujski*, the chicory *Gori ki*, *Solkanski, Erni ki*, the turnip *Kranjska okrogla* and *Kranjska podolgovata*, the buckwheat *Siva Dolenjska* and E*rna Gorenjska*, the apple *Dolenjska vo Φenka*, *Gori ka sevka*, the cherry *Gori ke*, the grapevine cultivars *Bri ka Glera*, *teverjana, Planinka*.

Slovenia can be considered a gene centre for some Brassicaceae (cabbage, turnip), for Alliaceae (onion, garlic), Asteraceae and Valerianaceae (lettuce, chicory, corn lettuce), grapevine species, grasses, clovers, medicinal and aromatic plants.

Also, quite a lot of landraces can be found among crops which have been introduced centuries ago from other parts of the world. From America, maize, beans and the potato were introduced at the time of the Austro-Hungarian Monarchy. In the varied ecological conditions of Slovenia, our farmers breed

many different populations adapted to less favourable growing conditions, for example, the populations named Bohinjska and Koro ka maize can be grown in the Alpine region for grain.

With the development of the seed trade, introduced cultivars entered into production at a small scale before the second world war. Some of the Slovenian seed merchants also multiply our domestic cultivars, as in the case of the Ljubljanski cabbage and the clover from Gorenjska.

After the second world war, some projects were initiated to collect the Slovenian autochthonous populations, ecotypes and primitive cultivars with the goal of breeding new, improved cultivars. The results of these efforts were the cultivars entered into the Yugoslav List of Cultivars and now they are on the Slovenian List of Cultivars. 11 cv. of grasses and clovers, 6 cv. of beans, 2 cv. of cabbage, 2 cv. of chicory, 1 cv. of onion, 7 cv. of field crops, 3 cv. of apples, 1 cv. of peach, 11 cv. of hop and 14 cv. of potato were bred.

Autochthonous populations were still cultivated on a small scale by old generations, especially turnip, maize, buckwheat, and in home gardens beans, lettuce, chicory, corn lettuce, onion, garlic and cabbage. The young generation prefers to buy seeds, therefore much of the autochthonous material has been lost forever.

Foreign cultivars of wheat, maize, potato, fodder and sugar beet, barley, rye, oats, cabbage, cauliflower, cucumber, tomato, carrot, red beet, onions, and aromatic and medicinal plants were introduced to the Register of Cultivars and have been cultivated to the present.

As it has been pointed out in the “Strategy of the Slovenian Agriculture”, it can be predicted that because of their diversity and quality, old and improved Slovenian cultivars will also find a place in large scale production.

CHAPTER 3
National Conservation Activities

3.1 CROPS

3.1.1 *In Situ* Conservation

For agricultural plants there is no programme for *in situ* conservation, including conservation on the farm level.

3.1.2 *Ex Situ* Collections

The first collections of different plants and seeds were made primarily for breeding or teaching activities at the following institutions:

- Agricultural Institute of Slovenia, Ljubljana (potato, grasses, clovers, cabbage, beans, faba beans, small fruits, grapevine plants);
- Biotechnical Faculty, Agronomy Department, Ljubljana (cereals, maize, buckwheat, rye, barley, soybeans, onion, fruit and grapevine plants);
- Institute for Hop and Brewery, ≠alec (hop, medicinal and aromatic plants).

Ex situ collections of perennial plants are still maintained and can serve as a source of genetic diversity and are included in the present collections. Old cultivars of grapevine were maintained and the phytosanitary selection was made in the collection plantations.

The seeds of *ex situ* collections of annual plants were properly stored only for maize, in a refrigerator at 6°C. The other original seeds lost germination capabilities owing to improper storage at room temperature, as there was no money available for refrigerators at that time.

Data from thirty to forty years ago enables us to estimate the extent of genetic erosion. For autochthonous populations of cabbage from the Ljubljana vicinity, a 90% genetic erosion was established after 30 years. Also, some potato samples and two bread cereal cultivars were sent to the Braunschweig Gene Bank.

In the former Yugoslavia, the study of plant genetic resources was carried out by Prof. Dr. Jo≡e Spanring from the Agronomy Department, Biotechnical Faculty in Ljubljana in the year 1988. The curators from Slovenia were nominated for the potato, fodder plants, hop, lettuce, small fruits and grapevine. From 1989 to 1991, various crop collections were established in the frame of the Yugoslav project.

After the independence of Slovenia in 1991, three year projects financed by the Ministry of Science and Technology were carried out at the Biotechnical Faculty, University of Ljubljana, and at the Agricultural Institute of Slovenia, together with the Institute for Hop and Brewery. In 1993 and 1994, the Ministry of Agriculture, Forestry and Food financed the work on a gene bank of maize, fruit, hop and fodder plants.

The data collected in Spring 1995 from the Slovenian collections were published in the IPGRI, FAO publication: Directory of European Institutions Holding Crop Genetic Resources Collection 1995. Until now a central national gene bank has not been established, but the possibility exists that genetic resources of Slovenian origin will be kept properly in the future.

As every researcher has his own collection, there are no data about the quantity of samples studied each year. However, researchers use their own collections of potato, hop, cereals and fodder plants for breeding.

3.1.3 Storage Facility

Two storage rooms were built at the Agricultural Institute of Slovenia in 1994. For the medium-term storage of seeds there are 20 m^3 at +4° C and for the long-term storage 24 m^3 at -20°C available. These storage rooms were made according to internationally recommended standards. There are not enough samples for storage at -20°C at present, so all samples are stored at +4°C. These storage rooms will be fundamental to the Central Slovenian Gene Bank.

When the national programme on plant genetic resources is accepted, the long term facilities will be used especially for the seeds of autochthonous accessions from all the institutions involved in plant genetic resources conservation.

For the running of a long-term storage facility, equipment for drying the seeds to 3 or 5% moisture and for their cleaning, counting and packing is needed.

At the Agronomy Department, Biotechnical Faculty and at the Institute for Hop and Brewery, refrigerators are available for medium-term storage. The Agronomy Department also has one deep freezer capable of -17°C.
The Agricultural Institute of Slovenia has storage facilities in Moste, near Komenda where potato tubers can be stored for one year. They could also be available for gene bank purposes. All cultivars and breeding clones are also stored under *in vitro* conditions as plants and microtubers.

Also, one part of the hop, apple and grapevine collection grown in field plantations has been reproduced and maintained *in vitro*.

Perennial plants are chiefly maintained in collection plantations at two different places. The grapevine collection is situated at 5 different locations in Slovenia.

3.1.4 Documentation

For the first collections after the second world war, all data were presented in yearly reports made for the fund "Sklad Borisa KidriΦa", from which research was financed. At that time, every researcher had chosen the passport data and the data about evaluation and documentation according to his own priorities.

At present collections also the UPOV descriptors are used. After 1988, plant genetic resources were documented mainly using IBPGR or IPGRI descriptors. For lettuce accessions, the descriptors from the Wageningen and Salinas Gene Banks are used. For grapevine accessions, descriptors from OIV, UPOV and IPGRI are used.

The research organizations now use facilities to computerize all data on their own computers. According to the propositions in the national programme, there will be a central registry in the central gene bank, which would include all passport data of each addition, data about collections and collecting institutions. All Slovenian accessions will be included In the central registry: those stored as seeds, *in vitro* (potato, hop) *in situ* (national parks) and *ex situ* (collections of perennial crops). This registry will facilitate the exchanging of data. It is our goal to connect the central registry to the international network of plant genetic resources.

3.1.5 Evaluation and Characterization

Every researcher who maintains a collection is responsible for the evaluation and characterization of his own genetic resources.

Some of the collection holders working on breeding also use the UPOV descriptors. In some collections, chemical analyses were performed in addition to morphological analyses e.g. in the cases of cabbage, raspberries and maize.

The buckwheat collection has also been analyzed using molecular markers. Last year, 27 samples of beans and 24 samples of lettuce were sent to the USA to be analyzed for molecular markers in cooperation with researchers here. Also, some apple tree and grapevine cultivars were analyzed using electrophoresis.

3.1.6 Regeneration

As every curator is responsible for his own plant genetic resources, he is also responsible for the regeneration of his accessions. Depending on storage facilities and species, regeneration is carried out in 1 to 10 years. In perennial plantations, regeneration has to be carried out every 10 to 50 years, depending on the species and other growing conditions. The curators take care of having sufficient regenerated samples to avoid genetic drift. Regeneration is done from the seeds of the original samples.

3.2 FOREST GENETIC RESOURCES

3.2.1 *In Situ* Conservation

According to the Slovenian Forest Act of 1993, all forests are managed in a co-natural way, which can be classified as Category VI of the IUCN management categories; "protected area managed mainly for the sustainable use of natural ecosystems". Sustainable, co-natural and multifunctional forest management implies:

- small-scale flexible forest management, adapted easily to site characteristics and the natural development of forests;
- active protection of natural populations of forest trees;
- protection and conservation of biological diversity in forests;
- support of the bioecological and economical stability of forests by improving the growing stock;
- tending of all developmental stages and all forest forms for supporting of vital and high-quality forest trees, which could optimally fulfill all functions of forests;

- natural regeneration is supported in all forests; if seedlings are used, they should be derived from adequate seed sources/provenances, and only adequate species can be used.

Additionally, the following areas of forests are protected under different IUCN categories (Table 1):

Table 1: Protected forest areas

Protected forests	IUCN category	Area of forests (ha)	Protected since
Triglav National Park	II / V	36,240	1924, 1981
36 regional parks	V, one III	30,045	most from 1984 or later
173 virgin forest reserves	I	10,421	some from 1887, 1973
Protection forests	I / V	55,400	most from 1852
Seed stands	IV / VI	2,799	1955, updated till 1987

In addition to the protected areas from the table above, special attention and protection is given to small ecocells/habitats of endangered animal species or sites of endangered plants (adequate to IUCN IV category of protection). Special attention comprises evidence and protection of such ecocells in detailed silvicultural plans.

The national Forest Development Programme suggests that all protection and nature conservation activities in forests should be the responsibility of the Slovenian Forest Service.

3.2.2 *Ex Situ* Conservation

Most forest stands are regenerated naturally, only 1/10th are regenerated from nursery seedling material, while seeds are mostly collected from yearly re-acknowledged seed stands. Therefore no special attention is given to *ex situ* conservation of forest genetic resources in Slovenia.

There is limited interest in poplars and other fast growing tree species in Slovenia, as poplar plantations only cover *circa* 2,000 ha, while fast growing East-American white pine was predominantly tested in plantations for scientific purposes. Plantations of common European ash and common alder are treated as semi-natural forests. In the forthcoming year, a small living archive of clones of poplars will be established at the Institute's grounds. It

will contain 50 clones of poplars from the *Aigeiros* and the *Tacamahaca* sections, which have been proven in the past to perform well in Slovenia.

A limited number of seed orchards were established in Slovenia about 15 to 30 years ago (Table 2). These seed orchards are not used for seed production and their future is questionable.

Table 2: Seed orchards in Slovenia

Tree species	Location	Year of establishment	Source of material	Area (ha)	Clones/ seedlings
L. decidua sudetica	Ti ina	1963	CR - Sudeti	1.62	14 / 388
Abies alba	Vrem. britof	1963	Yugoslavia	1.00	23 / 1120
L. leptolepis	Novi grad	1964	Ru e	1.52	? / 256
P. nigra viletta	Mlake	1964	Labin (Hr)	1.00	8 / ?
P. nigra corsicana	Lokve	1966	Lo inj (Hr)	1.83	? / 986
P. menziesii viridis	Adle iΦi	1966	Adle iΦi	1.83	abandoned
P. nigra austriaca	Tomaj	1969	Istra, Kras	1.04	24 / 455
L. decidua sudetica	Markovci	1969	CR - Sudeti	1.20	47 / 971
P. menziesii viridis	Markovci	1980	Ru e, Ortnek	3.00	abandoned
P. menziesii viridis	Ermo njice	1981	Ru e, Ortnek	2.00	abandoned
P. sylvestris	Lendava	1982	Selnica/Dravi	4.00	40 / ?
L. decidua alpica	Ljubno	1983	Vr iΦ, Radovna	2.00	?
P. omorika	PoΦivalnik	1988	Tara	1.50	58 / 1661
F. excelsior	Hra Φica	1989	Hra Φica	1.80	60 / 505
A. glutinosa	Murska uma	1988	Murska uma	2.00	55 / 330

International provenance tests have been established for silver fir on 4 research plots in 1987 on the mountain BoΦ, for Douglas fir in 1971 and 1972 on the hills Brkini and Javornik on high Karst with 27 provenances, for Austrian pine in 1977 and 1988 in Haloze (9 provenances) and in ≠ekanc (low Karst, 8 provenances). Tests of offspring were established for Norway spruce in 1987 on 6 research plots, on one (Hru ica) with 10 provenances, deriving from different Slovenian seed units, on others with only two provenances.

The forest seed bank is maintained by the commercial Seeds and Seedlings Enterprise, Semesadike Menge , for commercially interesting seeds. Only Norway spruce seeds from different provenances are kept also at the Slovenian Forestry Institute. The data for these seeds comprise the register no., locality of seed source, its height above sea level, bed-rock, potential forest type, age of stand, bonification of seed stand, date of fructification, date of arrival to the seed bank, percentage of germination and moisture content.

3.2.3 Storage Facility

At the "Semesadike" enterprise, two big storage rooms are kept at +4°C (one was supposed to operate at -20°C, but this consumed too much energy for commercial purposes). At the Slovenian Forestry Institute, two refrigerating chambers operate at +4°C and at -5°C.

3.2.4 Documentation

Information on *in situ* forest genetic resources are dealt with by the Slovenian Forest Service under the expert guidance by the Slovenian Forestry Institute and in collaboration with the Board for the Protection of Nature of the Ministry for Environment and Regional Planning. Annual certificates for seed stands and seeds are issued by the Slovenian Forestry Institute. All scientific studies and the development of strategies for management of forest genetic resources are dealt with by staff from the Slovenian Forestry Institute and the Forestry Department of the Biotechnical Faculty in Ljubljana.

3.2.5 Evaluation and Characterization

Seed testing and seed stand evaluation is done by staff from the Slovenian Forestry Institute. Spruce, silver fir and beech are being studied using isoenzyme electrophoresis by staff from the Slovenian Forestry Institute and the Forestry Department, while oaks are being analysed with molecular markers by staff from the Agronomy Department of the Biotechnical Faculty.

3.2.6 Regeneration

In Slovenian forests, only seedlings derived from seeds from seed stands of the same seed unit can be used for regeneration. Seed units are defined considering the potential forest type, bed-rock and elevation.

Seed units are groups of similar potential forest types, among which an exchange of seeds and seedlings is allowed. They belong to four altitudinal levels (0-400 m, 400-700 m, 700-1,000 m, above 1,000 m) and two groups based on bed-rock material (carbonate, non-carbonate).

Seed units are separately formed for each tree species. Noble hardwoods belong to one collective seed unit, and all exotics belong to one collective seed unit.

Each potential forest type can be included into one or more seed units, considering its altitude. The number of times a potential forest type is included into each seed unit depends on the ecological amplitude of the potential forest type.

CHAPTER 4
The Use of Plant Genetic Resources in Slovenia

4.1 CROPS

As mentioned in the previous chapters, in the past, the Slovene genetic resources were used mainly for breeding of new cultivars.

Breeding of the potato at the Agricultural Institute of Slovenia and of hop at the Institute for Hop and Brewery in the period 1994 to 1998 is financed by Ministry of Agriculture, Forestry and Food and, to a small extent the research on these two crops is also financially supported by Ministry of Science and Technology.

Presently, foreign cultivars are also used in the breeding programmes, not only the Slovenian autochthonous genetic resources. Foreign cultivars of potato and accessions from other gene banks have been received from different seed firms and the Braunschweig Gene Bank.

The main goal of breeding is to obtain high quality cultivars, with respect to various traits. For the potato, white flesh with good taste and cooking ability and resistance to virus diseases, especially Y necrotic ring spot, is the aim of breeding. For hop, resistance to pests and diseases and a good quality aroma are desired.

Every curator has his own genetic resources, so there are no data about the percentage of accessions that have been used in past three years. Usually there are small groups, from one to five persons, involved in the breeding activities of single crops.

The results of the breeding activities can be seen from the applications submitted to the Commission for the Release of New Cultivars in the last years and in 1996.

The review of cultivars bred in Slovenia and entered in the official cultivar testing shows crops on which the selection was done.

Table 3: Recent output of the Slovenian plant breeding

Crop	Name of cultivar	Breeding organ*	Breeders name	Start of testing	Released in cv. Register
Maize	BF LJ 1	1	Rozman, MatiΦiΦ	1993	
	BF LJ 2	1	Rozman, MatiΦiΦ	1994	
Buckwheat	Darina	1	Kreft, Luthar, Bohanec	1991-93	1995
	Rana 60	1	Kreft, Luthar, Bohanec	1991-93	1995
	Petra	1	Kreft, Luthar, Bohanec	1991-93	rejected
Winter wheat	BF 12(388)	1	Tone Tajn ek	1993/94	
	BF ≠375	1	Jo≡e ≠unkoviΦ	1995/96	
	AA 375	4	Lojze Av iΦ	1994/95	
Spring wheat	BF 35/85	1	Tone Tajn ek	1995	
	BF 35/84	1	Tone Tajn ek	1995	
Spring barley	AT-J185	1	Tone Tajn ek	1993-95	
Spring oats	AT 12	1	Tone Tajn ek	1994	
Potato	KIS 83/7	2	Sluga, DovΦ, DolniΦar	1994	
	KIS 78/14	2	DovΦ,Praprotnik,Sluga	1990-92	
Meadow fescue	RF 10/91	1	Koro ec, Gode a,	1994	
Lucerne	RL VII/92	1	Eerne Marjanca	1995	
	MSR 95	2	Fi akov,VerbiΦ, AgoviΔ	1995	
Tall fescue	R 1/87	2	Koro ec, Fi akov,	1994	
Kentucky bluegrass	R/84	2	VerbiΦ, AgoviΔ	1994	
Hop	Aurora 12	6	Kralj, Medved, Ferant	1994	
Turnip	kranjska podolgovata	3	Zmaj ek, Pu enjak, Jerala	1990-93	
Carrot	Semor	3	Zmaj ek, Pu enjak	1995	
Chicory	solkanski	5	Osvald, Kogoj-Osvald	1990-93	
	vervit	3	Avgu tin, Erjavec, Eerne, Zmaj ek	1989-93	
Lettuce	Leda	3	Zmaj ek, Pu enjak	1995	
Shallot	Pohorka	3	Zmaj ek, Pu enjak	1995	
Onion	Tera	3	Zmaj ek, Pu enjak	1995	
Corn lettuce	Zimko	3	Zmaj ek, Pu enjak	1995	
	≠liΦar	3	Zmaj ek, Pu enjak, Avgu tin	1995	
	Rumenko	3	Zmaj ek, Pu enjak	1995	
Pepper	Ferdi	3	Zmaj ek, Pu enjak	1995	

***: 1. Agronomy Department, Biotechnical Faculty, University of Ljubljana**
2. Agricultural Institute of Slovenia, Ljubljana
3. Semenarna, Selection Station Ptuj
4. Agricultural Centre Jablje at Trzin
5. Oswald d.o.o., Nova Gorica
6. Institute for Hop and Brewery, ≠alec

The cereal cultivars were mainly bred at the Agronomy Department of the Biotechnical Faculty, University in Ljubljana. At the Agricultural Institute of Slovenia, potato, grass and lucerne cultivars were developed. The seed firm, Semenarna, has bred 10 different vegetable cultivars at the selection field in Ptuj, mainly from the autochthonous accessions collected in different parts of

Slovenia. One cultivar of chicory was bred by the private firm Oswald from the autochthonous chicory accessions found in the vicinity of Nova Gorica. A hop cultivar was developed at Institute for Hop and Brewery - ≠alec.

4.2 FORESTS

In Slovenian forestry, no official breeding programmes have been running since the sixties. At that time, the beech, oak, Norway spruce, silver fir and a few other species were bred by staff from the Slovenian Forestry Institute. Testing of different poplar clones at different locations in Slovenia was also performed.

Today, only a very restricted programme is still operating. It includes a selection of fast growing spruce clones, the vegetative propagation of different spruce forms and of a pollution-resistant sycamore. For a few years, tissue cultures of sweet chestnut, aspen, Norway spruce and Austrian pine were studied. Additionally, Norway spruce seedlings were used as tester organisms for different stress conditions in laboratory conditions as bioindicators of pollution of forest sites, as well as for mycorrhizal studies. Biotechnology of mycorrhizal containerized seedlings and their physiology is being studied.

CHAPTER 5
National Goals, Polices, Programme and Legislation

5.1 CROPS

5.1.1 National Programmes

Until now, plant genetic resources have been dispersed among individual or groups of researchers at three institutions. The proposal for a central gene bank was submitted to the Ministry of Science and Technology and to the Ministry of Agriculture, Forestry and Food in September 1994, but was postponed. In 1995, the situation remained the same as in the previous years. This means that every researcher applied for his own funds, and that there are no organized connections between different programmes on plant genetic resources. The researchers have to maintain and take care of their own collections.

In 1995, the Ministry of Science and Technology accepted the study of genetic diversity in beans, grasses and grapevines. The Ministry of Agriculture, Forestry and Food financed the gene bank of maize, fodder plants, vegetables, medicinal and aromatic plants, hop, fruit trees and grapevines.

At the beginning of 1995, the Ministry of Science and Technology intended to finance the national collections. In December 1995, a special commission examined some of the collections. It is expected that some collections will be considered to be nationally important and will be financed in 1996.

A proposal for the national programme was sent to the Ministry of Agriculture, Forestry and Food in October 1995 and the commission for the preparation and operation of the national programme was nominated at the end of November 1995. The commission has begun to work and the national programme will have to be accepted by September 1996.

5.1.2 Training

There is no organized training on plant genetic resources in Slovenia. The curators of the gene bank also have to work in other programmes, for example in breeding, teaching and in the promotion for financing the work. In October 1995, one researcher from the Agricultural Institute of Slovenia was invited to be present at the Documentation Training in Poland.

5.1.3 National Legislation

As the national programme is in preparation, there is no special legislation on the protection or use of plant genetic resources.

For the production and finalization of seeds and plants, as well as import, export, and the control of trade of seeds and plants, there is a former Yugoslav Act on seeds and seedlings published in the Official gazette of the Socialist Republic of Slovenia, No. 42/1973. In addition to this law there are regulations about the conditions for production, processing and trade of agricultural seeds and plants published in the Official Gazette of SRS No 36/1974. There are also regulations on unique methods of control of the production of agricultural seeds published in the Official Gazette of SRS No. 36/1974. The latter regulations are nearly the same as in other European countries. Since December 1994, Slovenia has participated in the OECD schemes for the varietal certification of Maize and Sorghum seed and the OECD scheme for Herbage and Oil seed. The quality control of seeds and plants is prescribed in the Regulations on quality control of agricultural plants published in the Official Gazette of SRS No. 47/1987.

According to the law and regulations, only the cultivars included in the cultivar register can be produced, processed and traded in Slovenia.

The testing of new cultivars of agricultural and forestry plants, the listing on national cultivar list and the protection of agricultural plants are regulated by the law on testing and permission of introduction of new agricultural and forestry plants published in the Official Gazette of Yugoslavia No. 38/1980 and No. 82/1990. The regulations on the cultivar list and the procedure of registration and protection of new cultivars were published in the Official Gazette of Yugoslavia No. 56/1989.

As all the laws and regulations on seed were from the former Yugoslavia, new laws are in preparation which will regulate the registration of new cultivars, the production, the processing and the trade with seed and plants. The conditions for listing will be the test of distinction, uniformity and stability (DUS), and for some important crops, the value for cultivation use (VCU).

All of the regulations and laws will be harmonized with those from the European Union.
A law on breeders rights is being prepared and it will be harmonized with the UPOV convention from 1991.

5.1.4 Other Policies

Because the Strategy of Slovenian Agriculture promotes sustainable agriculture, there will also be a place for landraces and other primitive cultivars to spread in our production. Therefore some additional legislation must be established for the regulation of the trade with these seeds. All of these regulations will be harmonized with those from the European Union.

5.2 FORESTS

5.2.1 National Programmes

Within the national research programme, "Forest", one single project, 50% financed by the Ministry for Agriculture, Forestry and Food and 50% by the Ministry for Science and Technology, with less than 1 FTE, was accepted in 1995 for forest genetics, seeds and nurseries related studies. Some more applied work has been done through direct collaboration with the Slovenian Forest Service.

5.2.2 Training

In 1995, the Forestry Study Days, organized by the Forestry Department of the Biotechnical Faculty, having the title "Minor tree species", were organized for all forestry specialists from the Slovenian Forest Service which work on silviculture and the protection of forests.

5.2.3 National Legislation and Other Policies

The main Forest Act, which also regulates the management of forest genetic resources, was adopted in 1993. The Act on Plant Protection was adopted in 1994, while all regulations on seed testing, seed stands and seedlings date from the sixties. The Act on Seeds and Seedlings was adopted in 1973. All the old regulations as well as the Act on game and wildlife management are being

dealt with at the moment and will be issued in a revised version, presumably in the forthcoming year.
Besides the Forest Act, the most important laws and regulations concerning forest genetic resources are the Act of the Protection of the Environment (1993), the Regulation on protection of indigenous fungi, the Regulation on protection of endangered plant species, the Regulation on protection of endangered animal species, the Decree on financing and co-financing investments in forests and the Regulation on harvesting.

The national strategy for the development of forests, "Forest Development Programme", has been accepted in the Parliament this year (1996).

CHAPTER 6
International Collaboration

6.1 UNITED NATIONS INITIATIVES

The Convention on Biological Diversity from Rio de Janeiro was signed by the Slovenian government in June 1992. It has not been ratified by parliament yet. The Conventions from Strassbourg (1990) and Helsinki (1993) have also been signed at the adequate Ministerial Conferences.

Until now, Slovenia has not become the member of FAO Commission and International Undertaking on Plant Genetic Resources although its representatives participated in their sessions as observers.

Slovenia has been the member of FAO since 1993.

Staff from the Forestry Institute are official representatives to the different working groups of the UN ECE Convention on Long Range Transboundary Effects of Air Pollution ICP: IM, Forests, Effects.

6.2 INTERNATIONAL PLANT GENETIC RESOURCES INSTITUTE

Slovenia has not been included in CGIAR centres. It was invited to join IPGRI but has not become a member yet, although its representatives have participated at the conferences in Nitra, Slovakia, September 1995. It is believed that full membership will be attained in 1996.

Slovenia was invited to enter the European Forest Genetic Resources Programme (EUFORGEN) and participated at its Steering Committee meeting in Sopron, Hungary, in November 1995, as an observer. We hope that the formal requirements for officially joining the Programme will be met in 1996.

We expect to be officially included into EUFORGEN and ECP/GR (5^{th} phase) in 1996.

6.3 NON GOVERNMENTAL ORGANIZATIONS

Several non governmental organizations (NGO) have been indirectly involved in the protection of the natural environment and its genetic resources: The Union of the Societies for the Protection of the Environment in Slovenia, The Natural History Society, The Slovenian Genetical Association, The Association of Forestry Societies, The Slovenian Ecological Movement etc. (there are *circa* 80 NGOs enlisted in the National Report on the Environment in Slovenia). Also, Slovenian NGOs have established a loose link with the Regional Environmental Center in Budapest.

6.4 REGIONAL AND BILATERAL INTERGOVERNMENTAL INITIATIVE

The Slovenian Forestry Institute and the Forestry Department are official members of the European Forestry Institute (EFI). The staff from both organizations are active in different sections and working groups of IUFRO (International Union of Forest Research Organizations) and of other relevant international scientific associations. Other scientific and educational collaboration comprises TEMPUS JEP "Bioindication of forest site pollution", ALIS LINKs with the U.K. and collaboration in COST E6 project on Tree physiology and other COST projects.

CHAPTER 7
National Needs and Opportunities

7.1 CROPS

The following needs are important to Slovenian genetic resources conservation activities:

- Elaboration of the national programme on plant genetic resources accepted by three institutions working on plant genetic resources involving different permanent sources of financing from different ministries.
- Making an inventory of collections owned by different curators and setting priorities according to the status of collections.
- Development of a centralized documentation and information for the plant genetic resources stored as seeds, '*in vitro*, '*in situ*', '*ex situ*' following international rules.
- Harmonization of Slovenian legislation with European and international legislation.
- Study of the possibility to include the Slovenian programme in international programmes and search for additional funding.
- Collaboration with international institutions such as the FAO commission, IPGRI programmes ECP/GR and EUFORGEN and with international networks for different crops and trees in order to participate in the creation of core collections.
- Organization of expeditions in Slovenia to the regions where plant genetic resources can still be found in their natural habitat.
- Development of the open access to plant genetic resources and promotion of their sustainable use.
- Determination of genetic erosion in species for which data are available from the first collections.

7.2 FORESTS

In Slovenian forestry in the future, more attention and forces should be given to:

- further development of sustainable forest management in all aspects, especially in preserving and improving biological diversity and ecological, social and economic functions,
- develop a national strategy for the preservation of forest genetic resources and include it into the above management system,
- develop a national strategy for the protection of the environment and from genetic impoverishment due to pollution and other stress factors affecting forest ecosystems,
- develop better forest technical operations and diminish their adverse effects on forests.

The developments mentioned above will need more knowledge and therefore more support and efforts put towards studying of:

- the functioning and dynamics of different forest ecosystems,
- the genetic variability of forest trees and their physiological implications,
- the co-naturally oriented biotechnological methods for managing young forests and plant propagation materials,
- the possibility for the adaptation and use of ecosystem-friendly oriented forestry operations.

International collaboration in all above study aspects is a prerequisite for the development of our understanding of Slovenian forest ecosystems and their genetic potentials.

CHAPTER 8
Proposal for a Global Plan of Action

In the national programme, the plant genetic resources of Slovenian origin would have to be properly evaluated and then, together with all the data, would have to be maintained in medium and long-term storage. The financing of gene bank activities would have to be permanent enough to enable development of all necessary activities: collection, characterization, evaluation, regeneration, documentation, information and availability to the users, especially researchers and breeders. The promotion of the sustainable use of plant genetic resources is an important task which will increase the diversity of production.

International collaboration is needed in several sectors, most notably in training, research, consolidation of collections, technology transfer, knowledge of indigenous species and local practices.

Training should be developed on an international level, as Slovenia is too small for the trained staff to be working only on genetic resources.

Persons responsible only for the coordination of genetic resources would have to be trained properly to be able to perform all activities undertaken at the gene bank.

In research, international cooperation is also needed to avoid the repetitive development of methods that have been investigated at other gene banks. International cooperation will also promote the exchange of ideas and technology in order to obtain a better use of plant genetic resources. Consolidation of collections can be obtained by developing crop specific inventories, analyses of diversity and by the development of core collections.

The recommendations regarding **forestry** comprise:

- further development of a scheme of sustainable forest management,
- development of national programmes for the management of forest genetic resources,

- inventories of forest genetic resources,
- characterization of forest genetic variability and its physiological evaluation,
- coordination and complementarity of *in situ* and *ex situ* conservation activities,
- international collaboration in research activities and approaches.

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