POLAND:

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

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Prepared by:

Wieslaw Podyma
Barbara Janik-Janiec

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Note by FAO

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Table of Contents

Report's Preparation Method

The presented report is author's evaluation of plant genetic resources acitivity in Poland completed with opinions of co-workers and consultants. During preparation of the report we collected opinions of specialists involved in conservation of biological diversity on scientific and administrative level. Different type of questionaries were prepared and sent to users of genetic resources, curators of collections and botanical gardens. We were in contact with authors of parallely prepared reports and projects on biological diversity and its participants.

A draft of report was evaluated by consultants. Final chapters focused on national needs and capabilities (Chapter 7) and Global Plan Action (Chapter 8) were discused with representants of governmental administration and accepted by prof. H. J. Czembor-National Coordinatar of Plant Genetic Resources. We express our acknowledgments all contributors for their active participation in preparation of the report.

Wieslaw Podyma
Barbara Janik-Janiec

CHAPTER 1
The Country and its Agricultural Sector

1.1 THE COUNTRY

Poland lies in Europe between latitudes 49°00' and 54°50'N and longitudes 14°07' and 24°08'E. The territory is a frontier zone between the continental block of the Eastern Europe and the Western Europe, partitioned by seas. The Baltic coast constitutes the northern boundary, the Sudetian and Carpathian Mountains form the southern border. The area of Poland is 312.7 km^2. About 3/4 of it is occupied by a typical lowlands (northern and central part). The average altitude is 173 m. The capital of Poland is Warsaw.

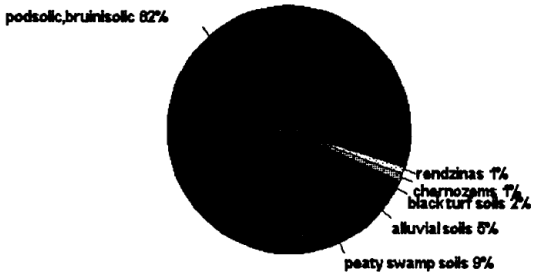
The physiographical conditions of Poland facilitate collisions of varying types of air masses, which exerts a remarkable influence on weather and climate. High variability of weather and irregularities in the course of year seasons are characteristic for the Polish climate. It is particularly evident for the winter weather, which is usually wet and relatively warm, like in the maritime climate, but in some years may be typically continental, clear and frosty. In Poland six seasons of the year can be distinguished: a snowy winter, an early spring, a spring, a summer, a sunny autumn and a foggy and humid approach of winter. The average temperature of January (the coldest month) ranges from -11°C in the southwest to- 41°C in The northeast. The warmest month (July) average temperatures range from 171°C in the north to 201°C in the southeast. Rainfalls are much dependent on the area configuration.

The average annual precipitation is about 600 mm, in the mountains exceeds 1,000 mm and in the lowlands amounts about 500 mm. Majority of rainfalls occur in summer. High fluctuations are stated in thickness and stability of snow cover. In the lowlands it seldom surpasses 20 cm. Besides, it appears and vanishes several times during a winter season. In the mountains snow cover lasts for about 150 days (dependent on altitudes) and reaches 2 m of thickness. As regards hydrography, 99.7% of the Polish territory drains to the Baltic, including 53.9% of the Vistula river-basin and 34% of that for the Oder. Lakes are quite numerous - about 9,300, with the sum of area about 3,200 km^2, however they are not uniformly distributed and are sparse beyond the northern lake districts. There are also about 10 artificial lakes covering 450 km^2 of area. Marshlands

constitute 5% of the area. Winds blow predominantly from the west or south-west, the frequency of eastern winds is much lower. The winds reach its maximal speed inwinter, the weakest are those blowing in June and July.

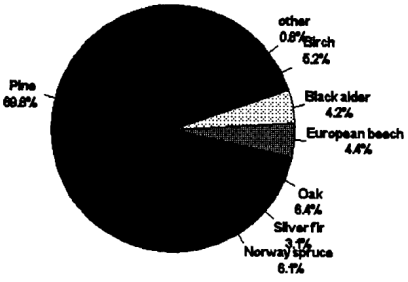
Majority of soils in Poland are classified as so called "light soils". They show a low level of fertility, require intense organic and mineral fertilization and special agrotechnique. The podsolic, pseudopodsolic and bruinisolic soils constitute 82% of the country area, 9% is covered by peaty swamp soils, 5% by alluvial soils, 2% by black turf soils and the rest is occupied by chernozems and rendzinas (1% each) (GUS 1994) (fig.1).

FIG. 1. SOILS IN POLAND



Forests cover 28.1% of the Polish territory. They are not regularly distributed. The biggest wooded areas are located in the east, north and west, while in the central part forests occupy below 11% of the area. Coniferous forests dominate, mainly those of pine (*Pinus silvestris*) 69.8%. Broadleaved species cover about 20% of the area (fig. 2). The fragments of primeval forests survived in northeast which the specific composition has not changed much. However the majority of Polish woods is strongly modified and exploited intensely.
The coniferous monocultures dominate with a high proportion of young stands. The state forests constitute 82% of the wooded area.

FIG. 2. SPECIES COMPOSITION OF POLISH FOREST



Population of Poland amounts about 38.5 million. 14.5 million are employed, including ca. 3.7 million of people working in agriculture (89% of them on private own farms).

1.2 AGRICULTURAL SECTOR IN POLAND

Agriculture is one of the most important branches of the Polish national economy and delivers ca. 6% of the gross product. Historical reasons caused the past and present regional differentiation of proportions between the traditional, self sufficient farming and the modern, market-oriented agriculture. Poland was a unique country of the socialistic block where no general collectivization was executed. The private farmers' estates maintained the dominant role as a form of agricultural land ownership. The most typical are, like in majority of the West-European countries, peasant family farms which can function without hired labour at the present level of mechanization. The characteristic feature (and a serious problem) is a high level of land fragmentation.

There are three types of farms in Poland:

- state farms that belong to the Treasury occupy 13.9% of the farming area,
- agricultural cooperatives (3.3% of the area),
- private farms (78.3% of the area).

The area of farming lands amounted 18,642 thousands of ha. in 1993, which made 59% of the Polish territory. The biggest part constituted arable area (ca. 80%) followed by meadows (ca. 11%), pastures (ca. 7%) and orchards (ca. 1%).

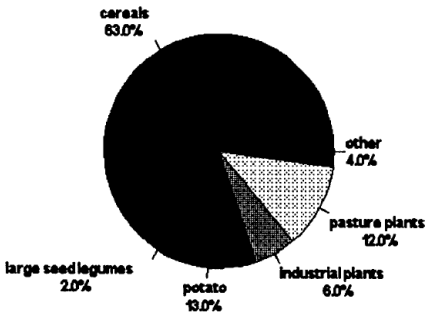
In Poland 0.49 ha. of the farming lands falls to each inhabitant, but the Polish lands are approximately by a half worse than the average ones in Europe; 34% of them are classified with the weakest bonitation grades (V and VI). The Polish agriculture shows a several times lower level of intensity when compared to the well developed countries. The doses of mineral fertilizers and pesticides applied per unit area are several times lower.

Cereals are the most widely cultivated crops, followed by the industrial crops and fodder crops (fig. 3). The largest plantation areas occupy wheat (18%) and rye (16%). Potatoes cover 13% of the area. There is a trend of gradual increase of the area under the intense cereals (wheat, barley and triticale). Especially the wheat area has grown from 9% in the 1950s to 18% in 1993. On the other hand the area of potato plantations decreased from 18% in nineteen seventies to 13% in 1993. The total production of cereals reached 25.5 mt in 1988, 27.8 in 1991 and in 1992 dropped to almost 20 mt. The changes were caused by weather conditions, by recent decrease in the mineral nutrition (from 196 kg/ha in 1988/1989 to 62 kg/ha in 1991/1992) and by the reduction of the

area of plantations (8.4 millions ha in 1988, 8.7 in 1991, 8.3 in 1992 and 1993). More than 2/3 of the total grain resources (both produced locally and imported) has been used for feed, about 115 for food an the rest for reproduction, industry (without flour milling) or has been wasted.

The total human consumption of cereals (and their products) amounts about 5.6 mt (including 1.2 mt for farmers' self-supply). Thus a surplus existed in the consumable cereals (augmented by the import of hard wheat) and shortages in fodder grain which were compensated by import. The balance of production and consumption of the bread cereals was always favourable (Szczęsny 1994).

FIG.3 PERCENTAGE SHARE OF CROPS IN PLANTED AREA



data from 1993 (Rocznik Statystyczny 1994)

The production of potatoes was 23.4 mt in 1992 (3rd place in the world). It has been dropping down since many years (36.3 mt in 1990, 29.0 in 1991), in spite of growing yields, as a consequence of the crop area reduction. It was caused by the decreasing consumption and, first of all, by the diminished use in swine feeding. The storage losses have been high (ca. 15%). The consumption of potatoes by the non-agricultural part of the population figured about 2.8 mt. The total purchase was 4.8 mt, 0.7 mt was directed to the industrial use and 1.2 mt was exported. Therefore, there was a small surplus in balance (ca. 0.1 mt).

In connection with popularization of the rational nutrition standards the growing of vegetables comes into prominence in Poland. Their plantations occupy 2% of the farming area and contribute with 7.7% to the total value of the agricultural production. The highest share in cultivation shows cabbages (20.5% of the vegetable cultivation area) followed by onions, carrots, red beets, cucumbers and tomatoes (10-12% of the area each). The cultivation of early vegetables under glass and plastic is also of high importance; it takes up 305 thousands sq. metres. In 1992 the commercial production amounted 3.7 mt, the demand of the non-agricultural population figured 3.2 mt and about 0.4 mt was exported. Therefore, the balance was active (about 0.1 mt surplus).

Orchards occupy in Poland 290 thousands ha. There are grown mainly apples, cherries, pears and plums. Since 1985 fruit harvests have been raised by 58% without a great increase of the cultivation area (by 26 thousands ha). The production of sore cherries has grown by 116% and that of apples by 55%.

The animal husbandry constitutes 41.7% of the total production value of the agriculture and 67% of its commercial production value. In the period of 1988 - 1992 remarkable changes took place in stocks. The number of cattle decreased by ca. 2 millions to 8.2 millions, including the 0.55 mln reduction of milk cows (to 4.2 millions). The population of ship dropped away by 2.5 millions to 1.8 millions. At the same time the stock of pigs increased by 2.5 millions and reached 22.1 millions.

The meat production remained almost constant in the period and figured above 3 mt. About 15% of this quantity was used for self-supply of farmers' families. In 1992 the commercial production of meat amounted ca. 2,650 thousands tons and the non-agricultural population consumption took about 2,400 thousands tons. Therefore, there was a 250 thousands tons surplus in the balance of production and consumption. 150 thousands of it was exported and the rest was stored as a reserve. On the other hand Poland imported in 1992 134 thousands tons of meat, including 56 thousands tons of poultry.

The decrease in milk production happened in relation to reduction of diary cattle stock, from 15.9 milliard litres in 1988 to 12.8 milliard litres in 1992. The limited purchase of milk was caused by rebuilding in dairying industry, by financial troubles and by introduction of higher quality standards. There was an important decrease in consumption of milk and its products.

In 1992 the Polish agriculture was affected with drought. The estimated reduction of plant production value amounted 15.4 % and that of animal production - 3% (Woś 1993). In the last decade a rise has been recorded in the number of pest species. 90% of them are invertebrates of foreign origin, mainly insects. In 1989 the mass occurrence of the cucumber aphid (Aphis gossypi) was observed. Serious problems in plant production bring at present *Frankliniella occidentalis* (the pest of vegetable and ornamental plants) and *Liriomyza trifolii*(as the pest of tomatoes). The most destructive pests in agrobiocenoses are both native species (e.g. an insect *Pieris brassicae* on cabbages, a *fungus Phytophtora infestans* on potatoes) and the foreign ones (e.g. *Leptinotarsa decemlineata* - the potato beetle).

There are 65 seed production firms in Poland. Their production potential is much higher than demand of the market. Recently farmers often use their own seed in order to reduce production costs. The certified seed prices are not high

in Poland when compared to those in Western Europe. It is, in part, a result of the government programme subsiding seed production (Oleksiak 1992).

At the present time, the Polish agriculture, based on ca. 18.5 millions ha of farming lands provides 56.0 -65.0 mt of cereal equivalent, whilst about 70 mt are necessary for the optimal alimentation of the population (Michna 1993).

The maintenance of production potential of the Polish agriculture should be the main objective of agricultural policy in the nearest future. It is connected with the protection and stabilization of the agricultural market and with maintenance of the farmers life standards. At the present stage of development the economic goals are focused on improvement of work effectiveness, lowering of unit costs of production and on raising the financial efficiency of agriculture.

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 FLORA OF POLAND

The Polish flora contains over 2,300 species of seed plants (Spermatophyta) classified into 730 genera and 120 families (Pawtowska, 1972). The proportion of trees in our flora is small, especially when compared to the warm climate zone, and amounts 2%. Shrubs constitute 7% of species, the rest are herbaceous plants.

The number of endemic species in the Polish flora is small. The occurrence of 59 endemites and sub-endemites has been stated. The cause of this paucity are the physiographic conditions of the country (lack of the natural barriers separating from the eastern and western neighbouring terrains). On the other hand the flora and fauna were destroyed by the Pleistocene glaciations (Pawtowska, 1972). The majority of endemites occur in mountains. They are related to the Carpathian ridge and are often recorded in the other countries which have these mountains on their territory.

Besides the endemic species the relict ones are of high importance for the biological diversity scale. This kind of species show narrowly defined environmental requirements, related to their origin. Since they are more threatened than the species with broad ecological tolerance.

During the two last centuries 124 plant species became extinct or retreated from their localities, including 29 species of seed plants. The other 30 seed plants are endangered. At the same time at least several hundreds of species entered the territory or were brought in. By evaluating the anthropogenic changes in the Polish flora it is worth of notion that the native species make about 68% of seed plants. The rest constitute those of foreign origin. Almost 16% of them are archaeophytes. A remarkable part of them is in extinction resulting from recent alterations in the traditional farming.

The present-day composition of our flora is a constantly changing, dynamic set of species of different origin, settled in different periods. It makes difficult to define the level of changes that happened. On the "List of plants endangered

in Poland"(Zarzycki, Szeląg 1992) figured 418 species, viz. 19% of the flora (tab. 1). In the western countries this proportion exceeds 30% (Landolt, 1991).

The Polish ecosystems (both natural and agricultural ones) have been subjected to less intense genetic erosion than in other European countries.

Table 1. Provisional list of protected plants, crop plants and their wild relative in Poland - threats and method of protection. (Andrzejewski, Weigle 1991; Gorczyński et al. 1961 Podbielkowski 1985; Szafer et al. 1969; Zarzycki, Szelag 1992; Zohary, Heywood 1993)

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Abies alba	*Pinaceae*										1	+	+
Acer campestre	*Aceraceae*										3	+	+
Acer negundo	*Aceraceae*											+	
Acer platanoides	*Aceraceae*										3	+	+
Acer pseudoplatanus	*Aceraceae*										2	+	+
Achillea asplenifolia	*Compositae*									R			
Achillea millefolium	*Compositae*											+	+
Achillea nobilis	*Compositae*									R			
Achillea ptarmica	*Compositae*											+	+
Achillea stricta	*Compositae*									R			
Aconitum gracile	*Ranunculaceae*			+			+						
Aconitum jacquini	*Ranunculaceae*			+			+						
Aconitum lasiostomum	*Ranunculaceae*	+		+			+						
Aconitum moldavicum	*Ranunculaceae*			+			+						
Aconitum napellus	*Ranunculaceae*											+	
Aconitum paniculatum	*Ranunculaceae*			+			+						
Aconitum tauricum	*Ranunculaceae*	+		+			+			E			
Aconitum variegatum	*Ranunculaceae*			+			+						
Aconitum vulparia	*Ranunculaceae*			+			+			R			
Acorus calamus	*Araceae*											+	
Adenophora liliifolia	*Campanulaceae*									V			
Adonis flammea	*Ranunculaceae*									E			
Adonis vernalis	*Ranunculaceae*			+		+	+					+	+
Aegopodium podagraria	*Umbelliferae*											+	+
Aesculus hippocastanum	*Hippocastanaceae*											+	
Agrimonia eupatoria	*Rosaceae*											+	+
Agropyron junceum	*Gramineae*									E			
Agropyron repens	*Gramineae*											+	+
Ajuga chia	*Labiatae*									R			
Aldrovanda vesiculosa	*Droseraceae*									V			
Allisma gramineum	*Alismataceae*									R			
Allium carinatum	*Liliaceae*									I			
Allium cepa	*Liliaceae*											+	
Allium porrum	*Liliaceae*											+	
Allium sativum	*Liliaceae*											+	
Allium scorodoprasum	*Liliaceae*									R			
Allium sibiricum	*Liliaceae*									R		+	+
Allium strictum	*Liliaceae*									Ex			

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4, 1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Alnus glutinosa	*Betulaceae*										2	+	+
Alnus incana	*Betulaceae*											+	+
Alnus viridis	*Betulaceae*										2		
Alopecurus pratensis	*Gramineae*											+	+
Althaea officinalis	*Malvaceae*											+	+
Amaranthus hybridus	*Amaranthaceae*											+	
Ammophila areniaria	*Gramineae*											+	+
Anacamptis pyramidalis	*Orchidaceae*			+			+			Ex			
Androsace obtusifolia	*Primulaceae*									R			
Anemone narcissiflora	*Ranunculaceae*					+	+						
Anemone sylvestris	*Ranunculaceae*					+	+						
Angelica palustris	*Umbelliferae*									E			
Angelica silvestris	*Umbelliferae*											+	+
Antennaria dioica	*Compositae*											+	+
Anthericum liliago	*Liliaceae*			+		+	+			R			
Anthoxanthum odoratum	*Gramineae*											+	+
Anthriscus cerefolium	*Umbelliferae*											+	+
Anthylis vulneraria	*Papilionaceae*											+	+
Aphanes microcarpa	*Rosaceae*									R			
Apium graveolens	*Umbelliferae*											+	+
Apium inundatum	*Umbelliferae*									Ex			
Apium nodiflorum	*Umbelliferae*									E			
Apium repens	*Umbelliferae*									V			
Aquilegia vulgaris	*Ranunculaceae*					+	+					+	+
Arabis auriculata	*Cruciferae*									V			
Archangelica officinalis	*Umbelliferae*					+	+					+	+
Arctium lappa	*Compositae*											+	+
Arctium minus	*Compositae*											+	+
Arctium tomentosum	*Compositae*											+	+
Arctostaphylos uva-ursi	*Ericaceae*					+		+				+	+
Armeria halleri	*Plumbaginaceae*									R			
Armoracia lapthifolia	*Cruciferae*											+	+
Arnica montana	*Compositae*		+			+	+					+	+
Arrhenatherum elatius	*Gramineae*											+	+
Artemisia abrotanum	*Compositae*											+	+
Artemisia absinthium	*Compositae*									R		+	+
Artemisia eriantha	*Compositae*									R			
Artemisia pontica	*Compositae*									R			

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
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1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Artemisia vulgaris	*Compositae*											+	+
Aruncus sylvestris	*Rosaceae*					+	+					+	+
Asarum europaeum	*Aristolochiaceae*					+		+				+	+
Asclepias syriaca	*Asclepiadaceae*											+	
Asparagus officinalis	*Liliaceae*											+	+
Asparagus sprengeri	*Liliaceae*											+	
Asparagus tenuifolius	*Liliaceae*									I			
Asperula odorata	*Rubiaceae*					+		+				+	+
Asplentum adiantum-nigrum	*Polypodiaceae*									Ex			
Asplenium adulterinum	*Polypodiaceae*									R			
Asplenium cuneifolium	*Polypodiaceae*									R			
Asplenium onopteris	*Polypodiaceae*									R			
Aster tripolium	*Compositae*									V			
Astralagus australis	*Papilionaceae*									R			
Astralagus frigidus	*Papilionaceae*									R			
Astralagus pendulíflorus	*Papilionaceae*									V			
Atriplex calotheca	*Chenopodiaceae*									E			
Atriplex glabriuscula	*Chenopodiaceae*									R			
Atriplex hortense	*Chenopodiaceae*											+	
Atriplex littoralis	*Chenopodiaceae*									R			
Atriplex longipes	*Chenopodiaceae*									R			
Atropa bella-donna	*Solanaceae*					+		+				+	+
Avena nuda	*Gramineae*											+	
Avena sativa	*Gramineae*											+	
Avena strigosa	*Gramineae*											+	+
Azalea pontica (Rhododendron flavum)	*Ericaceae*		+	+		+	+			V		+	+
Baldellia ranunculoides	*Alismataceae*									E			
Bellis perennis	*Compositae*											+	+
Berberis vulgaris	*Berberidaceae*											+	+
Beta vulgaris	*Chenopodiaceae*											+	+
Betonica officinalis	*Labiatae*											+	+
Betula humilis	*Betulaceae*		+	+	+		+			V			
Betula nana	*Betulaceae*				+		+			V			
Betula oycoviensis	*Betulaceae*			+			+			V			
Betula pendula	*Betulaceae*										3	+	
Betula pubescens	*Betulaceae*										2	+	+
Betula szaferi	*Betulaceae*									R			
Betula verrucosa	*Betulaceae*										3	+	+

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1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Bidens tripartitus	*Compositae*											+	+
Blechnum spicant	*Polypodiaceae*					+	+						
Blysmus rufus	*Cyperaceae*									V			
Borago officinalis	*Boraginaceae*											+	
Botrychium lanceolatum	*Ophioglossaceae*									Ex			
Botrychium matricariifolium	*Ophioglossaceae*									V			
Botrychium multifidum	*Ophioglossaceae*									V			
Botrychium simplex	*Ophioglossaceae*									E			
Botrychium virginianum	*Ophioglossaceae*									Ex			
Brasica napus	*Cruciferae*											+	+
Brasica nigra	*Cruciferae*											+	
Brasica rapa	*Cruciferae*											+	+
Brassica nigra	*Cruciferae*											+	+
Brassica oleracea	*Cruciferae*											+	
Bromus inermis	*Gramineae*											+	+
Bromus racemosus	*Gramineae*									V			
Bryonia alba	*Cucurbitaceae*											+	
Bryonia dioica	*Cucurbitaceae*											+	
Buglossoides purpurocaerulea	*Boraginaceae*									R			
Bupleurum rotundifolium	*Umbelliferae*									E			
Bupleurum tenuissimum	*Umbelliferae*									E			
Caldesia parnassiflora	*Alistmataceae*									E			
Calendula officinalis	*Compositae*											+	
Callianthemum coriandrifolium	*Ranunculaceae*									R			
Callitriche stagnalis	*Callitrichaceae*									I			
Calluna vulgaris	*Ericaceae*											+	+
Camelina alyssum	*Cruciferae*									Ex			
Camelina sativa	*Cruciferae*											+	+
Campanula barbata	*Campanulaceae*									V			
Campanula corcontica	*Campanulaceae*									R			
Campanula latifolia	*Campanulaceae*									R			
Campanula rapunculus	*Campanulaceae*											+	
Campanula scheuchzerii	*Campanulaceae*									R			
Campanula serrata	*Campanulaceae*									V			
Cannabis sativa	*Cannabaceae*											+	
Capsella bursa pastoris	*Cruciferae*											+	+
Cardamine parviflora	*Cruciferae*									R			
Cardamine pratensis	*Cruciferae*											+	+

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4, 1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Cardamine resedifolia	*Cruciferae*									R			
Carduus lobulatus	*Compositae*									R			
Carex arenaria	*Cyperaceae*				+			+				+	+
Carex athorodes	*Cyperaceae*									R			
Carex bohemica	*Cyperaceae*									V			
Carex brunescens	*Cyperaceae*									I			
Carex buekii	*Cyperaceae*									I			
Carex buxbaumii	*Cyperaceae*									V			
Carex chordorhiza	*Cyperaceae*									V			
Carex dacica	*Cyperaceae*									R			
Carex davalliana	*Cyperaceae*									V			
Carex disperma	*Cyperaceae*									V			
Carex divulsa	*Cyperaceae*									R			
Carex extensa	*Cyperaceae*									Ex			
Carex globularis	*Cyperaceae*									R			
Carex heleonastes	*Cyperaceae*									V			
Carex lachenalii	*Cyperaceae*									R			
Carex ligerica	*Cyperaceae*									R			
Carex limosa	*Cyperaceae*									V			
Carex loliacea	*Cyperaceae*									R			
Carex mocroglochin	*Cyperaceae*									Ex			
Carex parviflora	*Cyperaceae*									R			
Carex pauciflora	*Cyperaceae*									V			
Carex paupercula	*Cyperaceae*									V			
Carex pediformis	*Cyperaceae*									V			
Carex pseudobrizoides	*Cyperaceae*									V			
Carex pulicaris	*Cyperaceae*									V			
Carex punctata	*Cyperaceae*									I			
Carex repens	*Cyperaceae*									R			
Carex rupestris	*Cyperaceae*									R			
Carex secalina	*Cyperaceae*									Ex			
Carex stenophylla	*Cyperaceae*									R			
Carex strigosa	*Cyperaceae*									V			
Carex supina	*Cyperaceae*									R			
Carex umbrosa	*Cyperaceae*									R			
Carex vaginata	*Cyperaceae*									V			
Carlina acaulis	*Compositae*			+		+	+	+				+	+
Carlina onopordifolia	*Compositae*					+	+			V			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Carpinus betulus	*Betulaceae*											+	+
Carum carvi	*Umbelliferae*											+	+
Castanea sativa	*Fagaceae*											+	
Centaurea cyanus	*Compositae*											+	+
Centaurea kotschyana	*Compositae*									R			
Centaurea melanocalathia	*Compositae*									I			
Centaurea pannonica	*Compositae*									I			
Centaurea triumfetti	*Compositae*									R			
Centaurium litorale	*Gentianaceae*									V			
Centaurium umbellatum	*Gentianaceae*					+		+				+	+
Cephalanthera alba	*Orchidaceae*				+	+	+			R			
Cephalanthera logifolia	*Orchidaceae*			+	+	+	+			V			
Cephalanthera rubra	*Orchidaceae*									E			
Cerastium alpinum	*Caryophyllaceae*									R			
Cerastium brachypetalum	*Caryophyllaceae*									V			
Cerastium dubium	*Caryophyllaceae*									R			
Cerasus avium	*Rosaceae*										3	+	+
Cerasus fruticosa	*Rosaceae*			+			+					+	+
Cerasus mahaleb	*Rosaceae*											+	
Cerasus vulgaris	*Rosaceae*											+	
Ceratophyllum demerosum ssp.plathyc	*antum Caryophyllaceae*									I			
Chaerophyllum bulbosum	*Umbelliferae*											+	+
Chamaecystius albus	*Papilionaceae*									R			
Chamaedaphne calyculata	*Ericaceae*			+	+		+			V			
Chamaeorchis alpina	*Orchidaceae*			+			+			R			
Chelidonium majus	*Papaveraceae*											+	+
Chenopodium ambrosioides	*Chenopodiaceae*											+	
Chenopodium album	*Chenopodiaceae*											+	+
Chenopodium bonus-henricus	*Chenopodiaceae*											+	+
Chenopodium foliosum	*Chenopodiaceae*											+	+
Chimaphila umbellata	*Pirolaceae*					+	+						
Chrysanthemum parthenium	*Compositae*											+	+
Chrysosplenium oppositifolium	*Saxifragaceae*									R			
Cichorium intybus	*Compositae*											+	+
Cicuta virosa	*Umbelliferae*											+	+
Cimicifuga europaea	*Ranunculaceae*				+		+						
Cirsium decussatum	*Compositae*									R			
Cirsium pannonicum	*Compositae*						+						

Fields:
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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Cirsium waldsteinii	*Compositae*									R			
Clematis recta	*Ranunculaceae*					+	+						
Clematis vitalba	*Ranunculaceae*											+	+
Cnidium dubium	*Umbelliferae*									V			
Cochlearia officinalis	*Cruciferae*											+	+
Cochlearia polonica	*Cruciferae*			+			+			Ex			
Cochlearia tatrae	*Cruciferae*									R			
Coeloglossum viride	*Orchidaceae*					+	+			V			
Colchicum autumnale	*Liliaceae*			+		+		+				+	+
Colutea arborescens	*Papilionaceae*											+	
Conium maculatum	*Umbelliferae*											+	+
Conrigia orientalis	*Cruciferae*									E			
Consolida regalis	*Ranunculaceae*											+	+
Convallaria maialis	*Liliaceae*					+		+				+	+
Corallorhiza trifida	*Orchidaceae*					+	+			V			
Cornus mas	*Cornacae*											+	
Cornus suecica	*Cornaceae*									Ex			
Coronilla varia	*Papilionaceae*											+	+
Corrigiola litoralis	*Caryophyllaceae*									V			
Cortusa matthioli	*Primulaceae*									R			
Corydalis pumila	*Papaveraceae*									R			
Corylus avellana	*Betulaceae*											+	+
Cotinus coggygria	*Anacardiaceae*											+	
Cotoneaster nabrodensis	*Rosaceae*									R			
Crambe maritima	*Cruciferae*											+	+
Crassula aqatica	*Crassulaceae*									Ex			
Crataegus monogyna	*Rosaceae*											+	+
Crategus macrocarpa	*Rosaceae*									R			
Crategus palmstruchii	*Rosaceae*									R			
Crocus scepusiensis	*Iridaceae*			+		+	+					+	+
Cryptogramma crispa	*Polypodiaceae*									V			
Cucurbita maxima	*Cucurbitaceae*											+	
Cucurbita pepo	*Cucurbitaceae*											+	
Cuscuta epilinum	*Cuscutaceae*									Ex			
Cyclamen europaeum	*Primulaceae*											+	+
Cynoglossum officinale	*Boraginaceae*											+	+
Cynosurus cristatus	*Gramineae*											+	+
Cyperus michelianus.	*Cyperaceae*									Ex			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Cypripedium calceolus	*Orchidaceae*				+	+	+			V			
Cytisus albus	*Papilionaceae*						+						
Dactylis glomerata	*Gramineae*											+	+
Dactylorhiza baltica	*Orchidaceae*									V			
Dactylorhiza cordigera	*Orchidaceae*									I			
Dactylorhiza cruenta	*Orchidaceae*									V			
Dactylorhiza fuchsii	*Orchidaceae*									V			
Dactylorhiza lapponica	*Orchidaceae*									V			
Dactylorhiza maculata	*Orchidaceae*									V			
Dactylorhiza praetermissa	*Orchidaceae*									V			
Dactylorhiza russowii	*Orchidaceae*									V			
Dactylorhiza sambucina	*Orchidaceae*									V			
Dactylorhiza traunsteineri	*Orchidaceae*									V			
Daphne cneorum	*Thymelaeaceae*			+		+	+			V			
Daphne mezereum	*Thymelaeaceae*			+	+		+					+	+
Datura stramonium v. stramonium	*Solanaceae*											+	+
Daucus carota	*Umbelliferae*											+	+
Delphinium ajacis	*Ranunculaceae*											+	
Delphinium elatum	*Ranunculaceae*											+	+
Deschampsia setacea	*Gramineae*									Ex			
Dianthus arenarius	*Caryophyllaceae*					+	+					+	+
Dianthus armeria	*Caryophyllaceae*					+	+						
Dianthus caesius	*Caryophyllaceae*					+	+					+	+
Dianthus compactus	*Caryophyllaceae*					+	+						
Dianthus glabriusculus	*Caryophyllaceae*					+	+			Ex			
Dianthus glacialis	*Caryophyllaceae*					+	+					+	+
Dianthus gratianopolitanus	*Caryophyllaceae*									R			
Dianthus nitidus	*Caryophyllaceae*					+	+			Ex		+	+
Dianthus praecox	*Caryophyllaceae*					+	+						
Dianthus pseudoserotinus	*Caryophyllaceae*					+	+						
Dianthus speciosus	*Caryophyllaceae*					+	+						
Dianthus superbus	*Caryophyllaceae*					+	+						
Diantus barbatus	*Caryophyllaceae*											+	+
Dictamnus albus	*Rutaceae*			+			+			V		+	+
Dictamnus albus var.rosea	*Rutaceae*											+	+
Digitalis grandiflora	*Scrophulariaceae*					+	+					+	+
Digitalis purpurea	*Scrophulariaceae*					+		+				+	+
Digitaria sanguinalis	*Gramineae*											+	+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Diphasium issleri	*Lycopodiaceae*									V			
Diphasium tristachyum	*Lycopodiaceae*									V			
Dipsacus silvester	*Dipsacaceae*											+	+
Doronicum austriacum	*Compositae*					+	+						
Dorycnium germanicum	*Papilionaceae*									R			
Dorycnium herbaceum	*Papilionaceae*									R			
Draba dubia	*Cruciferae*									I			
Draba tomentosa	*Cruciferae*									R			
Dracocephalum ruyschiana	*Labiatae*									V			
Drosera angelica	*Droseraceae*									V			
Drosera anglica	*Droseraceae*			+	+		+						
Drosera intermedia	*Droseraceae*			+	+		+			V			
Drosera rotundifolia	*Droseraceae*			+	+		+			R		+	+
Dryopteris cristata	*Polypodiaceae*									V			
Dryopteris villarii	*Polypodiaceae*									R			
Echinochloa crus-galli	*Gramineae*											+	+
Echinops sphaerocephalus	*Compositae*											+	+
Echium rubrum	*Boraginaceae*					+	+						
Echium russicum	*Boraginaceae*									V			
Elatine alsinastrum	*Elatinaceae*									E			
Elatine hexandra	*Elatinaceae*									E			
Elatine triandra	*Elatinaceae*									E			
Eleocharis multicaulis	*Cyperaceae*									E			
Eleocharis ovata	*Cyperaceae*									V			
Eleocharis parvula	*Cyperaceae*									E			
Epipactis atropurpurea	*Orchidaceae*					+	+						
Epipactis latifolia	*Orchidaceae*					+	+						
Epipactis microphylla	*Orchidaceae*					+	+			E			
Epipactis palustris	*Orchidaceae*					+	+			V			
Epipactis purpurata	*Orchidaceae*									R			
Epipactis sessilifolia	*Orchidaceae*					+	+						
Epipogium aphyllum	*Orchidaceae*				+	+	+			V			
Equisetum arvense	*Equisetaceae*											+	+
Equisetum maximum	*Equisetaceae*				+		+						
Erica tetralix	*Ericaceae*		+	+	+		+						
Erigeron alpinus	*Compositae*									V			
Erigeron droebachiensis	*Compositae*									R			
Erigeron macrophyllus	*Compositae*									R			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Erigeron nanus	*Compositae*									R			
Erigeron uniflorus	*Compositae*									R			
Erodium cicutarium	*Geraniaceae*											+	+
Eruca sativa	*Cruciferae*											+	
Eryngium maritimum	*Umbelliferae*			+			+						
Erysimum cheiranthoides	*Cruciferae*											+	+
Erysimum pieninicum	*Cruciferae*									V			
Eupatorium cannabinum	*Compositae*											+	+
Euphorbia epithymoides	*Euphorbiaceae*									R			
Euphrasia minima	*Scrophulariaceae*									R			
Fagopyrum esculentum	*Polygonaceae*											+	
Fagopyrum tataricum	*Polygonaceae*											+	
Fagus silvatica	*Fagaceae*										1	+	+
Festuca amethystina	*Gramineae*									V			
Festuca macrutrensis	*Gramineae*									R			
Festuca pratensis	*Gramineae*											+	+
Festuca pseudodalmatica	*Gramineae*									R			
Festuca pseudovina	*Gramineae*									R			
Festuca rubra	*Gramineae*											+	+
Filipendula ulmaria	*Rosaceae*											+	+
Fragaria vesca	*Rosaceae*											+	+
Fragaria viridis	*Rosaceae*											+	+
Frangula alnus	*Rhamnaceae*					+		+				+	+
Fraxinus excelsior	*Oleaceae*										2	+	+
Fritillaria meleagris	*Lilliaceae*			+	+	+	+			V		+	+
Fumaria officinalis	*Papaveraceae*											+	+
Gagea spathacea	*Liliaceae*									V			
Gagea vilosa	*Liliaceae*									R			
Galanthus nivalis	*Amaryllidaceae*			+		+	+					+	+
Galega officinalis	*Papilionaceae*											+	+
Galium Valdepilosum	*Rubiaceae*									R			
Galium cracoviense	*Rubiaceae*									R			
Galium sudeticum	*Rubiaceae*									R			
Genista germanica	*Papilionaceae*											+	+
Genista tinctoria	*Papilionaceae*											+	+
Genitana asclepiadea	*Gentianaceae*					+		+					
Gentiana amarella	*Gentianaceae*				+	+	+			V			
Gentiana baltica	*Gentianaceae*			+		+	+			E			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Gentiana campestris	*Gentianaceae*			+		+	+			E			
Gentiana ciliata	*Gentianaceae*			+		+	+						
Gentiana clusii	*Gentianaceae*			+		+	+						
Gentiana cruciata	*Gentianaceae*					+	+						
Gentiana frigida	*Gentianaceae*	+			+	+	+						
Gentiana lutea	*Gentianaceae*					+	+					+	+
Gentiana nivalis	*Gentianaceae*			+		+	+						
Gentiana orbicularis	*Gentianaceae*			+		+	+						
Gentiana pneumonanthe	*Gentianaceae*				+	+	+			V			
Gentiana praecox	*Gentianaceae*			+		+	+						
Gentiana punctata	*Gentianaceae*			+		+	+						
Gentiana pyrenaica	*Gentianaceae*					+	+						
Gentiana tenella	*Gentianaceae*					+	+			V			
Gentiana uliginosa	*Gentianaceae*			+	+	+	+			V			
Gentiana verna	*Gentianaceae*			+		+	+						
Gentiana wettsteinii	*Gentianaceae*			+		+	+						
Geranium bohemicum	*Geraniaceae*									Ex			
Geranium divaricatum	*Geraniaceae*									I			
Geum urbanum	*Rosaceae*											+	+
Gladiolus felicis	*Iridaceae*									Ex			
Gladiolus imbricatus	*Iridaceae*				+	+	+					+	+
Gladiolus palustris	*Iridaceae*				+	+	+					+	+
Glaux maritima	*Primulaceae*				+		+						
Glechoma hederacea	*Labiatae*											+	+
Glyceria fluitans	*Gramineae*											+	+
Gnaphalium uliginosum	*Compositae*											+	+
Goodyera repens	*Orchidaceae*					+	+						
Gratiola officinalis	*Scrophulariaceae*											+	+
Groenlandia densa	*Potamogetonaceae*									E			
Gymnadenia conopea	*Orchidaceae*					+	+						
Gymnadenia odoratissima	*Orchidaceae*						+						
Gypsophila paniculata	*Caryophyllaceae*						+					+	+
Halimione pedunculata	*Chenopodiaceae*									Ex			
Hammarbya paludosa	*Orchidaceae*									V			
Hedera helix	*Araliaceae*					+	+					+	+
Helianthemum rupifragum	*Cistaceae*									R			
Heliantus tuberosus	*Compositae*											+	+
Helichrysum arenarium	*Compositae*				+	+		+				+	+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Helleborus purpurascens	*Ranunculaceae*									R			
Helleborus viridis	*Ranunculaceae*											+	
Hepatica nobilis	*Ranunculaceae*											+	+
Herminium monerchis	*Orchidaceae*				+		+			E			
Herniaria glabra	*Caryophyllaceae*											+	+
Hesperis matronalis	*Cruciferae*									R		+	+
Hesperis nivea	*Cruciferae*									R			
Hieracium racemosum	*Compositae*									I			
Hierochloe australis	*Gramineae*					+		+		R			
Hierochloe odorata	*Gramineae*					+	+			R		+	+
Hippophae rhamnoides	*Elaeagnaceae*					+	+					+	+
Hordeum vulgare	*Gramineae*											+	
Heracleum sphondylium	*Umbelliferae*											+	+
Humulus lupulus	*Cannabaceae*											+	+
Hydrilla verticillata	*Hydrocharitaceae*									R			
Hyoscyamus niger	*Solanaceae*											+	+
Hypericum elegans	*Guttiferae*									R			
Hypericum perforatum	*Guttiferae*											+	+
Hyssopus officinalis	*Labiatae*											+	+
Inula germanica	*Compositae*									Ex			
Inula helenium	*Compositae*											+	
Iris aphylla	*Iridaceae*			+		+	+			E			
Iris graminea	*Iridaceae*			+		+	+			Ex			
Iris pseudacorus	*Iridaceae*											+	+
Iris sibirica	*Iridaceae*					+	+			V			
Isatis tinctoria	*Cruciferae*											+	+
Isoetes echinospora	*Isoetaceae*		+		+		+			E			
Isoetes lacustris	*Isoetaceae*		+		+		+			V			
Isolepis supina	*Cyperaceae*									Ex			
Juncus acutiflorus	*Juncaceae*									R			
Juncus atratus	*Juncacae*									V			
Juncus stygius	*Juncaceae*									Ex			
Juncus subnodulosus	*Juncaceae*									V			
Juncus tenagea	*Juncaceae*									R			
Juncus triglumis	*Juncaceae*									V			
Juniperus communis	*Cupressaceae*											+	+
Juniperus sabina	*Cupressaceae*									R		+	+
Lactuca saligna	*Compositae*												+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Lactuca sativa	*Compositae*											+	
Lactuca serriola	*Compositae*											+	+
Lactuca virosa	*Compositae*											+	
Lamium album	*Labiatae*											+	+
Larix decidua	*Pinaceae*										2	+	+
Larix kaempferi	*Pinaceae*										4	+	
Laserpitium archangelica	*Umbelliferae*									R			
Lathyrus laevigatus	*Papilionaceae*					+	+						
Lathyrus latifolius	*Papilionaceae*									R		+	+
Lathyrus niger	*Papilionaceae*											+	+
Lathyrus nissolia	*Papilionaceae*									R			
Lathyrus palustris	*Papilionaceae*									V			
Lathyrus pannonicus	*Papilionaceae*									V			
Lathyrus pisiformis	*Papilionaceae*									R			
Ledum palustre	*Ericaceae*					+		+				+	+
Leontopodium alpinum	*Compositae*				+	+	+						
Leonurus cardiaca	*Labiatae*											+	+
Lepidium sativum	*Cruciferae*											+	
Leucoium vernum	*Amaryllidaceae*	+		+		+	+			V			
Leucojum vernum var.carpaticum	*Amaryllidaceae*												+
Leucorchis albida	*Orchidaceae*			+			+						
Levisticum officinale	*Umbelliferae*											+	
Ligularia sibirica	*Compositae*									E			
Ligustrum vulgare	*Oleaceae*											+	+
Lilium bulbiferum	*Liliaceae*									V		+	+
Lilium martagon	*Liliaceae*			+		+	+	+				+	+
Limnanthemum nympoides	*Menyanthaceae*		+			+	+						
Linaria loeselii	*Scrophulariaceae*									V			
Linaria vulgaris	*Scrophulariaceae*											+	+
Lindernia procumbens	*Scrophulariaceae*									E			
Linnaea borealis	*Caprifoliaceae*		+				+						
Linosyris vulgaris	*Compositae*				+		+						
Linum austriacum	*Linaceae*									R			
Linum flavum	*Linaceae*					+	+						
Linum hirsutum	*Linaceae*					+	+			V			
Linum usitatissimum	*Linaceae*											+	
Liparis loeselii	*Orchidaceae*				+		+			V			
Listera cordata	*Orchidaceae*					+	+						

Fields:
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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Listera ovata	*Orchidaceae*					+	+						
Litorella uniflora	*Plantaginaceae*									R			
Lobelia Dortmanna	*Lobeliaceae*		+		+		+			V			
Lolium multiflorum	*Gramineae*											+	
Lolium perenne	*Gramineae*											+	+
Lolium remotum	*Gramineae*									E			
Lonicera caprifolium	*Caprifoliaceae*											+	
Lonicera periclymenum	*Capriofoliaceae*			+	+		+						+
Lotus corniculatus	*Papilionaceae*											+	+
Lotus uliginosus	*Papilionaceae*											+	+
Ludwigia palustris	*Onagraceae*									Ex			
Lupinus polyphyllus	*Papilionaceae*											+	
Luronium natans	*Alistmataceae*									V			
Lycopodiella inundata	*Lycopodiaceae*									V			
Lycopodium alpinum	*Lycopodiaceae*					+	+						
Lycopodium annotinum	*Lycopodiaceae*					+	+						
Lycopodium clavatum	*Lycopodiaceae*					+	+					+	+
Lycopodium complanatum	*Lycopodiaceae*					+	+						
Lycopodium inundatum	*Lycopodiaceae*					+	+						
Lycopodium selago	*Lycopodiaceae*					+	+						
Lycopodium trystachyum	*Lycopodiaceae*					+	+						
Lythrum hyssopifolia	*Lythraceae*									V			
Lythrum salicaria	*Lythraceae*											+	+
Lythrum virgatum	*Lythraceae*									I			
Malaxis monophyllos	*Orchidaceae*									R			
Malaxis paludosa	*Orchidaceae*				+		+						
Malus domestica	*Rosaceae*											+	
Malus silvestris	*Rosaceae*											+	+
Malva silvestris	*Malvaceae*											+	+
Marrubium vulgare	*Labiatae*											+	+
Marsilea quadrifolia	*Marsileaceae*									Ex			
Matricaria chamomilla	*Compositae*											+	+
Matteucia struthiopteris	*Polypodiaceae*					+	+						
Matthiola incana	*Cruciferae*											+	
Medicago falcata	*Papilionaceae*											+	+
Medicago lupulina	*Papilionaceae*											+	+
Medicago sativa	*Papilionaceae*											+	+
Melampyrum cristatum	*Scrophulariaceae*									R			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Melampyrum saxosum	*Scrophulariaceae*									R			
Melica ciliata	*Gramineae*									I			
Melilotus albus	*Papilionaceae*											+	+
Melilotus officinalis	*Papilionaceae*											+	+
Melissa officinalis	*Labiatae*											+	
Mentha aquatica	*Labiatae*											+	+
Mentha spicata	*Labiatae*											+	+
Menyathes trifoliata	*Menyanthaceae*											+	+
Microstylis monophyllos	*Orchidaceae*				+		+						
Minuartia setacea	*Caryophyllaceae*									R			
Muscari botryoides	*Liliaceae*					+	+					+	
Muscari comosum	*Liliaceae*			+			+			R		+	+
Myosotis praecox	*Boraginaceae*									R			
Myosotis stenophylla	*Boraginaceae*									Ex			
Myrica gale	*Myricaceae*		+				+						
Najas flexilis	*Najadaceae*									V			
Najas minor	*Najadaceae*									V			
Nasturtium microphyllum	*Cruciferae*									R			
Nasturtium officinale	*Cruciferae*											+	+
Neottia nidus-avis	*Orchidaceae*				+	+	+						
Neottianthe cucullata	*Orchidaceae*			+			+			V			
Nigella sativa	*Ranunculaceae*											+	+
Nigritella nigra	*Orchidaceae*						+						
Nuphar lutea	*Nymphaeaceae*				+	+	+					+	+
Nuphar pumila	*Nymphaeaceae*				+		+						
Nymphaea alba	*Nymphaeaceae*				+	+						+	+
Nymphaea candida	*Nymphaeaceae*				+	+		+					
Nymphoides peltata	*Menyanthaceae*									V			
Oenanthe lachenalii	*Umbelliferae*									E			
Onobrychis montana	*Papilionaceae*									R			
Onobrychis viciifolia	*Papilionaceae*											+	+
Ononis spinosa	*Papilionaceae*					+		+				+	+
Ophioglossum azoricum	*Ophioglossaceae*									V			
Ophrys insectifera	*Orchidaceae*									R			
Ophrys muscifera	*Orchidaceae*			+			+						
Orchis cordigera	*Orchidaceae*					+	+					+	+
Orchis coriophora	*Orchidaceae*			+			+			E		+	+
Orchis incarnata	*Orchidaceae*					+	+					+	+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Orchis latifolia	*Orchidaceae*					+	+					+	+
Orchis maculata	*Orchidaceae*				+	+	+					+	+
Orchis mascula	*Orchidaceae*			+			+			V		+	+
Orchis militaris	*Orchidaceae*				+	+	+			V		+	+
Orchis morio	*Orchidaceae*				+	+	+			V		+	+
Orchis pallens	*Orchidaceae*			+			+			V		+	+
Orchis palustris	*Orchidaceae*			+	+		+			V		+	+
Orchis purpurea	*Orchidaceae*			+		+	+			V		+	+
Orchis russowii	*Orchidaceae*					+	+					+	+
Orchis sambucina	*Orchidaceae*			+			+					+	+
Orchis traunsteineri	*Orchidaceae*				+	+	+					+	+
Orchis tridentata	*Orchidaceae*			+			+			Ex		+	+
Orchis ustulata	*Orchidaceae*				+	+	+			E		+	+
Origanum vulgare	*Labiatae*											+	+
Ornithogalum dalmaticum	*Liliaceae*									R			
Ornithogalum gussonei	*Liliaceae*				+		+						
Ornithogalum kochii	*Liliaceae*									R			
Ornithogalum umbellatum	*Liliaceae*			+	+		+						
Ornithopus sativus	*Papilionaceae*											+	+
Orobanche alsatica	*Orobanchaceae*									R			
Orobanche arenaria	*Orobanchaceae*									Ex			
Orobanche coerulescens	*Orobanchaceae*									Ex			
Orobanche elatior	*Orobanchaceae*									I			
Orobanche gracilis	*Orobanchaceae*									I			
Orobanche minor	*Orobanchaceae*									I			
Orobanche picridis	*Orobanchaceae*									E			
Orobanche purpurea	*Orobanchaceae*									R			
Orobanche ramosa	*Orobanchaceae*									R			
Orobanche reticulata	*Orobanchaceae*									R			
Orobanche teucrii	*Orobanchaceae*									I			
Osmunda regalis	*Osmundaceae*				+	+	+			V			
Oxycoccus microcarpus	*Ericaceae*									V			
Oxytropis campestris	*Papilionaceae*									R			
Oxytropis carpatica	*Papilionaceae*									I			
Oxytropis halleri	*Papilionaceae*									I			
Oxytropis pilosa	*Papilionaceae*						+						
Padus avium	*Rosaceae*											+	
Padus serotina	*Rosaceae*											+	

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Panicum miliaceum	*Gramineae*											+	
Papaver rhoeas	*Papaveraceae*											+	+
Papaver somniferum	*Papaveraceae*											+	
+	*Urticaceae*											+	+
Pastinaca opaca	*Umbelliferae*									I			
Pastinaca sativa	*Umbelliferae*											+	+
Pedicularis exaltata	*Scrophulariaceae*									I			
Pedicularis hacquetii	*Scrophulariaceae*									R			
Pedicularis sceptrum-carolinum	*Scrophulariaceae*		+			+	+			V			
Pedicularis sudetica	*Scrophulariaceae*									V			
Pedicularis sylvatica	*Scrophulariaceae*					+	+						
Petasites hybridus	*Compositae*											+	+
Phacelia tanacetifolia	*Hydrophyllaceae*											+	
Phalaris arundinacea	*Gramineae*											+	+
Phaseolus cocineus	*Papilionaceae*											+	
Phaseolus vulgaris	*Papilionaceae*											+	
Phalaris canariensis	*Gramineae*											+	
Phleum pratense	*Gramineae*											+	+
Phyllitis scolopendrium	*Polypodiaceae*				+	+	+						
Physalis Alkekengi	*Solanaceae*											+	+
Phyteuma orbiculare	*Campanulaceae*					+	+						
Picea abies	*Pinaceae*										1	+	+
Pilularia globulifera	*Marsileaceae*									E			
Pimpinella major	*Umbelliferae*											+	+
Pimpinella saxifraga	*Umbelliferae*											+	+
Pinguicula vulgaris	*Lentibulariaceae*									E			
Pinus cembra	*Pinaceae*			+			+				2	+	+
Pinus mughus	*Pinaceae*			+			+						
Pinus mugo	*Pinaceae*										2		
Pinus nigra	*Pinaceae*										4	+	
Pinus strobus	*Pinaceae*										4	+	
Pinus sylvestris	*Pinaceae*										1	+	+
Pinus uliginosa	*Pinaceae*		+		+		+			V			
Pisum sativum	*Papilionaceae*											+	
Plantago atrata	*Plantaginaceae*									R			
Plantago coronopus	*Plantaginaceae*									E			
Plantago lanceolata	*Plantaginaceae*											+	+
Plantago major	*Plantaginaceae*											+	+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Platanthera bifolia	*Orchidaceae*					+	+						
Platanthera chlorantha	*Orchidaceae*					+	+						
Poa glauca	*Gramineae*									I			
Poa nemoralis	*Gramineae*											+	+
Poa nobilis	*Gramineae*									R			
Poa palustris	*Gramineae*											+	+
Poa pratensis	*Gramineae*											+	+
Poa trivialis	*Gramineae*											+	+
Poa violacea	*Gramineae*									R			
Polemonium coeruleum	*Polemoniaceae*						+					+	+
Polygala amara	*Polygalaceae*											+	+
Polygala hybrida	*Polygalaceae*									I			
Polygonum aviculare	*Polygonaceae*											+	+
Polygonum bistorta	*Polygonaceae*											+	+
Polygonum hydropiper	*Polygonaceae*											+	+
Polygonum oxyspermun	*Polygonaceae*									Ex			
Polypodium interjectum	*Polypodiaceae*									I			
Polypodium vulgare	*Polypodiaceae*					+		+				+	+
Populus alba	*Salicaceae*											+	+
Populus nigra	*Salicaceae*											+	+
Populus sp.	*Salicaceae*										1	+	+
Populus tremula	*Salicaceae*											+	+
Portulaca oleracea	*Portulacaceae*											+	
Potamogeton coloratus	*Potamogetonaceae*									I			
Potamogeton polygonifolius	*Potamogetonaceae*									V			
Potentila sterilis	*Rosaceae*									V			
Potentilla anserina	*Rosaceae*											+	+
Potentilla erecta	*Rosaceae*											+	+
Primula elatior	*Primulaceae*					+		+					
Primula farinosa	*Primulaceae*		+	+		+	+			E			
Primula halleri	*Primulaceae*									Ex			
Primula officinalis	*Primulaceae*					+		+				+	+
Primula vulgaris	*Primulaceae*									E			
Prunella laciniata	*Labiatae*									R			
Prunus spinosa	*Rosaceae*											+	+
Prunus avium	*Rosaceae*										3	+	
Prunus cerasus	*Rosaceae*											+	+
Prunus domestica	*Rosaceae*											+	

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Prunus fruticosa	*Rosaceae*									V			
Prunus insititia	*Rosaceae*											+	
Prunus padus ssp.borealis	*Rosaceae*									R		+	+
Pseudotsuga menziesii	*Pinaceae*										2	+	
Puccinellia maritima	*Gramineae*									E			
Pulmonaria officinalis	*Boraginaceae*											+	+
Pulsatilla alpina	*Ranunculaceae*			+		+	+						
Pulsatilla patens	*Ranunculaceae*					+	+			V			
Pulsatilla pratensis	*Ranunculaceae*					+	+					+	+
Pulsatilla slavica	*Ranunculaceae*					+	+			V			
Pulsatilla teklae	*Ranunculaceae*			+		+	+						
Pulsatilla vernalis	*Ranunculaceae*		+	+		+	+			V			
Pulsatilla vulgaris	*Ranunculaceae*					+	+			E			
Quercus petraea	*Fagaceae*										1	+	
Quercus pubescens	*Fagaceae*									E		+	+
Quercus robur	*Fagaceae*										1	+	+
Quercus rubra	*Fagaceae*										4	+	
Ranunculus baudotii	*Ranunculaceae*									I			
Ranunculus illyricus	*Ranunculaceae*									V			
Ranunculus penicillatus	*Ranunculaceae*									R			
Ranunculus reptans	*Ranunculaceae*									V			
Raphanus raphanistrum	*Cruciferae*												+
Raphanus sativus	*Cruciferae*											+	
Reseda luteola	*Resedaceae*											+	+
Reseda phyteuma	*Resedaceae*									V			
Rhamnus cathartica	*Rhamnaceae*											+	+
Rhododendron flavum	*Ericaceae*		+	+		+	+			V		+	
Rhynchospora fusca	*Cyperaceae*									V			
Ribes nigrum	*Saxifragaceae*					+		+				+	+
Ribes rubrum	*Saxifragaceae*											+	
Robinia pseudoacacia	*Papilionaceae*											+	
Rosa arvensis	*Rosaceae*											+	
Rosa canina	*Rosaceae*											+	+
Rosa gallica	*Rosaceae*									V		+	
Rosa rugosa	*Rosaceae*											+	
Rubus caesius	*Rosaceae*											+	+
Rubus chamaemorus	*Rosaceae*		+				+			V		+	+
Rubus idaeus	*Rosaceae*											+	+

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Rumex acetosa	*Polygonaceae*											+	+
Rumex crispus	*Polygonaceae*											+	+
Rumex obtusifolius	*Polygonaceae*											+	+
Rumex patientia	*Polygonaceae*											+	+
Rumex scutatus	*Polygonaceae*											+	+
Ruppia maritima	*Ruppiaceae*									V			
Ruta graveolens	*Rutaceae*											+	
Sagina maritima	*Caryophyllaceae*									Ex			
Salix acutifolia	*Salicaceae*											+	
Salix alba	*Salicaceae*											+	+
Salix caprea	*Salicaceae*											+	+
Salix cinerea	*Salicaceae*											+	+
Salix daphnoides	*Salicaceae*											+	+
Salix fragilis	*Salicaceae*											+	+
Salix lapponum	*Salicaceae*		+				+			V			
Salix myrtilloides	*Salicaceae*						+			R			
Salix purpurea	*Salicaceae*											+	+
Salix sp.	*Salicaceae*										2		
Salix viminalis	*Salicaceae*											+	+
Salsola kali ssp.kali	*Chenopodiaceae*									V			
Salvia sclarea	*Labiatae*											+	
Salvinia natans	*Salviniaceae*				+		+			V			
Sambucus ebulus	*Caprifoliaceae*											+	+
Sambucus nigra	*Caprifoliaceae*											+	+
Samolus valerandi	*Primulaceae*									R			
Sanguisorba officinalis	*Rosaceae*											+	+
Sanicula europaea	*Umbelliferae*											+	+
Saponaria officinalis	*Caryophyllaceae*											+	+
Sarothamnus scoparius	*Papilionaceae*											+	+
Saussurea alpina	*Compositae*									R			
Saussurea pygmaea	*Compositae*									R			
Saxifraga cernua	*Saxifragaceae*									R			
Saxifraga decipiens	*Saxifragaceae*									V			
Saxifraga hirculus	*Saxifragaceae*									E			
Saxifraga moschata ssp.basaltica	*Saxifragaceae*									E			
Saxifraga nivalis	*Saxifragaceae*									E			
Schoenoplectus americanus	*Cyperaceae*									Ex			
Schoenoplectus mucronatus	*Cyperaceae*									E			

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Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Schoenus ferrugineus	*Cyperaceae*									V			
Schoenus nigricans	*Cyperaceae*									E			
Schoenus radicans	*Cyperaceae*									R			
Scilla bifolia	*Liliaceae*											+	+
Scilla siberica	*Liliaceae*											+	
Sclerochloa dura	*Gramineae*									R			
Scolochloa festucacea	*Gramineae*									R			
Scopolia carniolica	*Solanaceae*				+		+					+	+
Scorzonera hispanica	*Compositae*											+	+
Scorzonera purpurea	*Compositae*					+	+			R			
Secale cereale	*Gramineae*											+	
Sedum telephium	*Crassulaceae*									I			
Sedum villosum	*Crassulaceae*									Ex			
Selaginella helvetica	*Selaginellaceae*									Ex			
Sempervivum montanum	*Crassulaceae*						+						
Sempervivum ruthenicum	*Crassulaceae*						+						
Sempervivum soboliferum	*Crassulaceae*						+						
Senecio doria ssp.doria	*Compositae*									R			
Serratula lycopifolia	*Compositae*									E			
Sesleria bielzii	*Gramineae*									E			
Sesleria uliginosa	*Gramineae*									V			
Setaria italica	*Gramineae*											+	
Setaria viridis	*Gramineae*											+	+
Sibbaldia procumbens	*Rosaceae*									R			
Silene lithuanica	*Caryophyllaceae*				+		+						
Silene parviflora	*Caryophyllaceae*									V			
Silybum marianum	*Compositae*											+	
Sinapis alba	*Cruciferae*											+	
Sisymbrium polymorphum	*Cruciferae*									R			
Solanum dulcamara	*Solanaceae*											+	+
Solidago canadensis	*Compositae*											+	+
Solidago vigra-aurea	*Compositae*											+	+
Sorbus aria	*Rosaceae*											+	+
Sorbus aucuparia	*Rosaceae*										2	+	+
Sorbus carpatica	*Rosaceae*									I			
Sorbus chamae-mespilus	*Rosaceae*									R			
Sorbus domestica	*Rosaceae*											+	
Sorbus graeca	*Rosaceae*									R			

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct
E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4,
1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

(Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Sorbus intermedia	*Rosaceae*		+	+	+		+			V		+	+
Sorbus torminals	*Rosaceae*			+	+		+					+	+
Sparganium angustifolium	*Typhaceae*									V			
Spergula arvensis	*Caryophyllaceae*											+	+
Spergularia echinosperma	*Caryophyllaceae*									I			
Spergularia media	*Caryophyllaceae*									Ex			
Spergularia segetalis	*Caryophyllaceae*									R			
Spiraea media ssp. media	*Rosaceae*									R		+	+
Spiraea salicifolia	*Rosaceae*											+	+
Spiranthes spiralis	*Orchidaceae*			+			+			E			
Staphylea pinnata	*Staphyleaceae*			+			+						
Stellaria crassifolia	*Caryophyllaceae*									V			
Stipa borysthenica	*Gramineae*									V			
Stipa capillata	*Gramineae*			+			+						
Stipa joannis	*Gramineae*			+			+			V			
Stipa pulcherrima	*Gramineae*									V			
Stipa stenophylla	*Gramineae*			+			+						
Suaeda maritima	*Chenopodiaceae*									Ex			
Succisella inflexa	*Dipsacaceae*									R			
Sweertia perennis	*Gentianaceae*				+		+			V			
Symphoricarpos albus	*Caprifoliaceae*											+	
Symphtum officinale	*Boraginaceae*											+	+
Syringa vulgaris	*Oleaceae*											+	
Tanacetum parthenium	*Compositae*											+	+
Tanacetum vulgare	*Compositae*											+	+
Taraxacum bessarabicum	*Compositae*									I			
Taraxacum officinale	*Compositae*											+	+
Taraxacum pieninicum	*Compositae*									Ex			
Taxus baccata	*Taxaceae*			+			+				2	+	+
Teucrium scorodonia	*Labiatae*											+	+
Thlaspi alliaceum	*Cruciferae*									R			
Thlaspi alpestre	*Cruciferae*									R			
Thlaspi perfoliatum	*Cruciferae*									R			
Thymus praecox	*Labiatae*									E			
Thymus serpyllum	*Labiatae*											+	+
Tilia cordata	*Tiliaceae*										2	+	+
Tilia platyphyllos	*Tiliaceae*										3	+	+
Tofieldia calyculata	*Liliaceae*				+		+						

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct
E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4,
1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Tozzia alpina ssp.carpatica	*Scrophulariaceae*									R			
Trapa natans	*Oentheraceae*		+		+	+	+	+		V		+	+
Traunsteinera globosa	*Orchidaceae*			+		+	+						
Trichophorum alpinum	*Cyperaceae*									V			
Trichophorum germanicum	*Cyperaceae*									V			
Trifolium hybridum	*Papilionaceae*											+	+
Trifolium incarnatum	*Papilionaceae*											+	+
Trifolium pratense	*Papilionaceae*											+	+
Trifolium repens	*Papilionaceae*											+	+
Trigonella caerulea	*Papilionaceae*											+	
Trisetum flavescens	*Gramineae*											+	+
Trisetum fuscum	*Gramineae*									R			
Trisetum sibiricum	*Gramineae*									R			
Triticum spp.	*Gramineae*											+	
Trollius europaeus	*Ranunculaceae*					+	+						
Tussilago farfara	*Compositae*											+	+
Typha latifolia	*Typhaceae*											+	+
Ulex europaeus	*Papilionaceae*											+	
Ulmus campestris	*Ulmaceae*										2	+	+
Ulmus glabra	*Ulmaceae*										2	+	+
Ulmus laevis	*Ulmaceae*										3	+	+
Urtica dioica	*Urticaceae*											+	+
Urtica urens	*Cannabaceae*											+	+
Utricularia ochroleuca	*Lentibulariaceae*									V			
Vaccaria hispanica	*Caryophyllaceae*									V			
Vaccinium myrtillus	*Ericaceae*											+	+
Vaccinium uliginosum	*Ericaceae*											+	+
Vaccinium vitis-idaea	*Ericaceae*											+	+
Valeriana officinalis	*Valerianaceae*											+	+
Veratrum Lobelianum	*Liliaceae*					+		+				+	+
Veratrum album	*Liliaceae*					+		+				+	+
Veratrum nigrum	*Liliaceae*					+		+					
Verbascum austriacum	*Scrophulariaceae*									V			
Verbascum phlomoides	*Scrophulariaceae*											+	+
Verbascum thapsiforme	*Scrophulariaceae*											+	+
Verbascum thapsus	*Scrophulariaceae*											+	+
Verbena officinalis	*Verbenaceae*											+	+
Veronica anagalloides	*Scrophulariaceae*									I			

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4, 1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

Table 1. Provisional list of protected plants

Species	Family	1	2	3	4	5	6	7	8	9	10	11	12
Veronica bellidioides	*Scrophulariaceae*									E			
Veronica jacquinii	*Scrophulariaceae*									I			
Veronica officinalis	*Scrophulariaceae*											+	+
Veronica paniculata	*Scrophulariaceae*									V			
Veronica praecox	*Scrophulariaceae*									V			
Viburnum lantana	*Caprifoliaceae*											+	+
Viburnum opulus	*Caprifoliaceae*					+		+				+	+
Vicia faba	*Papilionaceae*											+	
Vicia sativa	*Papilionaceae*											+	+
Vicia villosa	*Papilionaceae*											+	+
Vinca minor	*Caprifoliaceae*					+	+					+	
Viola alba	*Violaceae*									I			
Viola elatior	*Violaceae*									I			
Viola epipsila	*Violaceae*									E			
Viola odorata	*Violaceae*											+	+
Viola persicifolia	*Violaceae*									V			
Viola pumila	*Violaceae*									R			
Viola tricolor	*Violaceae*											+	+
Viola uliginossa	*Violaceae*									E			
Viscum album	*Loranthaceae*											+	+
Vitis vinifera	*Vitaceae*											+	
Woodsia alpina	*Polypodiaceae*									R			
Woodsia ilvensis	*Polypodiaceae*									E			

Fields:
1-endemits, 2-relikts, 3- species on border of distribution , 4- rare species, 5-rare and endangered species,
6-fully protected, 7- partialy protected, 8- protection in reserves 9-category of endangered (Ex-extinct and probably extinct
E-endangered, V- vulnerable, R-rare, I -Indeterminate /taxa known to be extinct/, 10- priority of protection in forestry (1-4,
1 - the highest priority) 11- crop plants or utilized, 12-wild relatives

2.2 FOREST GENETIC RESOURCES

It appears from the map of the potential natural vegetation that in Poland the oak-hornbeam forests should prevail (Andrzejewski, Weigle 1993). However presently the coniferous forests dominate, mainly those of pine (Pinus silvestris). In north occur forests with admixtures of spruce (Picea abies) in northeast and of beech (Fagus silvatica) in northwest. In the southern part of the country dominate mixtures of broadleaved woody species with pine admixtures and the broadleaved mixtures. On the southern edge of Poland, occur the typical mountaineous, stratified forests.

The Polish forests are among the most important and unique in Europe. The montane forests of the southwest (Sudety) and the last remnant of the vast lowland European forest, which exists now only in Białowieża, are the greatest biological treasures. 600 species of vascular plants, above 200 species of Bryophyta, more than 250 species of lichens, 1,000 fungi species and 11,000 animal species are an illustration of richness of the Białowieża National Park (Sokołowski, 1991). The forest is also source of valuable and economically important genotypes of pine, Norway spruce and Black alder. Forests ecosystems in Poland are less genetically eroded because of more natural ways of forest management (natural restoration) and use of local materials for forestation.

The health of Polish forests shows remarkable regional differentiation. Generally, it has been constantly declining. The results of observations carried out as a part of regular monitoring of forests (according to the European standards) show that almost a half of trees (48.8%) is significantly damaged and only 8% of them are sound. In comparison to the same kind of observations from 1989 the share of damaged trees has increased by 13.8% and, for the class of moderately and heavily damaged trees - by 16.2% (GUS, 1994).

A markedly reduced occurrence has been recorded for 20 woody species and largely reduced one - for 7 species out of 160 ones included into "Atlas of trees and shrubs distribution in Poland" (Boratyński 1991).

The most endangered are the coniferous trees, first of all fir, which occurrence as awoody tree in Sudety was artificially limited, western Carpathians and in Silesia. The symptoms of its extinction are observed in the Holy Cross Mountains and even in the Bieszczady montane region of southeast. If the instant actions are not undertaken, the fir will, in all likelihood, become only a relict of the forest flora, like yew and stone pine.

The common pine (Pinus silvestris) and the Norway spruce (Picea abies) are less imperilled. The symptoms of diseases are more and more distinct on the broadleaved trees (particularly on beech and oak) because of level of ground water changes.

The regions with the highest intensity of the woods destructing factors are those of southwest. In the Sudety mountains decay of forests (mainly the spruce ones) has been recorded on ca. 15 thousands ha. The same symptoms of ecological disaster are observed in the Kłodzko dale, in the top parts of the Silesian Beskid, Żywiecki Beskid and in Tatra.

The preservation of the forest genetic resources is a continuation of the hiherto realized programmes and an amplification of particular postulates included in the "National programme of the environment protection". The General Directorate of State Forests and the Forestry Research Institute have elaborated the "Programme of preservation of the forest genetic resources and of breeding of forest trees in Poland for years 1991-2010"(Matras at al. 1993). Maintenance of the germplasm resources would be possible by reduction of the environmental pollution to the level which not only allows survival of species but enables also generative and vegetative propagation. The protection and maintenance of genetic resources *in situ* is possible only on the non-endangered or the low ecological risk areas. It aims at preservation of the whole biodiversity of native populations. The basic method is initiation of the natural renewal in the chosen stands of seed trees or in the exploited woods of a high health level. The artificial renewals are in use either.

The *ex situ* activities of genetic resources protection concern the populations and ecotypes which require moving beyond the areas of their present occurrence, mainly because of industrial emissions.

2.3 WILD AND CROPS-RELATED SPECIES

The full list of wild ancestors of the important crops is difficult to be completed. Generally, Poland is not a region rich in such species. The wild ancestors of the most popularly cultivated plants do not occur on the area. The green fodder plants (grasses, pulses) were bred immediately from the native ecotypes.

On the Polish territory occur the ancestors of cultivated plants of *Prunus genus*. The *Prunus fruticosa-* a progenitor of *Prunus cerasus* and *Prunus avium* grows here on its western border of range locations. There are also wild populations

of *Prunus spinosa* and *Prunus insititia* which have taken part in the origin of *Prunus domestica*. There occur other species representing gene pool of *Prunus genus*, e.g. the montane species *Prunus padus* L. *ssp. borealis*.

Lactuca serriola - a lettuce progenitor is present as a popular plant on the lowland and the upland stations. In *Silesia Lactuca saligna* occurs which belongs to the same crop gene pool.

Many indigenous species of important drug plants are spread widely on their natural locations, e.g. *Achillea millefolium*. There are the well adapted foreign ones either, e.g. *Acorus calamus*. Some of these species are in danger of extinction, e.g. *Allium scordoprasum, Iris sibirica*.

Another group is constituted by the species that have lost their former economic importance and were reaped from the natural stands in the past. *Trapa natans* is an aquatic plant which previously inhabited a wide geographical range and its fruits were used as a starchy food. Now it is very rare in the Central Europe. In Poland it occurs on the southeastern edges. The subspecies *T. natans var. convicarpa* was not noticed recently. Table 1 contains the provisional list of wild species related to the useful plants.

A majority of the native plants' variation has been used on a limited scale or never exploited. It concerns mainly the fodder plants. Populations of grasses of *Alopecurus* and *Bromus genera* and pulses *Coronilla varia, Medicago lupulina, M. falcata, Anthyllis vulneraria, Trifolium medium, T. fragiferum* are a potential source of biological diversity for agriculture.

There occurs also a group of wild species which could be applied as ornamental plants, e.g. *Azalea pontica* (locations near Leżajsk), *Scilla bifolia*, *Leucoium vernum var. carpaticum* (Bieszczady), *Telekia speciosa* and *Dendranthema* zawadskii.

The causes of dying out of various plant groups are usually very similar. It is, first of all, destruction of the whole ecosystems by urbanization, industrialization and by an increase of the cultivation area (Zarzycki, Szeląg 1992). The degradation caused by changes in water relations, sometimes difficult to be noticed, results in danger and decay for, first of all, the water, peatbog and swamp ecosystems, which are refugial places of many rare and highly specialized plant species (Jasnowska, Jasnowski, 1977). Disturbation of balance between ecosystems and changes in the areas occupied by plant populations led to the immediate contact of related but distinct taxons and stimulated their intercrossing (Zarzycki, Szeląg 1992). It became the cause of impendence for numerous populations of a steppe cherry Prunus fruticosa, which forms hybrids with the popularly cultivated sore cherry (Wójcicki, 1991).

The species recognized as threatened and in extinction are included into the "Red list of the vascular plants endangered in Poland" (Zarzycki, Szeląg 1992) and into "Red book" (Zarzycki, Kaźmierczakowa 1993). Some of them are under the law protection. The important areas are protected as national parks and sanctuaries. Since 1994 a preparatory research has been conducted on monitoring of the threatened plants (Zarzycki, 1994). There is a need for financial support of research work and practical local measures for maintenance of the particularly interesting and important plant populations.

2.4 LANDRACES AND OLD CULTIVARS

Poland is a unique example of a country in Central Europe, where the old local forms of crops plants subsisted owing to the "crumbled" structure of farming. The main areas of their occurrence are situated in the southern part of the country and include the montane regions of Beskidy, the Tatra and their forelands. Minor refugial regions have been discovered in eastern and south-eastern Poland in Podlasie and in the basin of Sandomierz. The harsh climate, short vegetation period and undulating surface are characteristic for these regions. The geographic, ecological and sociological factors favoured the local landraces (geographical isolation, unsuitable conditions for industrial production methods, infrastructure, tradition). It should be emphasized that the local races compete successfully with the new varieties in these regions. Well adapted to the specific environmental conditions they guaranteed not high, but stable yields also in unfavourable years. The mentioned regions are characterized by cultivation of some relic crops, e.g. *Camelina sativa*, *Raphanus sativus var. oleiformis, Panicum miliaceum* (Kulpa, Hanelt, 1981).

Only in years 1986-1989, on the fields, meadows, pastures, wastelands, backyard gardens of these regions total number of 713 accessions were collected, mainly of cereals, pulses, oil plants and grasses. The local forms of beans, peas and popy were secured.

Expeditions resulted also in the documented examples of active breeding activities of farmers, e.g. on *Vicia dasycarpa*, which was selected for fodder purposes from weedy populations of the species (Kulpa, Hanelt, 1981).

At the present moment the local crop cultivars are available mainly as the materials stored in gene bank. According to our evaluations in the last decade the local populations of crop plants disappeared almost completely. However,

still exist some regions where traditional vegetable varieties are grown. The fragment of Kotlińska report from the collecting mission of 1992 may serve as an illustration:

"The expedition was carried out in regions having a long tradition of growing vegetables. Included were Nowe Miasto nad Pilicą and Przybyszewo, well known for growing old ecotypes of onion type Żytawska-Przybyszewska and cucumber type Przybyszewski. The seeds of these vegetables are still available on the market. The neighbourhood of Jędrzejów, Pińczów, Skalbmierz and Kazimierza Wielka is a very rich area for garlic ecotypes. In the Pogórze region, especially near Kraków, Wieliczka, Dobczyce, Nowy Targ and Mszana, different types of common bean differentiated on morphological and agronomic characters are still grown. Some of them were cultivated there in the XIX century. Different types of shalot and garlic, and the very old vegetable *Brassica napus* var. *napobrassica* called "Karpiel" were collected near Jordanów. "Karpiel" is used for human consumption as well as for fodder. A very old, native variety of white head cabbage used for souring is still grown in the village of Włosienica near Oświęcim. Old vegetable varieties are still grown in the north-east region of Poland too. Areas near Nowy Dwór and Elbląg are especially interesting because emigrants from former Eastern Poland live there. They still grow a lot of vegetables brought from their native regions, such as pumpkin, common bean, tomatoes type Bycze Serce, Malinowy, onion - type "Kartoflanka" and others. In eastern regions (Hajnówka, Zabłudów, Trześcianka, Nowosady) every small garden contained old ecotypes of the following crops: red beet, curled parsley, carrot, dill, white mustard, onion, shalot, different types of common bean, tomatoes with yellow or red fruits, and pumpkin. The Lublin district is well known for growing vegetables; mainly the areas near Lubartów, Szczebrzeszyn and Frampol are famous for local varieties of the onions "Lubartowska" (Wola Sernicka, Serniki, Chlewiska) and "Szczebrzeszyńska" (Błonie, Kawęczyn, Zurawica). Moreover, ecotypes of cucumber, garlic, lettuce, carrot, red beet, common been and curled parsley were collected near Lublin" (Kotlińska 1992).

The modernization of Polish agriculture, exclusion of marginal areas from cultivation and a wide access of seeds of new varieties are menacing the local populations of all crops.

The protection programme should include also old plantations of fruit trees and the ornamental plants. Archaeophytes related to flax cultivation e.g. *Camelina alyssum, Cusucuta epilinum* are in danger too (Warcholińska 1986).

CHAPTER 3
Conservation activities

3.1 *IN SITU* PRESERVATION OF GENETIC RESOURCES

The introduction of a system of protected areas has been considered in Poland since the beginning of 1980's. The main goal was to strengthen the relationships between areas with various degrees of protection. The most valuable areas i.e. nature protection areas and national parks constitute the main links of this network with landscape parks and areas of protected landscape joining them into a whole system. Additional buffer zones consisting of productive forests, afforested grounds, wasteland, meadows, afforestations along rivers, farms with extensive agricultural systems are going to be established. National parks are the most advanced way of wildlife preservation. They are established mainly on natural or almost natural ecosystems. There are now 19 national parks in Poland covering an area of 243,679 hectares (0.78% of the country's total area). Three of them (Białowieża National Park, Babia Góra National Park and Słowinski National Park) were included by UNESCO in the International Biosphere Protection Network. The primeval forest along with the flora and fauna of the Białowieza National Park are a part of the World's Natural Heritage within the Convention of World Natural and Cultural Heritage (Okołow 1993). The system of nature protection areas consists of 1,037 areas covering 122,000 hectares. Until now 82 landscape parks were established, which, together with their protecting zones, cover an area of 2.6 million hectares. Areas with the most typical landscapes for a given region are included in and protected as areas of protected landscape. These areas cover now 4.9 million hectares. At present 22% of the country's total area is protected in various ways.

212 plant species are fully protected by the Polish law, 28 species of economical or medical importance are protected partially. 400 species of endangered vascular plants are currently under investigation as the initial step toward an all-country's monitoring system of endangered species (Zarzycki, 1994). The monitoring system started with verification of stands and description of ecological parameters (number of plants, its condition) of endangered species. The study will be periodically repeated and will give

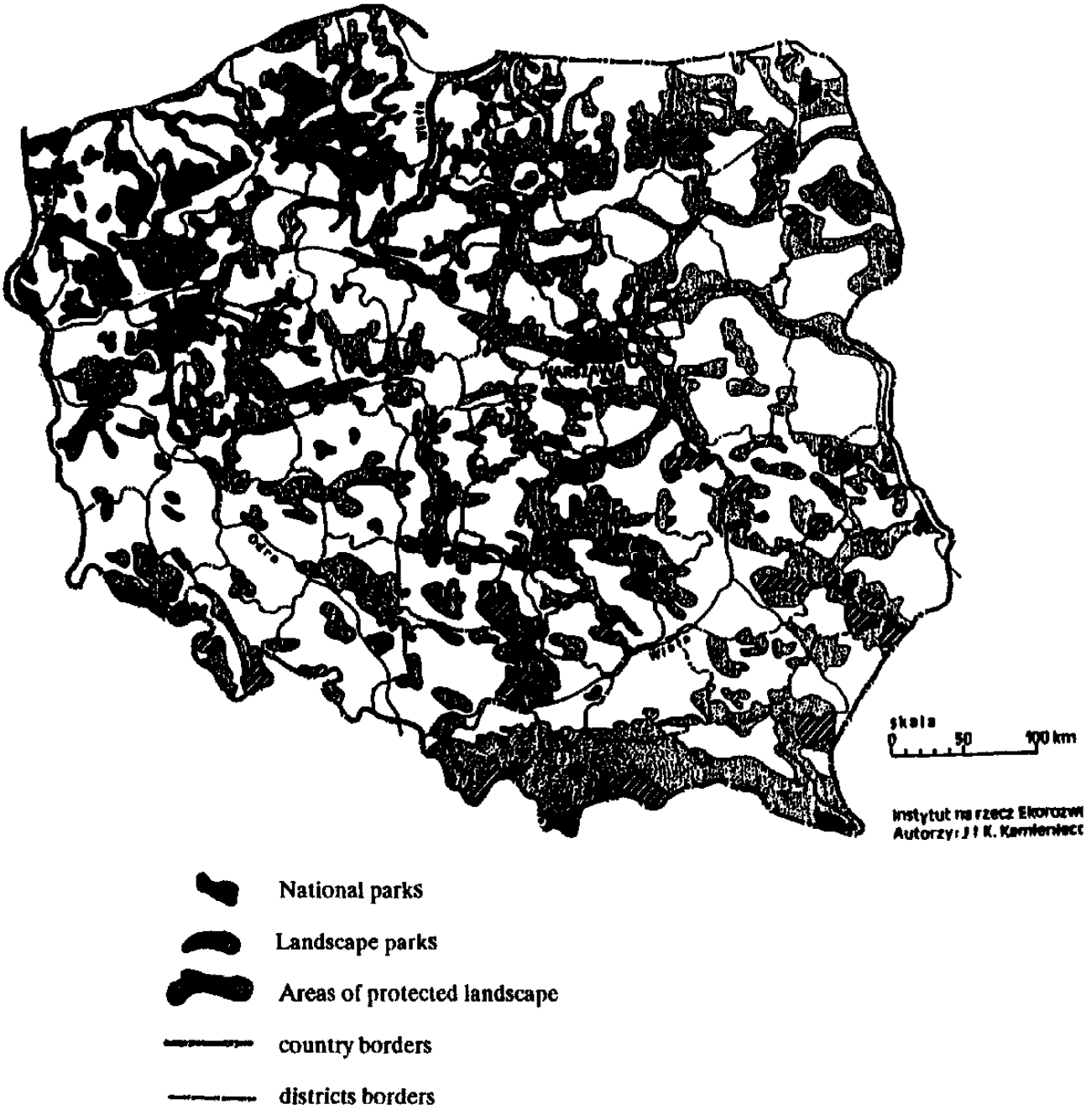
overview of changes going on in the populations. The contributors of the system stress necessity of archeophytes monitoring, also.

A database of the most endangered species of vascular plants in Poland (Korzeniak and Mitka, 1994) is in preparation. An "Atlas of distribution" of all vascular plants both native and introduced, found in Poland (Zając, 1978) has been published.

"On farm conservation" of plant and livestock species is not included in any programme of *in situ* preservation. Small peasant's farms and other forms of human activities in protected areas are questioned and expropriated.

As a part of the preservation programmes the introduction of species of plants and animals of foreign origin is not allowed.

FIG 4. PRESERVATION OF THE NATURE AND LANDSCAPE OF POLAND



3.2 *EX SITU* COLLECTIONS

The preservation of species *ex situ* has two separate but related aspects (Andrzejewski and Weigle, 1991): 1/ the protection of the individuals of the endangered species, and 2/ germplasm preservation. This division is somewhat artificial having mainly historical and organizational background.

Preservation of species *ex situ* is carried out by botanical gardens, arboreta, dendrological parks and wildlife museums. There are 16 such facilities in Poland. They are joined in the Commission of the Botanical Gardens and Arboreta. This group includes both big, old gardens with a broad spectrum of plant species (e.g. Botanical Garden of the Warsaw University, Botanical Garden of the Adam Mickiewicz University in Poznań) as well as more specialized ones (e.g. the Botanical Garden of Medicinal Plants of the Medical University in Wrocław, the Botanical Garden of the Institute of Plant Breeding and Acclimatization in Bydgoszcz). A few thousands of taxa of native plants and about 12,000 taxa of foreign origin are included in these collections. About 5,500 of them are grown in greenhouses (Andrzejewski and Weigle 1991).

These collections include about 120 plant species protected by law at various degrees and about 80 endangered species. Intense research on their biology and reproduction is carried out. At the Botanical Garden in Wrocław research is done concerning the vegetative reproduction of the species from the genera Droseraceae and Orchidaceae (Kukułczanka and Kromer 1984, Kukułczanka et al. 1989). The conservation of the endemic plant Cochlearia polonica which natural sites of occurrence have been destroyed and the work with the species Trapa natans in the arboretum in Bolestraszyce provide a good example of *ex situ* preservation.

Specialists from botanical gardens also monitor the sites of natural occurrence of endangered species. Because of the limitation of *ex situ* preservation the main aspect is the preservation of natural ecosystems. However, under some circumstances the *ex situ* preservation may help to preserve the species from full extermination. In the Botanical Garden in of the Polish Academy of Sciences attention is paid to the cryopreservation of seed material in liquid nitrogen at -192°C. Some species from the red list of endangered species are currently preserved in this way (Puchalski et al. 1993).

Plant germplasm conservation is mainly the task of agricultural institutes. Collecting and preservation of plant germplasm was initialized by professor Kaznowski at the PINGW in Puławy and at the Agricultural University in Dublany. Germplasm preservation of plant species of economic importance

has been continued since 1971 at the Plant Breeding and Acclimatization Institute. The National Department of Plant Genetic Resources has been founded on the basis of the agreement between the Ministry of Agriculture, Ministry of National Education, Polish Academy of Sciences and the Ministry of Industry. The samples gathered in the collections are recognized as a part of the national heritage.

Following main tasks have been assigned to this programme:

- protection of plant genotypes against genetic erosion by gathering them into collections,
- evaluation of the collected materials,
- conservation of the genotypes in the living state and their provision to plant breeders
- documentation of the collected materials.

In the years 1986-1990 this programme has been realized in the form of cooperation between the collections and the central storage and documentation center localized at the Plant Breeding and Acclimatization Institute (PBAI) in Radzików. The programme has been coordinated by IHAR and financed by the Ministry of National Education (Góral, Podyma 1991). The programme has been limited in 1990-1992 because of poor financing. Currently the collections are financed by institutions from their own means. Some of them are financed partially by the Biological Progress Fund of the Ministry of Agriculture and Food Industry (announcement of the Minister of Agriculture and Food Industry from March, 30. 1993). Three universities, 9 branch institutes, 7 experimental stations (among which 6 of the Plant Breeding and Acclimatization Institute), and the Botanical Garden of the Polish Academy of Sciences are partially financed from the state budget (tab. 2).

The materials in the collections are gathered during collecting missions and exchanged with other gene banks, institutes, botanical gardens and plant breeders. About 60,000 accessions have been collected. They represent all economically important plant groups: cereals, fodder plants, root crops, vegetables, fruit crops, herbages and industrial plants.

The collections include wild species related to crops, landraces and ecotypes, advanced cultivars and lines. The structure of the collections differ between plant groups. In Avena collection cultivars and lines comprise 62%, local varieties 4.5%, and wild species 2% of the total number of accessions, the genetic background of the remaining materials is unknown. In the collection of grasses ecotypes comprise 94%, and cultivars 5% of the total number of accessions. In the collection of fruit trees varieties and lines comprise 94%, local forms 4%, and related wild species 4% of the total number of accessions.

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Department of Plant Breeding & Seed Science, Academy of Agriculture ul. Akademicka 15 20-934 Lublin	Triticum durum	plant genetic resources conservation	gene bank MAFE	varietes and breeding material	controlled 0 C-(-18 C)	yes	100%	15%	1144
	Triticosecale	plant genetic resources conservation	gene bank MAFE	varietes and breeding material	controlled 0 C-(-18 C)	yes	100%	20%	1584
Plant Breeding Station Bąków k/Kluczborka 46-233 Bąków	Hordeum vulgare	plant genetic resources conservation	gene bank MAFE	varietes, breeding material, wild species	controlled 0 C-(-18 C)	yes	30-40%	5%	5345
Experiment Breeding Station 63-743 Smolice	Zea mays ssp. indurata, ssp. indentata saccharata, everata	plant genetic resources conservation	gene bank MAFE	varietes, breeding material, synthetics	no controlled	yes		very few	420
Department of Seed Science and Nursery of Horticulture, Academy of Agriculture Baranowo 62-081 Przeźmierowo	Phaseolus vulgaris	plant genetic resources conservation	gene bank MAFE						230
Department of Forage Crops Plant Breeding and Acclimatization Institute ul. Borkowska 3 30-438 Kraków	Medicago media, M. sativa, M. falcata	plant genetic resources conservation	gene bank MAFE	uniq.breeding material., indigenous populations, ekotypes	controlled +4 C	yes		few	21
Department of Meadows Cultivation, Academy of Agriculture ul. Akademicka 15 20-934 Lublin	Festuca rubra	ekotype selection to lawn use and barren sod	breeding	wild species 24	plantation				24
Department of Plant Breeding & Seed Science, Warsaw Agricultural University ul. Nowoursynowska 166 02-766 Warszawa	Solanum	plant genetic resources conservation	gene bank MAFE	wild species	in vitro		10-15%		33

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Department of Genetics and Breeding of Root Crops of IHAR Pl. Weyssenhoffa 11 85-950 Bydgoszcz	Beta	plant genetic resources conservation	gene bank MAFE	wild species, varietes, breeding material	controlled 0 C-(-18 C)	yes	80%	30-40 s	196
Experiment Breeding Station Borowo 62-055 Czempin	Brassica napus,Sinapis alba,Carthamus tinctorius,Raphanus sativus,Camelina sativ	plant genetic resources conservation	gene bank MAFE	varietes and breeding material	no controlled	yes	75%	5-10%	256
Institute of Natural Fibres ul Wojska Polskiego 71 b 60-630 Poznań	Linum	plant genetic resources conservation	gene bank MAFE	varietes, wild forms, indigenous varietes	controlled 0 C-(-18 C)		95%		979
Research Institute of Vegetable Crops ul.Konstytucji 3 Maja 1/3 96-100 Skierniewice	vegetable plants	plant genetic resources conservation	gene bank MAFE	wild species, ekotypes, varietes,breeding material,indigenous material	controlled 0 C-(-18 C)	yes	20%	10-20%-	2598
Institute of Medicinal Plants ul. Libelta 27 61-707 Poznań	medical plants	plant genetic resources conservation	gene bank MAFE	wild species, varietes,breeding material	no controlled				160
Botanical Garden Plant Breeding and Acclimatizatin Institute Jeżdziecka 5 85-687 Bydgoszcz	other grasses	plant genetic resourcse conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes	90%	40%	143
Plant Breeding Station 99 423 Bielawy	Triticum aestivum	material for crossing	breeding	varietes 110, breeding material/breeding lines 20	no controlled, plantation				130
Potato Breeding Station 05 860 Józefów	Solanum tuberosum	generative cross	breeding	varietes 50, breeding material/breeding lines 20	no controlled, plantation				70

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Plant Breeding Station 47 415 Szonowice	Triticum aestivum	initial material for breeding	breeding	varietes 85, breeding material/breeding lines 298, wild species	no controlled				418
Plant Breeding and Acclimatization Institute Radzików 05-870 Błonie	Avena	plant genetic resources conservation	gene bank MAFE	varietes,breeding material/breeding lines,wild species	controlled 0 C-(-18 C)	yes			1880
Plant Breeding Station 82 230 Nowy Staw	Triticum aestivum	breeding	breeding	varietes, breeding material/breeding lines	no controlled				143
Plant Breeding Station 62 841 Rajsko	Hordeum vulgare	material for breeding	breeding	varietes, breeding material/breeding lines	no controlled				65
Plant Breeding Station 62 100 Wągrowiec	Pisum sativum	Pisum variability conservation, genotype characterization	gene bank MAFE	populations or local varietes,varietes,research material/breeding line	no controlled	yes			2887
Plant Breeding Station 74 230 Mielęcin	Hordeum vulgare	evaluation and breeding	breeding	varietes, breeding material/breeding lines	no controlled				64
Plant Breeding Station 76 024 Swieszyno	Rhododendron	seedling production	breeding	local varietes (undefined), varietes 9	in vitro				9
Horticultural Breeding and Seed Production POLAN ul.Rydla 53/55 31 512 Kraków	Phaseolus vulgaris	test varietes conservation	breeding	varietes 37, research material/breeding lines1	no controlled				38

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Department of Plant Breeding & Seed Science, Academy of Agriculture Sw.Marka 37 30024 Kraków	Hordeum sp.	conservation of species and old cultivars for research and didactics	research	local varietes, varietes, wild species	no controlled		100%		309
Department of Botany, Academy of Agriculture Al.29 listopada 48 31 425 Kraków	Lycopersicon	virus resistant research	research		no controlled				35
Kortowo 40 10 957 Olsztyn	Pisum sativum, Lupinus angustifolius, Vicia faba ssp. minor	for Department research	research						
Department of Plant Genetics, Breeding and Biotechnology, Warsaw Agricultural University ul.Nowoursynowska 166 02 766 Warszawa	Cucumis, Cucurbita, Lycopersicon, Capsicum annum, Solanum lycopersicoides	plant genetic resources conservation	gene bank	lines,varietes, wild species	in vitro, no controlled				
Institute of Botany, ul.Kanonia 6/8 50 328 Wroclaw	Triticeae, Bromeae, Brachypodieae, Stipa, Melica	taksonomic and cytogenetic research	research	populations,local varietes,varietes,wild species,research mat.	no controlled, controlled				
Botanical Garden University of Wroclaw ul.H.Sienkiewicza 23 50 335 Wroclaw	Lupinus mutabilis Sweet.	genetic variability increase	research	pop. 16, var. 2, research mat/breed.lines 130,wild species 25,	no controlled				150
Institute of Soil Science and Plant Cultivation Osada Palacowa 24-100 Pulawy	Humulus lupulus L.	plant genetic resources conservation	gene bank	141 var. 2 hybrids, 11 clones, 14 crosses, 400 male plants	plantation	yes	100%	if necessa	568
Institute for Potato Research 76-009 Bonin	Solanum tuberosum	utilization for breeding and seed production, research	gene bank	varietes 450, breeding material/breeding lines 100	controlled, in vitro	yes		50%	550

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Institute of Pomology and Floriculture Pomologiczna 18 96-100 Skierniewice	fruit trees, berry plants, ornamental plants	plant genetic resources conservation	gene bank	varietes 90%, local varietes 2%, breeding material 4%, wild species 4%	plantation, controlled +4 C		30%	60%in.5 %br	1856
Institute of Pomology and Floriculture,Department of Apiculture Kazimierska 2 24-100 Puławy	honey plants	plant genetic resources conservation	gene bank		plantation		30%		293
Institute of Plant Genetics Polish Academy of Sciences Strzeszyńska 34 60-479 Poznań	Pisum sativum, Ornithopus sativus, Lupinus sp.			species,ekotypes,varietes,uniq.old cultivars,research mat./breed.lines	no controlled	yes	50%	10-20%	
Botanical Garden of the Polish Academy of Sciences Prawdziwka 2 02-973 Warszawa	Secale cereale	plant genetic resources conservation	gene bank	varietes, ekotypes, local form, wild species	controlled 0 C-(-18 C)	yes		few%	1365
Institute of Plant Protection Miczurina 20 60-318 Poznań	pathogenic fungi, bakteria and viruses	plant genetic resources conservation	gene bank	races of pathogenes	controlled	yes	70%		
Department of Pomology,Warsaw Agriculture University ul.Nowoursynowska 166 Warszawa	Vaccinium spp.x Malus domestica Borkh. Prunus arme	research and breeding works	breeding	varietes 40,breeding material/breeding lines 5, wild species 5	plantation				50
Department of Pomology, Academy of Agriculture ul.S.Leszczyńskiego 58 20-068 Lublin	Malus	didactics	gene bank	varietes 195	plantation				195
Department of Horticulture ul.Bernardyńska 6/8 85-029 Bydgoszcz	Capsicum annuum	breeding	breeding	varietes 5, breeding material/breeding lines 17	no controlled				21

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Plant Breeding Station 63-005 Kleszczewo Poznańskie	Triticum aestivum	initial material for breeding	breeding	varietes 59, breeding material/breeding lines 51	plantation				11
Plant Breeding Station ul.Sportowa 21 55-040 Kobierzyce	Zea mays	genotypes conservation	gene bank	populations or local varietes 115, varietes 7, breeding lines 400	no controlled				523
Mangel Breeding Station 32-010 Koomyrzów	Phleum pratense, Festuca pratensis, Poa pratensis	reproduction, observation and breeding	breeding	populations,local varietes 79, var. 3, breeding lines 54, undefined 4	plantation				133
Specialistic Station of Horticulture Vitroflora 86-065 Lochowo	Gerbera jamesunii	breeding and conservation plant genetic resources	breeding	varietes, breeding material/breeding lines	in vitro				100
Mangel Breeding Station Wielopole 33-300 Nowy Sącz	Festuca rubra	breeding	breeding	varietes 46, wild species 26	plantation				72
Plant Breeding Station DANKO 64-005 Racot	Triticale	genotypes conservation	breeding	varietes,breeding material/breeding lines	plantation				240
Plant Breeding Station 05-660 Warka	Triticale, triticosecale	plant genetic resources conservation for breeding	breeding	varietes, breeding material/breeding lines	no controlled, plantation				400
Plant Breeding Station 62 100 Wągrowiec	Ornithopus sativus	Ornithopus variability conservation, genotype characterization	research, breeding MAFE	populations,local varietes,varietes,research mat./breed. lines,wild sp	controlled, lawt.	yes			125

Table 2. Institutions maintaining collections of plants and pathogens(

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
	Lupinus albus, Lupinus angustifolius, Lupinus luteus	Lupinus variability conservation, genotype characterization	research, breeding MAFE	population,local varietes,varietes,research mat./breed.lines,wild spec	no controlled, controlled	yes	.		986
Plant Breeding Station 63-005 Kleszczewo Poznańskie	Triticum aestivum	initial material for breeding		varietes 32, research material/breeding lines 65	plantation				97
	Hordeum vulgare	breeding	breeding	varietes 146, research material/breeding lines 162					308
Plant Breeding Station 47 415 Szonowice	Hordeum vulgare	initial material for breeding	breeding	varietes 132, research meterial/breeding lines 184, wild species 31	no controlled				347
	Vicia faba	initial material for breeding	breeding	populations 4, varietes 34, research material/breeding lines 17	no controlled				55
Mangel Breeding Station Wielopole 33-300 Nowy Sącz	Poa pratensis	breeding	breeding	varietes 35, wild species 19, undefined 5					59
	Avena	breeding	breeding	varietes 233, research material/breeding lines 666, wild species 10					909
Plant Breeding Station DANKO 64-005 Racot	Triticum aestivum	breeding	research, breeding	varietes 159, research material/breeding lines 280	no controlled				439
Department of Plant Breeding & Seed Science, Academy of Agriculture Sw.Marka 37 30024 Kraków	Avena sp.	conservation of species and old cultivars for research and didactics	research	local varietes, varietes, wild species	no controlled		100%		210

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Institute of Botany, ul.Kanonia 6/8 50 328 Wroclaw	Lathyrus	taxonomic and cytogenetic research	research					1-5%	
Department of Forage Crops Plant Breeding and Acclimatization Institute ul. Borkowska 3 30-438 Kraków	Trifolium pratense	plant genetic resources conservation	gene bank MAFE	ekotypes, indigenous populations, varietes, breeding material	controlled +4 C	yes		few	116
Institute of Soil Science and Plant Cultivation Osada Palacowa 24-100 Puławy	Nicotiana	plant genetic resources conservation	gene bank	wild species,varietes,amfidiploids, autotetraploids ,malesterile plants	controlled, no controlled	yes		20%	847
Plant Breeding and Acclimatization Institute Radzików 05-870 Błonie	Triticum	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			8921
	Vicia faba	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			750
	Vicia sativa	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			292
	Secale	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			1532
	Phaseolus	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			1086
	Seteria italica	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			88

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
	Triticum sp.	Conservation of species and old cultivars for research and didactics	research	local varietes, varietes, wild species	no controlled		100%		770
Department of Plant Breeding & Seed Science, Warsaw Agricultural University ul. Nowoursynowska 166 02-766 Warszawa	dihaploids Solanum tuberosum	plant genetic resourcse conservation	gene bank MAFE	selected dihaploid clones	in vitro		10-15%		
Plant Breeding Station 76 024 Swieszyno	Rubus fruticosus	seedling production	breeding	varietes	in vitro				1
	Solanum tuberosum	breeding new varietes	breeding	varietes 71, breeding lines 2	in vitro				73
	Vaccinium corymbosum	seedling production	breeding	varietes 5	in vitro				5
Horticultural Breeding and Seed Production POLAN ul.Rydla 53/55 31 512 Kraków	Cucumis sativus	to find individuals of morphology character and resistant carrier for breeding	breeding	populations or local varietes 15, varietes 21	no controlled				36
	Phaseolus vulgaris	breeding new varietes	breeding	varietes 31	no controlled				31
	Daucus carota	to obtain valuable important plants for new varietes	breeding	varietes 11, research material/breeding lines 1	no controlled				12
Botanical Garden of Medical Plants Kochanowskiego 12/14 51601 Wroclaw	medical plants				plantation				1146

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
	Lotus	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			209
	Lathyrus	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			89
	Fagopyrum	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			74
Botanical Garden of the Polish Academy of Sciences Prawdziwka 2 02-973 Warszawa	Triticineae	plant genetic resources conservation	gene bank		controlled 0 C-(-18 C)	yes		few%	485
Botanical Garden Plant Breeding and Acclimatizatin Institute Jeżdziecka 5 85-687 Bydgoszcz	Poa	plant genetic resources conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes			1511
	Phleum	plant genetic resources conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes			2435
	Dactylis	plant genetic resources conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes			5538
	Festuca	plant genetic resources conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes			4358
	Lolium	plant genetic resources conservation	gene bank MAFE	ekotypes, varietes	controlled 0 C-(-18 C)	yes			475

Table 2. Institutions maintaining collections of plants and pathogens

Institution	Group of plants	Task of collection	Type of collection Financing	Type of material	Type of storage	Computerized documentation	Evaluation %	Utilization %	Number of accession
Plant Breeding and Acclimatization Institute Radzików 05-870 Błonie	Panicum miliaceum	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			365
	Lens culinaris	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			67
	Glycine max	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			933
	other species	plant genetic resources conservation	gene bank MAFE	varietes, research material/breeding lines, wild species	controlled 0 C-(-18 C)	yes			170
Agricultural University Poznań Marcelin	Asparagus officinalis	plant genetic resources conservation	gene bank MAFE	local populations,varietes	plantation		100%		55
Arboretum of Warsaw Agricultural University 96-135 Rogów	trees and shrubbery	plant genetic resources conservation	gene bank	ggeographical species and varietes	plantation				2300
ul. Parkowa 5 62-035 Kórnik	Syringa, Malus, Rhododendron	plant genetic resources conservation	gene bank	geographical varietes and cultivated, breeding material, wild species	plantation				2500
Agricultural University Poznań ul. Dąbrowskiego 165 60-594 Poznań	trees,shrubbery, herbaceous plants	plant genetic resources conservation	gene bank		plantation				7000

Number of accessions maintained in collections 73612

The collection structure is determined mainly by the requirements of the plant breeders, which prefer more advanced breeding material. However, the accessions collected during expeditions are an important part of the collections.

A large part of the natural variability of cereals, grasses, legumes and vegetable is gathered in the collections. The collection of grasses represents 75% of their total variability found in Poland. The collections of small seed legumes represent the variability found in some regions e.g. the Trifolium pratense collection contains accessions from the southern part and the Lotus collection accessions from the north-eastern part of Poland. Some species for which collection exist have no counterparts in Poland (wild species, local races, a limited number of varieties): soybean, *Triticum durum*, for example. Such collections are based on accessions imported from abroad. The collection of Triticale contains materials provided by plant breeders and will never contain the whole variability obtained.

The most valuable part of the collections are old varieties and local populations collected during expeditions.

3.2.1 Sample exchange

5.6% of the total number of accessions stored are rendered annually to other collections or breeders (tab. 3). The samples are requested mainly by plant breeding stations and institutes. About 30% of the samples are sent abroad.

3.2.2 Expeditions

Systematic explorations with the aim to collect landraces of agricultural crops have been started in 1971. The expeditions are carried out every year. Between 1990 and 1992 the number of expeditions performed has been limited because of poor financing. The expeditions are organized jointly by the Genebank Laboratory (formerly National Department of Plant Genetic Resources) of the Plant Breeding and Acclimatization Institute (agricultural crops and other species), the Botanical Garden of the Plant Breeding and Acclimatization Institute (grasses) and the Department of Germplasm Collection of the Institute of Vegetable Crops. Two to three expeditions are performed annually.

Table 3. Utilization of species and group of plants preserved in Gene Bank

Species	1992			1993			1994			years 1992-1994				
H-plant breeding, I-Other Appropriation Z - abroad	H	I	Z	H	I	Z	H	I	Z	HIZ	HI	I	Z	%*
Triticum aestivum	17		56	110	35	97	153	16	58	542	331	51	211	
Hordeum vulgare	15		3	91	24	11	338	10	21	513	478	34	35	
Avena sativa				8			104	5	63	180	117	5	63	
x Triticosecale	32			1	14	6				53	47	14	6	
Triticum spelta	3			76			30			109	109			
Secale cereale	16		6	21	10	4	39	3	3	102	89	13	13	
Triticum other species							18			18	18			
Panicum miliaceum	1				3				10	14	4	3	10	
Zea mays	10				3					13	13	3		
Triticum durum						1	10			11	10		1	
Hordeum other species					10					10	10	10		
Aegilops					3		3			6	6	3		
Triticum turgidum							5			5	5			
Fagophyrum esculentum						3			1	4			4	
Amaranthus sp	1									1	1			
Cereals	95		65	307	102	122	700	34	156	1581	1238	136	343	**2.5**
Poa	27		1000	32						1059	59		1000	
Pasture grasses	9			2	59	9	190	53	3	325	313	112	12	
Festuca	26		2	16						44	42		2	
Lolium	21			5		11	37		11	85	63		22	
Phleum	1									1	1			
Dactylis			1							1			1	
Other grasses				670			862			1532	1532			
Grasses	84		1003	725	59	20	1089	53	14	3047	2010	112	1037	**7.0**
Vicia faba	14			68	2	8	4	5		101	93	7	8	
Pisum sativum				62	18	125	10	447	321	983	537	465	446	
Glycine max					5				46	51	5	5	46	
Phaseolus vulgaris	7								4	11	7		4	

(*- average percentage of utilization during one year)

Table 3. Utilization of species and group of plants preserved in Gene Bank

Species	1992			1993			1994			years 1992-1994				
H-plant breeding, I-Other Appropriation Z - abroad	H	I	Z	H	I	Z	H	I	Z	HIZ	HI	I	Z	%*
Lupinus				45	123	60	75	80	23	406	323	203	83	
Vicia sativa								7		7	7	7		
Lathyrus sativus	4									4	4			
Large seed legumes	25			175	148	193	89	539	394	1563	976	687	587	**11.0**
Trifolium pratense				48		2		15	3	68	63	15	5	
Medicago sativa								6	12	18	6	6	12	
Lotus sp	1				16			1		18	18	17		
Ornitophus sativa	2							3		5	5	3		
Onobrychis	1				1			1		3	3	2		
Melilotus	2				1					3	3	1		
Trifolium repens						2				2	2	2		
Small seed legumes	6			48	20	2		26	15	117	100	46	17	**7.6**
Brassica napus v. *oleifera*					1		3		1	5	4	1	1	
Camelina sativa	1		2				1			4	2		2	
Papaver somniferum								3		3	3	3		
Raphanus sativus v. *oleifera*									1	1			1	
Catharmus tinctorius	1									1	1			
Brassica rapa v. *oleifera*						1				1			1	
Oil plants	2		2		1	1	4	3	2	15	10	4	5	**0.2**
Allium sativum				258			20			278	278			
Phaseolus vulgaris				69		3	86		9	167	155		12	
Cucumis sativus	2			36		1	109		2	150	147		3	
Allium cepa	8			44		4	63		1	120	115		5	
Lactuca sativa				46		4	11		1	62	57		5	
Lycopersicon esculentum				9	29	5			18	61	38	29	23	
Brassica oleracea v. *capitata*	24					2	31			57	55		2	
Allium sp.							28			36	36	8		
Daucus carota	12					4	8		7	31	20		11	
Raphanus sativus	6					5	16		3	30	22		8	
Pisum sativum						7	15		4	26	15		11	
Carum carvi						1	12		3	16	12		4	
Spinacia oleracea	10		1			1			1	13	10		3	

(*- average percentage of utilization during one year)

Table 3. Utilization of species and group of plants preserved in Gene Bank

Species	1992			1993			1994			years 1992-1994				
H-plant breeding, I-Other Appropriation Z - abroad	H	I	Z	H	I	Z	H	I	Z	HIZ	HI	I	Z	%*
Capsicum annuum							12			12	12			
Brassica chinensis				8			4			12	12			
Petroselinum sativum						3	8			11	8		3	
Apium graveolens						3	6		2	11	6		5	
Beta vulgaris						1	7		1	9	7		2	
Vicia faba						2	4	1	2	9	5	1	4	
Cichorium sp			3						1	4	3	3	1	
Rumex acetosa			2			1	1			4	1		3	
Cucurbita maxima						1	3			4	3		1	
Rheum hybridum						1	2			3	2		1	
Cucumis melo				2			1			3	3			
Brassica rapa							3			3	3			
B. oleracea v. *gyngyloides*						1	1			2	1		1	
Pastinica sativa							2			2	2			
Phaseolus coccineus	1									1	1			
B. oleracea v. *gemmifera*						1				1			1	
B. oleracea v. *sabaudia*						1				1			1	
B. oleracea v. *botrytis*						1				1			1	
Cardamine pratensis						1				1			1	
Scorzonera hispanica							1			1	1			
Sinapis alba							1			1	1			
Allium schoenoprasum							1			1	1			
Lens culinaris							1			1	1			
Vegetables	63		3	472	37	54	457	1	55	1145	1033	41	112	**23.5**
Medicinal plants			6							6			6	-
Ornamental plants							15			15	15			-
Total	275		1082	1727	367	392	2354	656	636	7489	5382	1026	2107	**5.6**

(*- average percentage of utilization during one year)

During the expeditions regions rich in local races of agricultural and horticultural crops (northeastern and southern part of Poland) are visited. Seed samples are obtained from farmers or on local markets. Every accession is accompanied by relevant information. Registration of old gardens of fruit trees and collecting of medicinal and ornamental plants found in house gardens are new task recently assigned to the exeditions. More than 1,300 seed samples have been collected during the expeditions performed on the territory of Poland. Grass plant ecotypes are systematically collected in all regions of Poland. Until now about 75% of the country's total area has been penetrated.

In the last three years 660 samples of crop seed and 406 ecotypes of grass plants have been collected (tab. 4).

During the international expeditions to Morocco, Algeria, Czech Republic, Slovakia, Bulgaria, Albania and former Soviet Union 1,600 samples, mainly of cereals, legumes and vegetables have been collected (tab. 5).

Table 4 Management of the Gene Bank material

	1992	1993	1994
Number of samples collected	39,971	43,770	44,883
Number of samples distributed	1,257	3,677	3,647
Number of samples distributed abroad	1,082	395	636
Number of Samples imported	--	1,315	1,772
Expeditions	19	428	619
Viability evaluation	1,345	2,698	3,652
Regeneration	--	1,783	713

Table 5 Foreign collection missions and the number of collected samples

Country	Year	Number collected Samples	Plant Group
The Soviet Union	1981	167	cereals, legumes, grasses
Morocco	1985	139	cereals, legumes
The Soviet Union	1986	232	cereals, *Aegilops,* legumes, grasses
Czechoslovakia	1987	143	grasses, legumes
The Soviet Union	1988	162	onion, garlic, wild species *Allium*
Morocco	1989	123	cereals
The Soviet Union	1989	209	*Aegilops,* grasses, legumes
Bulgaria	1989	125	*Aegilops,* legumes, cereals
Russia	1990	112	onion, garlic, wild species *Allium*
Albania	1994	275	cereals, legumes, other crop plants
Total		**1687**	

3.2.3 Seed storage

Seed samples collected under the auspices of the National Plant Genetic Resources Conservation Programme are stored, since 1981, in the central long-term storage located at the Plant Breeding and Acclimatization Institute. In this storage samples from all collections of crop plants are stored (tab. 6).

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Achillea millefolium	1
Aconitum callibotryon	1
Adonis vernalis	1
Aegilops spp.	64
Aesculus hippocastanum	1
Agrimonia eupatoria	1
Agropyron repens	1
Agrostis alba	4
Agrostis stolonifera	2
Agrostis tenuis	18
Alchemilla pastoralis	1
Allium cepa + other species	166
Allium porrum	7
Alopecurus pratensis	3
Althaea officinalis	1
Althaea rosea v. nigra	1
Ammi maius	1
Ammi visnaga lam.	1
Anethum graveolens	1
Anthyllis vulneraria	4
Apium graveolens	8
Arachis hypogaea	1
Archangelica officinalis	2
Arcticum lappa	1
Arcticum minus	1
Arnica chamissonis	1
Arnica Montana	1
Artemisia abrotanum	1
Artemisia absinthium	1
Asarum europeum	1
Aparagus officinalis	1

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Asperula odorata	1
Atriplex hortensis	1
Atropa belladonna	1
Avena barbata	1
Avena byzantina	63
Avena fatua	1
Avena macrostachya	11
Avena nuda	1
Avena sativa	1,750
Avena sterilis	1
Avena strigosa	52
Bellis perennis	1
Berberis vulgaris	1
Bergenia crassifolia fritsch.	1
Beta vulgaris	12
Beta atriplicifolia	1
Beta lomatogona (2x and 4x)	2
Beta macrorrhiza	1
Beta nana	1
Beta patellaris	1
Beta procumbens	1
Beta trigyna	1
Beta vulgaris	183
Beta vulgaris subsp. macrocarpa	1
Beta vulgaris subsp. maritima	1
Beta vulgaris subsp. orientalis	1
Beta vulgaris subsp. Patula	1
Beta webbiana	1
Betonica officinalis	1
Betula verrucosa	1
Bidens tripartitus	1
Brassica juncea	3
Brassica napus var. napobrassica	7
Brassica napus rapifera	2
Brassica napus f. Annua	3
Brassica napus f. Biennis	72
Brassica nigra	1
Brassica oleracea var. Viridis	3
Brassica oleracea var. acephala	3

(Table 6 The number of accession in long-term storage in 1994

Brassica oleracea var. botrytis	108
Brassica oleracea var. capitata	82
Brassica oleracea var. gemmifera	19
Brassica oleracea var. gonglylodes	8
Brassica oleacea var. italica	11
Brassica oleacea var. sabauda	13
Brassica pekinensis	7
Brassica rapa	6
Brassica rapa var. rapa	2
Bromus inermis	100
Calendula officinalis	1
Cannabis sativa	4
Capsella bursa-pastoris	1
Capsicum annum	35
Carex arenaria	1
Carthamus tinctorius	1
Carum carvi	19
Centaurium umbellatum	1
Chelidonium maius	3
Chenopodium ambrosiodes	1
Chichorium intybus	1
Chichorium spp.	8
Cirsium oleraceum	1
Citrullus spp.	3
Cnicus benedictus	1
Colchicum autumnale	1
Conium maculatum	1
Consolida regalis	1
Convallaria maialis	1
Coriandrum sativum	1
Crategus monogyna	1
Crategus oxyacantha	1
Cucumis melo subsp melo.	17
Cucumis sativus	129
Cucurbita pepo convar.giromontiina	4
Cucurbita pepo convar. patissonina	2
Dactylis glomerata	5,538

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Daucus carota	57
Delphinum elatum	1
Dictammus albus	1
Digitalis chamomilla	1
Digitalis lanata	2
Digitalis purpurea	1
Erysimum perofskianum	1
Fagopyrum esculentum	74
Festuca arundinacea	878
Festuca het.	1
Festuca ovina	14
Festuca pratensis	3,395
Festuca rubra	70
Filipendula ulmaria	1
Frangula alnus	1
Funaria officinalis	1
Glycine max	933
Grammineae	11
Helianthus annuus	96
Helichrysum arenarium	1
Herniaria glabra	1
Herniaria hirsuta	1
Hippophae rhamnoides	1
Hordeum geniculatum	1
Hordeum glaucum	1
Hordeum hystrix	2
Hordeum laguncu	1
Hordeum leporinum	1
Hordeum murinum	2
Horteum spontaneum	5
Hordeum vulgare	5,332
Hyoscyamus niger	1
Hypericum perforatum	3
Hyssopus officinalis	1
Inula helenium	1
Juniperus communis	1
Lactuca spp.	169
Lathyrus sativus	89
Lavandula officinalis	1

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Lens culinaris	67
Leonurus cardiaca	1
Lepidum sativum	1
Levisticum officinale	1
Linum usitatissimum	557
Lobelia inflata	1
Lolium hybridum	16
Lolium multiflorum	63
Lolium perenne	394
Lolium ves	2
Lotus corniculatus	129
Lotus uliginosus	80
Lupinus spp.	509
Lycopersicon spp.	419
Malva silvestris	1
Marrubium vulgare	1
Matricaria chamomilla	3
Medicago lupulina	1
Medicago sativa	8
Medicago varia	12
Melilotus albus	1
Melilotus officinalis	1
Melissa officinalis	1
Nepeta cataria	2
Nicotiana spp.	962
Nigella sativa	1
Ocimum basilicum	1
Olaucium flavus	1
Onobrychis viciaefolia	14
Origanum majorana	2
Ornithopus sativus	108
Panicum	1
Panicum miliaceum	364
Papaver rhoeas	1
Papaver somniferum	85
Pastinaca sativa	3
Petroselinum sativum	25
Phalaris arundinacea	2
Phalaris canariensis	2

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Phaseolus spp.	170
Phaseolus vulgaris	966
Phleum pratense	2,435
Physalis ixocarpa	1
Pimpinela anisum	1
Pimpinella maior	1
Pisum sativum	1,173
Plantago lanceolata	1
Plantago psyllicum	1
Poa compresa	1
Poa nemoralis	2
Poa palustris	3
Poa pratense	1,504
Poa trivialis	1
Polygonum aviculare	1
Polygonum bistorta	1
Primula officinalis	1
Pulmonaria officinalis	1
Pyrethrum cineraria etolium	1
Raphanus sativus	1
Raphanus sativus var. sativus	23
Raphanus sativus var. Niger	13
Rhamnus cathartica	1
Rheum rhaponticum	2
Ribes nigrum	1
Ricinus communis	1
Robinia pseudacacia	1
Rosa canina	1
Rubia tinctorum	1
Rubus idaeus	1
Rumex acetosa	2
Rumex patientia	1
Ruta graveolens	1
Salvia officinalis	2
Sambucus nigra	1
Saponaria officinalis	1
Sarothamnus scoparis	1
Satureja hortensis	1
Scorzonera hispanica	3

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Secale afghanicum	4
Secale africanum	1
Secale anatolicum	4
Secale ancestrale	9
Secale cereale	1,466
Secale chaldicum	1
Secale ciliatoglume	1
Secale dalmaticum	1
Secale dighoricum	5
Secale kuprijanovii	4
Secale montanum	10
Secale segetale	6
Secale silvestre	11
Secale smaragdicum	1
Secale testanicum	1
Secale vavilovii	7
Sedum acre	1
Setaria italica	88
Silybum marianum	1
Sinapis alba	16
Solanum berthaultii	1
Solanum bulbocastanum	1
Solanum chacoense	6
Solanum dylcomara	1
Solanum gourlayi	1
Solanum jamesii	1
Solanum kurtzianum	1
Solanum lacinatum	1
Solanum melongena	1
Solanum multidisectum	1
Solanum ogorandinum	1
Solanum phureja	6
Solanum pinnatisectum	4
Solanum polyaclenium	1
Solanum polytrychon	2
Solanum stoloniferum	2
Solanum tarijense	1
Solanum verrucosum	1
Solidago virga-aurea	1

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Sorbus aucuparia	1
Spinacia oleracea	14
Synphytum officinalis	1
Tanacetum vulgare	1
Taraxacum officinale	1
Thymus pulegioides	1
Thymus serpyllum	1
Thymus vulgaris	2
Tilia cordata	1
Tilia platyphyllos	1
Trifolium alexandrinum	1
Trifolium hybridum	3
Trifolium incarnaum	1
Trifolium pratense	116
Trifolium repens	31
Trigonella foenum graceum	1
Triticum	696
Triticum aestivum	7,992
Triticum aethiopicum	3
Triticum araraticum	1
Triticum boeoticum	2
Triticum compactum	16
Triticum dicoccoides	5
Triticum dicoccum	43
Triticum durum	1,144
Triticum karamyschevii	1
Triticum kiharae	1
Triticum macha	8
Triticum militinae	1
Triticum monococcum	15
Triticum persicum vav.	11
Triticum polonicum	10
Triticum spelta	65
Triticum sphaerococcum	2
Triticum timonovum	1
Triticum timopheevii	10
Triticum turgidum	35
Triticum vavilovii	2
Tussilago fartara	1

Table 6 The number of accession in long-term storage in 1994

Species	Number of stored accessions
Urtica dioica	1
Vaccinium myrtillus	1
Vaccinium vitis-idea	1
Valeriana officinalis	3
Veratrum album	1
Verbascum phlomoides	1
Verbascum thapsiforme	1
Veronica officinalis	1
Viburnum opulus	1
Vicia bengalensis	2
Vicia faba	750
Vicia panonica	1
Vicia sativa	292
Vicia villosa	5
Vinca minor	1
X Triticosecale	1,584
Zea mays	420
Total	**44,883**

A total number of 44,883 accessions of plants, belonging to the following groups: cereals, grasses, large seed legumes, small seed legumes, oil plants, industrial plants, vegetables, and medicinal plants, are currently in the long-term storage. Cereals make up 48%, grasses 32% and large seed legumes 10% of the stored seed material.

The seeds are kept in temperature controlled chambers at -18°C and 0°C. The viability of the stored seed is determined by germination ratio. 10% of the stored material is tested for viability after four years of storage. The results obtained determine whether all samples have to be tested or rejuvenated. Attempts to elaborate monitoring standards for the samples stored have been made along with the introduction of low-temperature storage. The observations made in the last 10 years led to the conclusion that seed samples can be stored according to IPGRI standards for 5-6 years. After this time the germination ratio of some samples is reduced and abnormal seedlings can be observed (Grzelak et al. 1994). This indicates that monitoring of stored accessions have to increased after this time.

The storage has a total capacity of 100,000 samples from which about 50% is currently used. The number of accessions stored increases annually by 1,000-4,000 (tab. 4). Such amount can be prepared for long-term storage

(cleaning, drying, germination testing) without technical problems. The collections of hop, garlic, asparagus and fruit plants are maintained in the form of plantations. The remaining objects are stored in the short-term storages of the collections. At the Institute of Potato Breeding in Bonin the potato strains are stored *in vitro* in temperature and light controlled chambers at 8-10°C and in 16/8 h day/night cycle. The light fluence rate is 500-1,000 lux.

3.2.4 Documentation

All accessions stored in the gene bank are accompanied by passport data, 68% of them by evaluation data. The best documented are the collections of cereals, grasses, hop, and tobacco. Within the grass collection 83% of accessions have both passport and evaluation data. Within the cereals collection 73% of accessions is fully documented.

The collections maintain their own computerized documentation. All data available are sent to the documentation center at the Genebank Laboratory. The documentation there is updated once a year. Additional data concerning the condition of the samples (viability, water content), and the evaluation data are also collected. Databases stored at the Genebank Laboratory provide a safety duplication of the collection data. The data are stored in duplicate and updated once a week. The information is available in a local computer network.

Documentation about the collections are available in various forms. Detailed crops catalogues are published (Kolasiński, Podyma 1987, Podyma, Kolasiński 1986) and *Index Seminum* and *Delectus Seminum*. Selected data are sent upon request. The cooperation with other gene banks is coordinated by IPGRI. Data are prepared according to the appropriate standards and can be send on diskettes as dbase files or in the ECP format.

3.2.5 Description and evaluation

All accessions stored in the collections are described and evaluated. The accessions are examined, in three subsequent years, on the field plots, greenhouses and laboratories. To eliminate the experimental error a standard variety is included in each experiment. The main yield components and resistance against diseases and environmental stresses are evaluated. The evaluation has been finished for the majority of accessions. The intraspecific variability of chosen species (*Triticum durum*, Szwed-Urbaś 1993, Avena strigosa, Podyma, 1994, *Pisum sativum*, (Apistwanich 1993) is also under investigation.

The standard methods of evaluation have been simplified because of the large number of accessions (limited number of replications). These modifications have been called into question by data users. However, statistical studies on the variability of qualitative traits in the germplasm collection allowed to elaborate a method for evaluation of this kind of data (Mądr 1993). The evaluation results are available in the form of reports (Góral, Podyma 1991) and catalogues (Podyma, Kolasiński 1988, Podyma, 1994). The results of the analyses can be sent upon request.

3.2.6 Rejuvenation of the collected samples

The seed material is rejuvenated in the collections, according to the requirements of the species, at the rate of ca. 1,000 samples per year. When a collection is closed the accessions are rejuvenated at Genebank Laboratory. There are two ways of rejuvenation: either by the own means of the Laboratory or in cooperation with the breeding center for the given species.

The computerized information about the sample rejuvenation is available at IHAR for the collection of cereals. In other cases the computerized system has not been requested.

Old materials with unsatisfactory germination ratio are eliminated from the collections unless they are subjects of investigations concerning the effects of the long-term storage on seed condition.

3.3 FOREST GENETIC RESOURCES

Forest constitute the main fraction of the protected areas. This fraction consists of 19 national parks covering an area of 244,679 hectares, forested nature protection areas (37,053 hectares in 1993) and other types of protected forest areas - selected seed stands, seed plantations, experimental plots (about 30,000 hectares in 1990). Protected forest areas comprise 2% of the country's total forest area. Such area, along with a few thousand of protected individual trees should be sufficient for the preservation of the genetic variability of forest trees. However, because of environmental pollution and drastic man made changes the perspectives for the coming 20 years are very pessimistic.

Under the auspices of the "Programme for improving of seed production and breeding methods in the State Forests in the years 1975-1990" 13,344 hectares

of selected seed stands of 20 species have been selected for seed production (gene reserve forests). 528 hectares of seed orchads and 370 hectares seedling seed orchads have been established. 225,092 hectares of economical seed stands have been selected and 15,327 hectares of additional progeny plantations have been established. Several thousands of trees are protected individually (plus trees of State Forest: 4888, plus trees of the Institute of Dendrology: 867 and nature monuments). A list of the protected stands is published (MoEPNoF 1990).

Since 1991 the "Programme of conservation of the forest trees germplasm and breeding of forest trees" is implemented. Within this programme the most valuable seed material is kept in long-term storage. The methods of the forest plants germplasm preservation will be radically improved when the Polish Forest Tree Gene Bank will start in the winter of 1995/1996.

The goal setting of the Bank includes:

- evaluation of the whole genetic variability of the protected species,
- establishment of collections for *ex situ* preservation,
- documentation and distribution of the collected germplasm.

The laboratory of the Gene Bank has been founded at the Department of Genetics and Physiology of the Institute of Forestry. Investigations concerning the practical application of germplasm preservation are currently under way. These are:

- evaluation of the natural variability of the trees populations in Poland,
- evaluations of the effects of antropogenic factors on the genetic structure of trees population,
- elaboration of the long-term storage methods for seed and pollen conservation,
- evaluation of the effects of the long-term storage on the genetic structure of the stored seed samples,
- elaboration of propagation methods by cuttings, organogenesis and embryogenesis,
- cryopreservation of embryos, calluses and ñartificial seedsî,
- monitoring of the changes in the stored seeds, pollen and embryos.

In the state forests the selection of plus trees and establishment of seed plantations and progeny plantations is continued.

The prospects for forest propagation are determined by the properties of the geographical regions and the genetic variability of the various species building up the forest.

26 macroregions of seed production have been established in Poland. The topography of these regions covers the whole genetic and ecological variability of the following species: pine, spruce, larch, oak, beech and black alder. The geographical regions of the European continent and of Poland as well as the administrative structure of the State Forests has also been taken into consideration.

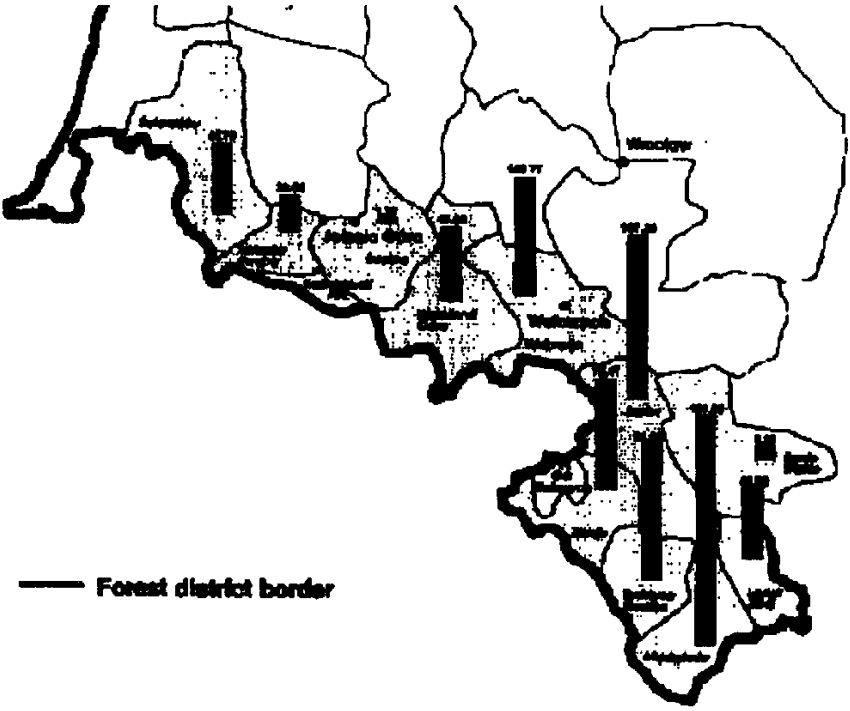
The preservation of the natural variability of Norway spruce is most advanced. First activities were motivated by and started after the Ministerial Conference on the Protection of Forests in Europe held in Strasbourg in 1990. Through the active involvement of Poland in European Forest Genetic Resources Programme (EUFORGEN), a follow-up programme of the Resolution 2 of the Strasbourg Conference, exchange of experiences in conservation of Norway spruce with other European countries has been facilitated.

The populations of spruce on natural sites occur in three isolated regions. The occurrence of spruce in the north-eastern part of Poland is connected with the northern and eastern spruce populations in Lithuania, Latvia and Bielorussia. The Hercynian West Carpatian region is a part of the population which occurs in Germany, Czech Republic and partially Slovakia. The spruce occurring in the south-eastern region is a part of the south-eastern Carpatian population of this species.

Macroregions with natural populations of spruce suitable for long-term conservation have been defined. A total number of 52 stands have been selected for conservation *in situ* (fig. 7). Additional *ex situ* plantations from seed material collected from these sites have been established. Since 1993, 623.7 hectares of conservation plantations have been established Spruce plus trees (about 500) from the seed plantations are an additional source of germplasm (Matras 1995).

The idea of spruce preservation has arisen from the observation that the population of this species growing in the Sudety region is seriously threatened (Capecki et al. 1991). In eleven forest districts 670 hectares of natural or probably natural stands have been selected. Two years ago 49 seed samples (1.5 kg each) have been collected for long-term storage.

FIG. 7 LOCALIZATION OF SPRUCE STANDS INCLUDED IN GENE CONSERVATION PROGRAMME FOR SUDETY REGION



A special program of conservation of old stands of spruce trees and trees growing within the protected areas of the northeastern part of Poland (mainly in Białowieża National Park), led by dr. A. Korczyk, is also realized. Natural stand of different age of trees (40-240 years old) and 73 trees aged 200 years or more have been selected. Those trees have been used for establishment of 2 clone collections *ex situ* covering 4.16 hectares.

The project of germplasm preservation of forest trees is realized with financial support from the Global Environment Facility (World Bank 1992). The tasks of this programme are following:

1. Conservation of the natural forestal ecosystems of the Białowieża primeval forest. This can be achieved by supporting the natural regeneration processes, reduction of environmental pollution, introduction of ecologically-oriented agricultural systems and cooperation with the Bielorussian authorities regarding the Bielorussian part of the forest.
2. Conservation of the biological variability of the mountaineous forest ecosystems of the Sudety region. Identification of the threat sources, collection and long-term storage of seedlings and seed material, monitoring of the environmental pollution, elaboration of the seed collection criteria. The conservation of common fir (Abies alba), the most endangered forest species, is the subject of regional cooperation between Poland and other European countries where this species occurs.

According to the suggestions of Agenda 21 an *ex situ* gene bank of the Douglas fir has been founded at the Institute of Dendrology in Kórnik and in the RDLP in Zielona Góra (2 plantations in the Sulechów forest district).

The natural variability of the economically important forest trees is assessed in experiments where populations of different origin are grown in the same conditions. More information can be provided by experiments where strains from air pollination or controlled pollination are compared. Such experiments provide information about the heritability of the traits, suitability of the individuals or population for breeding and interaction of the genome with environmental conditions. The intraspecific variability is also assessed by the methods of molecular biology.

Investigations concerning the genetic analysis of fir and yew will help to preserve the endangered populations of these species (Suszka, personnel communication).

CHAPTER 4
In-country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTIONS

According to the registers 5.6% of the samples stored are exchanged between germplasm users. The seed samples are sent upon request. The number of samples exchanged differ between collections and in years. The most frequent requested are samples of grasses and cereals (41 and 21%, respectively). From the comparison with the total number of accessions stored it can be concluded that the collection of grasses is used in 7%, cereals in 2.5% and vegetables in 23.5%. The exchange rate of white clover samples (2%) is low when compared to that of red clover (20%). New trends in grass breeding result in great interest in grass collections. The same holds for the Triticum spelta collection. Samples of varieties are most requested, samples of other types are ordered less frequently. The exchange rate of samples in three subsequent years is shown in Table 3.

In fact the actual exchange rate is larger than shown for following reasons:

1. The collections exchange the samples without the mediation of the central storage. Only unavailable material is requested from the central storage.
2. A part of the collections are used in breeding process, because most of the collection curators are plant breeders. According to their opinion the exchange rate ranges from few % up to 50% (potato collection) annually.

4.2 CROP IMPROVEMENT

The main objective of plant breeding is introduction to agriculture of the new cultivars bringing distinct positive economic effects like higher yield potential, lower labor inputs, better technological parameters, high reliability (Bilski et al. 1991, Czembor 1990).

The wheat breeding should have in prospects maintenance of high yielding level and improvement of lodging resistance, by changing the anatomical

structure of straw. In breeding for disease resistance the main pathogens should be considered: mildew, scab, rusts and the crown diseases. In winter wheat restoration of at least average level of winterhardiness is necessary. There is also a requirement to increase the number of high bread-making quality cultivars in the Register, as almost 50% of wheat grain is used for human consumption, mainly in the form of bread.

In breeding of the new rye varieties an attention should be paid to improvement of disease resistance and resistance to lodging. The raising of the quality parameters connected with the bread- and fodder use of grain is also important. Breeding should maintain high yielding potential and solve the most up-to-date problems: resistances to snow mould and to sprouting.

In barley breeding the two main directions will dominate: one for fodder and the other for brewing grain. They will be realized on the spring forms, because of the climate limitations.

Breeding of oats should guarantee for high yield potential and lodging resistance; it should have also in prospects the naked and the winter forms.

The release of the first winter triticale cultivar Lasko in 1982 commenced a new era in cereals production in Poland. Presently the area of triticale plantations amounts 4% of the farming land. As before, triticales are too much susceptible to lodging and to sprouting, their winterhardiness and septoria blotch resistance are insufficient. A work is necessary on breeding of bread-quality triticale.

Potatoes play a particularly important role in the Polish agriculture and occupy a great deal of the farming land. Growing of the crop is based mainly on the locally bred cultivars. During the last 25 years 73 cultivars were created, 51 of them are still in the Register. The prospects of future use of potatoes impose the following requirements for breeders: improvement of cooking quality of the edible varieties, increase of resistance of tubers to diseases, pests (cyst nematodes) and to mechanical damages.

The way of use and the climatic conditions are requisites of the major breeding objectives in maize. The most important is creation of early and middle-early varieties for corn and CCM, also of middle-late varieties for silage. The leading plant breeding companies introduce the hybrid varieties to production. In order to compete on the seed market the home breeding makes the simple and the three-way hybrids.

In the double-low rape the problems of maintenance of high yielding potential, winterhardiness and of distinct improvement of disease resistance are still up-to-date. The hybrid varieties and those with lowered fibre and glucosinolate content point out the prospective directions of breeding.

Polish sugar beet breeding reached particularly valuable achievements in creation of high-sucrose genotypes, which are used for improvement of foreign varieties. The wide application of heterosis methods in breeding leads to reduction of gene pool. Thus, it is necessary to preserve such genotypes for their further exploitation in creation of modern, monogerm and disease resistant varieties.

The stability of yield is the main goal in breeding of pulse crops. It is much connected with the breeding for resistance to fungal and viral diseases. In the breeding of field pea the main direction is a high green matter yield in composition with an acceptable level of seed yield. In the broadbean breeding earliness is the main breeding objective. The determinate types seem to be the prospective ones. Breeding of cultivars resistant to diseases, first of all to *Botritis, Ascochyta and Fusarium* is of great importance. The feed value should be improved in the breeding process by the removal of antinutritive compounds (mainly tannins) from seeds.

In lupines a successful combining of determinate type with thermo-neutrality and with resistance to fungal and viral diseases could promote a radical change in the way of the crop use, from the green forage to the seed type.

The direction prevailing in the red clover breeding is high yield of the digestible dry matter in the second year of cultivation.

Breeding of grasses in bound with a demand for various species and cultivars for reclamation of meadows and pastures, as well for special purposes: lawns, sport fields, roadsides and other ones. The diversity of ways of use makes the requirement for a large number of species and varieties under elaboration.

In laying out the main directions of breeding of the new vegetables' varieties the quality and the resistance characters should be taken into account. The climate conditions impose a need for vegetable cultivars suitable for the long-lasting storage. The food industry anticipates varieties well fitted for mechanical harvesting and processing, with the desired morphological and qualitative characters. The high dietetic value of many vegetables makes them a valuable contribution to the relatively poor assortment of vegetables consumed in Poland.

The agricultural policy aiming for maximal yields exerts an influence on breeding goals. The high yield potential is preferred to other important characters, e.g. resistance to diseases and stresses, quality parameters.

In Poland breeding work is subsided mainly by the government, through the Ministry of Agriculture and Food Economy (the Biological Progress Fund).

The process of introduction of the new home bred varieties was slowed down in recent years. It was caused by reorganization of breeding establishments and by marked impairment of some structures in seed production. Varieties of plants with a high reproduction coefficient are the most quickly popularized. The home-bred cultivars prevail in cereals, potato, pulse crops, hop, tobacco, herbs, some vegetables and ornamental plants. The increase of cereals' yields resulting from the biological progress is estimated as ca. 30 kg/ha per year. The degree of utilization of the breeding progress is unsatisfactory. The yields in farm production constitute about 60% of those registered in the state trials.

The contribution of farmers to the plant breeding activities is generally very low (if not to consider multiplications of some varieties). They are a bit more involved in varieties evaluation, in form of participation in dissemination activities (lectures, experimental fields visits, the "open door week" action) and in some trade unions (mainly for industrial crops). However, the participation is often restricted to getting instructions. The creation of expertise concerning the economic value of varieties, on the state scale, is a duty of the Research Centre of Cultivar Testing (COBORU). The producers can influence the opinions through their representatives in the special committees for cultivars registration.

4.3 USE OF FOREST GENETIC RESOURCES

There is a chance for Polish forestry to contribute to the world market not only with the timber export but also with the export of seeds, seedlings and cuttings of forest trees. The Polish ecotypes of pine, spruce, larch, oak and beech are well known and treasured in the West. However, the offered seeds and plants must fulfill all requirements comprised in regulations of OECD (Organization for Economic Cooperation and Development), in particular a need of documented origin.

The special law regulations for the forest species seed circulation has not been introduced yet, however the recommendations are obligatory, issued in the "Programme of forest genetic resources protection and selection breeding of

forest trees in Poland for years 1991-2010". The programme secures constant supply of the proper quantity and quality of seeds of the main forest trees for the State Forests and other forest users.

The seeds for production of renewal planting materials must be collected only from the selected stands, elite trees or from their progenies, which form a seed base. According to the direction and rate of selection the seed base is divided into the population selection seed base and the individual selection seed base.

The population selection seed base comprises:

- the chosen stands delivering seeds for production of planting material for the progeny plantations, the maintenance plantations and the provenance experimental areas,
- the progeny plantations, which will serve the same purposes after they reach seed-bearing age,
- the exploited seed stands which have to supply seed for planting material for the economic plantations. The chosen seed stands constitute living gene banks.

They are selected for the demands of State Forests and for preservation of their genetic resources.

The seed base of the individual selection includes:

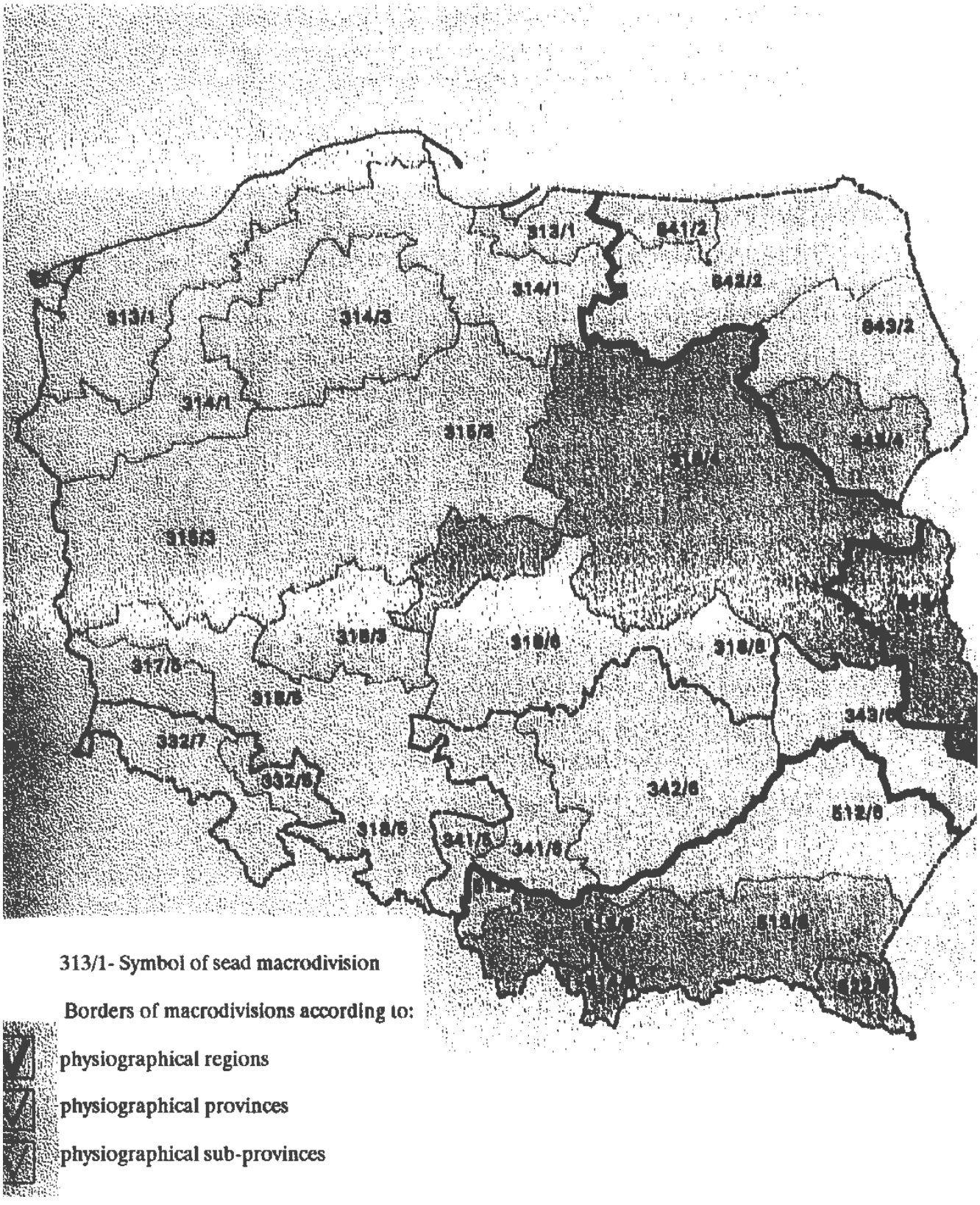
- the elite trees which deliver shoots for cloning by cuttings, which are used for founding seed orchards (now 530 ha, 7 species),
- the vegetative origin seed orchards,
- the generative origin seed orchards,
- seed plantations founded from the elite trees.

The progeny plantations, which will form in the future seed orchards (now 15,300 ha) are set up from the seeds collected from seed orchards.

Physiographical factors of the region and genetic diversity of forest species populations condition possibilities of a forest development and its multiple functions. The starting point in organizing economic infrastructure and selection seed base are seed regions. Basing on borders of physiographical sub-provinces and those of the forest ecosystems 26 seed macrodivisions have been distinguished. Their area comprises 106 seed microdivisions.

Following the regulations of OECD, characterization of natural conditions will be elaborated and published for all macrodivisions (Załęski 1994) (fig. 8).

FIG. 8 FOREST MACRODIVISION IN POLAND (ZAŁĘSKI ET AL. 1993)



Two kinds of microdivisions have been distinguished:

1. Microdivisions of the backwood type. They include the most valuable local populations of the basic forest-forming species and significant areas of the chosen and exploited seed stands.

2. Common microdivisions having very small seed base without, or with a little proportion of seed stands. In the backwood microdivisions the introduction of seed material from outside will be prohibited for the native species, for which the microdivision was established. In the common microdivisions, in cases of lacking self-supply from the own base, propagation from the different, (but defined) microdivision seed base will be permitted. Distribution of seeds will be legal only within a microdivision, with respect to the altitude zones in mountains.

The rules accepted in the programme (Załęski 1994) aim at prevention of free transport of seed into different physiogeographical and ecological conditions.

The technical infrastructure with an equipment for seed extraction and for their storage is one of the most important factors of the rational exploitation of seed bases in the State Forests. It could be stated from the analysis of the present state of seed extraction and preservation , that the State Forests have at their disposal an appropriate number of seed extraction and preservation stations. However, their technical equipment and work quality do not meet requirements of the modern seed production technology. The main assumptions of the programme in this respect are following:

- necessity of adjustment of extractory stations to the selective extraction of cones and adjustment of seed storages to preservation of the separated seed-lots,
- furnishing with a highly efficient equipment for extraction of seed-lots from cones.

The number and size of seed extraction stations subjected to the Regional Directorates of State Forests are determined by the owned seed base, demand for seeds of the basic forest-forming species and by storage of seed reserves for the needs of the whole country (in compliance with the "Forest breeding rules" (1988). The output capacity of the existing extractory plants is, in principle, sufficient to cover the forestry demand, if not to consider the needs of selection breeding.

Seed testing is an indispensable part of a seed production system. The main purpose of the hiherto conducted seed evaluation was estimation of their sowing value. One objective more should be set in the face of danger for numerous forests habitats: seed evaluation should also include monitoring of changes in genetic resources of the stored and processed seeds.

The new goals set for seed testing, a need for Poland to join OECD and necessity to warrant for the appropriate standards of seed evaluation in the growing number of laboratories showing different levels of possibilities, qualifications and competences call for reorganization of the seed testing system in Poland. Establishment is proposed of three kinds of seed testing stations with different status and range of actions:

1. The leading seed testing station, for all the country, using international methods of seed evaluation based on regulations of ISTA (International Seed Testing Association) and authorized to draw up international certificates.
2. Regional seed testing stations, comprising several Regional Directorates of State Forests, authorized to draw up certificates valid on the whole country territory.
3. Regional seed inspection stations, each working for one Regional Directorate of State Forests. Their certificates would serve only the own needs of a directorate.

The following objectives of forest trees selection have been set:

- improvement of qualitative and quantitative characters of stands,
- improvement of quality of trees and of timber,
- increase of wood mass in short production cycles,
- increase of resistance of trees to biotic factors.

Historically big forest areas have never been private ownership, for this reason social pressure on privatization of forests not indicated. Currently prepared economical programmes don't presume such direction of changes.

4.4 BENEFITS DERIVED FROM THE USE OF PLANT GENETIC RESOURCES

The idea of the programme realized in the recent years has been the use of germplasm collections as the basis for plant breeding. The working collections have been turned to plant genetic resources collections and they store materials for plant breeding. The working principle accepted by the management of the gene bank is the unlimited access to the stored germplasm, free of charge. Therefore, no limitations are set for the germplasm users. We expect, that this principle will also be respected by our partners.

The subject of the international germplasm exchange are mainly breeding materials and cultivars. These materials are used for plant breeding and research and are available for these purposes only. The author's rights are protected by separate regulations.

The main achievement of the gene bank is that all breeders are provided with the requested materials. The contacts to the breeders are good, although the expectations were higher. The breeders expected that gene bank will provide pre-bred materials for plant breeding. This is not the basic task of gene bank. However, such goals can be realized in short or medium-term cooperation with the gene bank workers.

4.5 IMPROVING PLANT GENETIC RESOURCES UTILIZATION

There are several ways of taking more advantage of the germplasm collected in the gene banks:

1. Improving of the documentation by collecting results of the experiments carried out by breeders with the materials obtained from gene bank,
2. Including study of new crop plants in germplasm collections, which because of high risk are not subjects of breeding work. Such projects should be financed from other means than the basic activities of the gene banks.

The main problem encountered is the fast access to the passport and evaluation data of the stored germplasm. Preliminary analysis and suggestions concerning the materials rendered to breeders may radically increase the advantages taken of germplasm collections.
Regional or global solutions should be implemented, which can be realized within a system of computer networks and central databases.

The attitude toward gene bank should be changed. Gene bank should not only be depositories of plant materials but also actively support germplasm preservation and breeding activities in the Institute and in the whole country.

CHAPTER 5
National Programmes for Genetic Resources

The protection of genetic resources is financed by a number of government and non-government bodies. There are four ministries involved: Ministry of Environmental Protection, Natural Resources and Forestry, Ministry of Agriculture and Food Economy, Ministry of National Education and Committee for Scientific Research. Other national and international organizations contribute also, e.g. International Bank for Reconstruction and Development.

In 1991, 992 millions of dollars were allocated to the purpose. The national parks and the programmes supporting *in situ* preservation (protection against pollutions) used 98% of this sum. The 2% of this budget was consumed by *ex situ* protection in botanical gardens and zoological parks, by wildlife museums and by gene banks (Andrzejewski and Weigle, 1993).

5.1 NATIONAL LEGISLATION

In spite of a long tradition of activities in the natural environment protection in Poland there is a lack of clearly formulated and future oriented policy of genetic resources conservation. It results from the antiquated way of understanding of the nature protection, restricted to the protection of areas and species.

The Constitution of Poland contains the article 12, par. 2, devoted to the nature protection affairs, which states, that the state secures protection and a rational management of the natural environment, which is a common property. It has also the article 71 proclaiming a citizen right to take advantages of the natural environment and requiring the duty of its protection.

The acts concerning this problem may be divided into three groups:

1. Acts devoted specially to the questions of environment protection: Act on Protection and Management of Environment from 1980 and Act on the Nature Protection from 1991.

2. Acts regulating management of particular elements of the environment, including also problems of its protection: Act on Forests from 1991, Act on Protection of Agricultural and Forest Grounds from 1982, etc.

3. Acts partially concerning problems of environment protection which regulate various scopes of social and economic life: Act on the Local Government from 1989, etc.

The majority of these acts became law before the Convention on Biological Diversity come into force. At present the most important programmatic document is the State Ecological Policy (MoEPNRaF, 1991). The ecological policy lays down a new direction of state development, with consideration of environmental conditions, called eco-development. The biological diversity protection and its balanced exploitation is a significant constituent of the eco-development model, which assumes adaptation of the directions, ways and rates of social and economic development to the state of environment and natural resources (Cieślak,1995). The series of new documents and elaborations, issued after 1992, updating the former regulations and accepted policy, seldom goes beyond the frame of previous legislations. A detailed analysis of legislation acts in respect of their conformability to the resolutions of the Convention and to the state policy has been performed by Cieślak (1995). The additional value of this review is its role as a starting point in the elaboration, by the same author, of the "Strategy of biological diversity protection"

The most important acts and programs concerning the nature and use of its resources

Act on Forests (1991);
Act on the Nature Protection (1991);
Act on Seed Trade and Production (1987);
Strategy of Protection of the Living Natural Resources in Poland (Ryszkowski and Balazy,1991);
State Ecological Policy (MAFE 1991);
Decree Nr 32 of Prime Minister concerning creation of the Committee for Eco-development;
Strategy for Poland (Kołodko,1994);
Strategy of Eco-development for Poland (Nowicki, 1993);
State Strategy of Biodiversity Protection (Project) (Cieślak,1995).

5.2 PROGRAMMES FOR GENETIC RESOURCES CONSERVATION

In the Polish agriculture and forestry, the three following directions of genetic resources conservation are realized, having different legislation bases and different financing sources:

- conservation of genetic resources of crop plants,
- conservation of genetic diversity of forests,
- conservation of genetic resources of domestic animals.

5.3 EVALUATION OF CONSERVATION OF CROP PLANTS GENETIC RESOURCES

The programme of plant genetic resources preservation (Ministry of Agriculture, 1979) was established in order to secure a broad base of initial materials for breeding work (grounds for agreement). Competences were divided according to the breeding profiles of institutions. It proved to be convenient for utilization in breeding of all maintained accessions. Difficulties appeared in collection and preservation of the materials which are more difficult in use (wild species, landraces) but potentially very valuable for future breeding and research. The leaders of the programme in the ninety-seventies and -eighties deserve the unquestionable credit for the broad vision in setting objectives of gene bank. Thanks to them, our collections contain local populations which are extinct in agro-biocenoses. At present the program goes out of its scope. More and more frequently the problems of environment protection and preservation of human welfare and culture are considered when discussing gene bank objectives.

The system of genetic resources protection for crop plants was based on cooperation between independent collections coordinated by the National Department of Plant Genetic Resources. The good and bad points of this system were recapitulated by Bulińska-Radomska et al.(1990).

The advantages are following:

- **easy access of breeders to genetic resources.** The majority of collections are managed by breeders. The specialists are involved in evaluation, propagation and regeneration of materials,

- **reduced costs of labour and equipment.** Staff involved in work on genetic resources is financed partially from the other programmes realized by institutes. The opposite situation is possible either. The special equipment necessary for collections may be used in other projects.

The faults of the system:

- **high proportion of advanced breeding materials (cultivars, strains).** Breeders prefer working on such materials and show tendency to restrict other forms in collections,
- **high risk of material losses.** There are practically no sanctions, if a co-worker refuses to regenerate materials or dissolves the contract without delivering materials to long-term storage. Another danger is the lack of experience in regeneration of wild and primitive forms. Thus the highest losses are noted among these materials, which were received at the highest cost (expeditions),
- **some delay in exchange of materials and information about them.** The problem concerns usually communication and effectiveness of cooperation.

The way of financing of genetic resources protection is another important task. At present it is based on a annual order of the Ministry of Agriculture.

According to the opinion of the Ministry, the government is directed at genetic resources preservation, because it provides funds. The Ministry admits that legislatory regulations are necessary in order to secure genetic resources as a national heritage. The creation of a board for genetic resources of crop plants is planned. The necessity of securing budget funds for genetic resources protection, purchase of the modern equipment and for scientific expeditions is stated.

The most important decrees and programmes of Ministry of Agriculture referring to preservation of biological diversity

The order of the Minister of Agriculture and Food Economy concerning penetration of pest organisms from abroad and localization of custom examination places (1990).

Directions of Social and Economic Policy for Villages, Agriculture and Food Economy until 2000 (MAFE, 1994). The programmatic document of the branch. **The programme does not take into account concerns of eco-development and omits the problem of biological diversity protection (Cieślak, 1995).**

The yearly order of the Minister of Agriculture and Food Economy concerning subsiding of tasks, including those of biological progress in plant and animal production.

Rationalization of the use of marginal soils (MAFE, 1993).

The opinion of collection curators is different: the protection of genetic resources in Poland results exclusively from engagement of curators and the institution they belong to. The government is rather a passive donor of funds responding to curators' pressures without being conscious of the problem importance.

The following facts support the curators' evaluation:

- the financing of the programme was interrupted for two years (1991-1992). The agreement between branches from 1979 has been broken. According to the Ministry representatives this agreement is not obligatory at the present time. The consequence was the lack of legal framework to secure variation in work collections of the falling breeding firms. The collections have been considered the properties of the maternal institutions holding them, not the common national heritage,
- the funds for the collections are allocated with a big delay,
- the collections are financed in half-year intervals, after completing the planned tasks. The holding institutions have to credit collections work during six months or more,
- purchase of devices is excluded from financing.

The changing economic situation and the way of science financing require new rules of cooperation. Taking into consideration the needs of the country and the obligatory legislation acts the following the National Programme of Crop Plant Genetic Resources Conservation has been elaborated (Czembor et. al. 1994).

National Programme of Crop Plants Genetic Resources Conservation

The project is a proposal for structuring of the Polish plant genetic resources collections and for creation of a system basing on a national gene bank and appropriate leading collections. It has been elaborated according to the hitherto accumulated experience, and includes objectives resulting from the signature of the Convention and of the FAO International Undertaking.

The following goals in genetic resources conservation were expressed:

1. Creation of a strategy for genetic resources conservation.
2. Collecting and inventorying crop plant genetic resources.
3. Securing of the suitable conditions for storage of the collected materials.
4. Rational use of plant genetic resources in breeding and research work.

The solutions have been proposed enabling effective run of the programme:

1. Establishment of a National Crop Genetic Resources Programme
2. Legislative regulation of the National Programme of Crop Plants Genetic Resources Conservation.
3. Creation of the Board for Crop Plants Genetic Resources.
4. Designation of a coordinating unit for the current works on genetic resources - National Gene Bank and stating its duties.
5. Definition of the status and goals for the leading collections of plants, in respect of collecting genetic resources.
6. Fixed position in finances of the Ministry of Agriculture and Food Economy budget.

Ministry of Agriculture is going to finance development of the national programme for genetic resources. The assumptions of this programme have been added with the animal genetic resources and with those of wild plants; they include also exploration of the selected regions, which will make possible monitoring and collecting of genetic resources, as well as popularization of *in situ* protection.

The document is the modern programme introducing the Convention ideas on *ex situ* and *in situ* protection, as well on the fields of research and law regulations. Integration is advisable of this programme with those for gene banks, concerning protection of the most endangered wild-living species, as well as their harmonization with the system of protected areas (Cieślak 1995).

National Symposium to develop a consensus on the National PGR Programme would be useful. The problem of genetic resources conservation is still undervalued in the country, even at the government level. There is a lack of commitment of trade companies, social organizations, individual farmers and agricultural organizations. The preservation of differentiated genetic material is important for the future of breeding and economy. Collections of crop plants are a source (sometimes the only in the country) of genetic variation for breeding programs. Thus, maintaining of the collections and broadening of their activities is of primary importance for the food security the of country. The maintenance of the local materials is a particularly important task. Among the postulates of the Ecological Board at the President of RP, directed to the Ministry of Agriculture, the 4th postulate reads as follows: " Support and propagate cultivation of the rare, old landraces of cultivated plants and domestic animals".

5.4 EVALUATION OF CONSERVATION OF FOREST GENETIC RESOURCES

The programme of genetic resources protection for forest trees does not exist as a whole; it must be worked out, together with the adequate law regulations. The existing programme (Matras et al. 1993) concerns only the so called economic forests (state forests subjected to the General Directorate of State Forests). It is necessary to include to the state programme other forests, mainly national parks, nature reserves and institutions managing these objects. The activities on the protected areas are regulated by the "Programme of development for the selected forestry fields and for protection of national parks ecosystems for years 1993-1997" (MOEPNRAF 1993). Parallely the GEF grant is realized, concerning selected forest complexes in Poland (GEF 1991).

The proposed changes in the way of forest management are, according to the opinion of Cieślak (1995), almost revolutionary and result from introduction of principles of the balanced development to the forest economy. However, they still initiate many disputes between ecologists and forestry workers. The close cooperation with ecologists should be a requisite of the created program. It is necessary to extend programme with the biological diversity elements which are beyond the scope of immediate interest of the forest economy. Only so worked out and so conducted program will ensure the proper protection of biological diversity of the whole country forests. It is connected with amendment of breeding rules and with education of the forest administration staff. The detailed justification for the forest economy modernization announces Gliwicz (1994).

Further increase of forestage (up to 30% of the country area) is planned for the nearest future, by intense afforestation of wastelands and the arable areas withdrawn from cultivation. The main function of forests, which is now the production, should be changed to the environment management.

Poland has been subjected to the less intense genetic erosion than other European countries, including the natural as well as agricultural ecosystems. It has resulted in existence of germplasm resources which are attractive for the world and, in particular, for Europe. It concerns natural forest and swamp ecosystems and, particularly, rural ecosystems with the old varieties of rye, lupine, buckwheat, lentils and other crops, including the old clones of fruit trees. In agriculture, plant genetic resources form a base for the biological progress in plant and animal production. Unhappily, their preservation in the existing ecosystems is endangered by anthropogenization of environment, and their collection and storage in collections and gene banks is insufficient owing to the lack of Financial means and little interest

of social and political organizations and of state administration. It creates a serious threat for the, relatively rich biological diversity on the genetic level still existing in our country. The losses of the presently existing genetic resources may cause in the near future irreversible adverse changes in the natural ecosystems and retard growth of plant and animal production, exposing agriculture and forestry to the difficult in prediction, but surely high economic losses (Nalborczyk 1994).

The most important instructions and programmes concerning forests

Instruction Nr 7 of the General Director of State Forests on selection of trees for the forest seed production (1988)

Principles of Forest Breeding (1988)

Program of maintaining forest genetic resources and breeding of trees in Poland for years 1991-2010 (Matras et al., 1993). The obligatory in the state forests of Poland programme of genetic resources conservation aims at preservation of the selected endangered forest complexes and the forest trees genotypes adapted to the country ecological conditions.

Project of Forest Biodiversity Protection. The programme is financed by the International Bank for Reconstruction and Development within the structures of GEFprogram. The project concerns protection of biological diversity in the selected forest complexes (Białowieża and Sudety) and construction of the Polish Forest Gene Bank (GEF 1992).

Program of Development of the Selected Fields of Forestry and of the Ecosystems Protection in the National Parks for years 1993-1997 (Forestry Department, 1993)

Polish Policy of the Balanced Forest Economy (MoEPNRaF,1994) Directions for Improvement of Forest Economy on the Ecological Base (General Director of State Forests, 1995)
Polish Policy of the Complex Protection of Forest Resources (Grzywacz, 1994)

Programme of Gene Bank Activities in Poland - the detailed elaboration of principles of resources collection and of the organization structure (in preparation) (Janson, 1994).

National Programme of Forestage Increase (project) (Łonkiewicz, 1994)

5.5 COORDINATION

The Ministry of Foreign Affairs, with the letter of 1993, 12.20, authorized Prof. H.J. Czembor (PBAI director) to represent Poland in the fifth phase of the European Cooperative Programme for Crop Genetic Resources - the National Coordinator of Plant Genetic Resources.

Poland is a member of the FAO Commission on Plant Genetic Resources. The obligation was signed entitled "International Undertaking on Plant Genetic Resources". Prof. H.J. Czembor is also a plenipotentiary of the Polish government in the FAO Commission on Plant Genetic Resources.

Since 1995 M.sc. Eng. Jan Matras (Institute of Forest Research) is the National Coordinator of the European Forest Genetic Resources Programme (EUFORGEN).

5.6 TRAINING

The collective body of scientists engaged in the genetic resources protection comes from agricultural academies and universities. The basic problem is a limited number of workers (scientific and technical ones) involved in gene bank activities. In the Gene Bank Laboratory 8 persons are employed now (including 4 persons on scientific posts). The completion of a suitable team of workers is difficult because of very low salaries. The problem is typical for the all Polish scientific institutions.

The group of leading collections takes part in various trainings in the country and abroad. It is a basic problem, that genetic resources conservation does not exist in Poland as an academic specialization. There is an urgent need to introduce this line of studies. The short courses organized by PBAI are directed mainly to the collection curators. This form of education can not replace studies on the academic level.

Specialists and trainings are lacking on the fields of taxonomy of cultivated plants, development of responsibility for genetic resources, management of genetic resources collections and on the new work directions like "on farm conservation". Courses of instruction for government administration are necessary too.

Poland may offer training on the following fields:

- methods of collection (expeditions), storage and agricultural evaluation of collected accessions,
- characterizaton of genetic variation with the application of electrophoretic methods of separation of enzymes and DNA,
- various trainings concerning the use of genetic resources in breeding of crop plants.

5.7 QUARANTINE LAWS

In Poland quarantine is regulated by the Instruction of Ministry of Agriculture and Food Economy from 1990, concerning prevention against penetration of pest organisms from abroad and localization of custom examination places. The base of its rules are recommendations of the European-Mediterranean Plant Protection Organization (EPPO), with consideration of the country specific conditions. The Polish quarantine list resembles many European ones (particularly those of western Europe), with exceptions of the store pests and weeds, which are taken into account in the West only in quality standards (Zych 1990). Sometimes the restrictions in import of plant material bring losses. However quarantine reduces, to a certain degree, expansion of diseases and pests.

5.8 TURNOVER OF SEEDS

The sale and distribution of crop plant seeds in Poland is regulated by the Act of Seed Trade and Production from 1987 and by quality standards, field expertise regulations and general regulations of trade. The cultivars different than those present in the Register are not permitted in the seed market (agency in seed materials, import of seeds from abroad and putting them on market). The other material may be released only by decision of the Minister of Agriculture and Food Economy. There are no restrictions in the trade of the species which are not included into the Register. The seed material should fit the germination standards (Act of Seed Trade and Production, Chapter 6, Art. 45). Restrictions in propagation of some cultivars on production scale come from variety protection rights of the cultivars' owners. Nevertheless you can usually obtain easily small quantities of seeds for research purposes.

The Seed Trade and Production Act from 1987 and the act being currently in preparation do not include any regulations concerning either biological diversity conservation or seed trade for its provision, (seed supply for farms cultivating old varieties, for example). The authors of the Act are of opinion that these issues can be regulated by the decisions of the Minister of Agriculture, mentioned above (de Virion, personal communication).

5.9 INTELLECTUAL PROPERTY RIGHTS PROTECTION

The protection of intellectual property rights in the field of plant breeding is not regulated by Polish law. The protection of breeders' rights is regulated by the Seed Trade and Production Act in accordance with the UPOV convention.

CHAPTER 6
International Cooperation

6.1 INTERNATIONAL CONVENTIONS

Conventions and other kinds of agreements provide the legislative basis for international cooperation. Poland has been for the long time a party of conventions concerning environment protection.

The most Important conventions are:

Washington Convention CITIES on international wild plant species and endangered animal species trade. The convention has been signed on March, 3 1973 and entered into force in 1975, Poland has ratified the convention in 1989. In Poland trading licenses for wildlife species of plant and animals are issued by the Ministry of Environment Protection, Natural Resources and Forestry.

Paris Convention 'WorldHeritage". Convention on Conservation Of the World's Cultural and Natural Heritage, signed on November, 23, 1972, entered into force on December, 17, 1975. The convention has been ratified by Poland on September, 29, 1976.

Bern Convention. Convention on the preservation of the European wildlife and natural habitats, signed on September, 19, 1979, entered into force in 1982. In Poland the ratification process is under way.

Helsinki Convention on protection of the marine environment of the Baltic Sea, signed on March, 22, 1974, entered into force in 1980, since that time Poland is a party of the Convention.

International Undertaking on Genetic Resources Conservation (1983)

UPOV - plant breeders' rights protection (1991)

The most Important conventions are

Preparations are made to sign the Convention of the International Commission for Protection of the Odra River against Pollution. The Parties of the Convention are Poland, Czech Republic, Germany and the EEC. On the basis of regional cooperation a programme, under the EEC auspices, named "the Black Triangle" for the frontier regions of Poland, Czech Republic and Germany has been developed. This programme will focus on the protection against air pollution, protection of nature and rainfalls in those regions. In the recent 2 years following Conventions have been ratified: the Vienna Convention, the Montreal Protocol; the Sophia Protocol has been signed, international agreements were made concerning the Basel and Bern Conventions. The representatives of Poland actively negotiate the texts of 6 new conventions and protocols prepared under the auspices of WHO and UNEP.

6.2 CONVENTION ON BIOLOGICAL DIVERSITY

The ratification of the Convention on Biological Diversity is the main goal to be accomplished.

Ratification of the Convention on Biological Diversity

Poland has been very active in the preparations made for the United Nations Conference on Environment and Development held in Rio de Janeiro. One of the 10 pilot country reports on biological diversity has been prepared on the request of the United Nations Environmental Programme (UNEP).

After the Convention on Biological Diversity has been signed at the beginning of 1993, an Ecological Board has been established to assist the President of Poland and the national ecological policy has been elaborated.

The Ministry of Environmental Protection, Natural Resources and Forestry started the ratification process after more than 2 years after the signature of the Convention, despite the State's Policy (1991) to ratify the Convention as soon as possible. The National Secretariat of the Convention localized at the Institute of Environment Protection existed only for a few months and was dismissed by the Minister of Environmental Protection, Natural Resources and Forestry in March of 1994.

Through it's signing of the Convention, Poland has proved it's willingness to join the Convention. The process of ratification has been much slower than expected and has given rise to some contradictions which urgently need to be

dealt with. In particular, the changes in national economy and lack of appropriate law regulations may lead to wasteful exploitation of natural resources. In many of the documents adopted, the conservation and sustainable use of biological diversity is not taken into account. This is the result of the innovatory character of the Convention, lack of popularity of the ideas of the Convention among the scientific and legislatory communities and lack of appropriate regulations supporting the introduction of the Convention. The slowness in the ratification of the Convention results in the delay in realization of the resolutions of Agenda 21.

In March of 1993 Poland has been appointed to the member of the UN Commission of Constant Development. Two additional national parks and 10 landscape parks have been established, the area of protected forests has been increased by 300,000 hectares. A seminar "Problems of Biological Diversity Conservation" has been organized by the National Environment Protection Fund (held in Rynia on 26-27 Nov., 1993). Prominent representatives of scientific community and state administration took part at the seminar (Weigle 1994).

6.3 FAO GLOBAL SYSTEM

Poland is member of the FAO Commission of Genetic Resources and a Party of the International Undertaking on Plant Genetic Resources. However, the accession to the International Undertaking on Plant Genetic Resources did not increase the policy guidance to the conservation and sustainable use of genetic resources. After the Undertaking has was signed no attempts have been made in order to implement its recommendations. The role of the FAO Commission on Plant Genetic Resources in the establishment and maintenance of international contacts is highly acknowledged. The attempts made within the International Undertaking on Plant Genetic Resources and the establishment of the Global System have a high impact on the conservation of genetic resources. The revision of the International Undertaking (pursuant to the FAO resolution No. 7/93) will help to elaborate a consensus regarding access to genetic resources, farmers' rights and the status of materials gathered in gene banks. The inclusion of animal and forest genetic resources in the activities of the Commission in the future is advisable. The International Fund established as a part of the Global System should support the *in situ* conservation. The Fund should provide means for local communities embodying traditional lifestyles, for managing and utilization of local genetic resources. The system should be based on a non-commercial mechanism supporting *in situ* conservation of genetic resources.

6.4 INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

According to a survey the knowledge of the current international efforts on genetic resources conservation is very poor among collection curators and users. Also, the functions and tasks of the International Agricultural Centers are not known. The only commonly known international organization is IPGRI. The cooperation with IPGRI is realized within the regional ECP/GR programme. The collection curators are members of the working groups of the programme. IPGRI has an essential impact on conservation of genetic resources in Poland. The most important tasks of IPGRI in the next 10 years are:

1. Strengthening of the national capabilities for utilization of genetic resources by:
   - development of the international database system for crop plants and of standards for documentation of genetic resources,
   - research on new plants with potential value as food crops,
   - development and utilization of basic crop plant collections,
2. improvement of the safety of stored accessions by duplication in other gene banks,
3. elaboration of new *in situ* conservation methods (on farm conservation, community level conservation). Research concerning socioeconomic and cultural aspects of genetic resources conservation.

Cooperation with International Agricultural Centres is developed in research area and training breeding. In 1985 PBAI signed agreement with CIMMYT for joint research on wheat, triticale and maize. Exchange of materials is conducted by breeding station with CIMMYT and CIAT.

6.5 REGIONAL COOPERATION

Since 1981 Poland is contributor to the European Programmes on Plant Genetic Resources Conservation and bears the responsibility for the international germplasm collections of the species Secale, Pisum and Festuca. Recently, the agreement of the 5th phase of the European Cooperative Programme for Crop Genetic Resources Networks has been adopted, and Poland has joined EUFORGEN (European Forest Genetic Resources Programme) which is the programme of conservation of forest resources. Four

working groups (Picea abies, Populus nigra, Quercus suber and noble hardwood) start their activities.

A grant for the east-European countries, financed by the Dutch government, provides a good example for regional cooperation. Within this programme a unified system of databases is elaborated, which will contribute to the international information exchange network in Europe.

The next aspect of conservation is the regional *in situ* cooperation concerning the frontier regions. Many valuable areas lie across state borders. On the Polish territory such areas are protected as national parks or nature conservation areas, whereas on the other side of the border the degree of protection is lower, or inversely. Poland wishes to establish or strengthen with regard to the Białowieża Primeral Forest, Tatra and Bieszczady Mountains, the Baltic Sea and areas along Odra river banks. Preparations are made on establishment of a Biosphere Conservation Area, within MAB, which will include the Polish and Bielorussian parts of the Białowieża Primeral Forest, and of an international Polish-Slovak- Ukrainian Biosphere Conservation Area in the East Carpathian Mountains.

6.6 BILATERAL COOPERATION

The bilateral cooperation on genetic resources conservation is rather unsatisfactory.

Regional and bilateral cooperation in conservation of genetic resources

ECP/GR. European Cooperative Programme for Crop Genetic Resources Networks (1981)

EUFORGEN. European Forest Genetic Resources Programme (1994)

Small Grain Cereal Programme - EEC - Programme on utilization of genetic resources. In cooperation with this programme a grant concerning the elaboration of a database for the genus Secale is realized.

Technical support for the east - European countries to create conditions to facilitate the access to the genetic resources collections - a grant financed by the Dutch government.

Regional and bilateral cooperation in conservation of genetic resources

Bilateral agreements

Agreement on cooperation between the Polish and Slovak gene banks (1995).

Agreement on cooperation with the Institute of Hop Technology in Zytomierz (Ukraine).

The cooperation has been broken away after Poland and the neighbouring countries encountered financial problems.

CHAPTER 7
National Needs and Capabilities

7.1 THREATS FOR BIOLOGICAL DIVERSITY

The global strategy for conservation of biological diversity (UNEP 1992) classifies the threats for biological diversity into two categories of basic and direct threats.

The basic threats include:

- fast and unbalanced growth of the human population and the consumption of natural resources,
- reduction of the product spectrum offered by agriculture, forestry and fishery,
- lack of equal access to natural resources, their management and benefits arising out of their utilization and conservation,
- lack of understanding, and ineffective utilization of the knowledge concerning natural resources conservation,
- legislative systems and institutional structures enabling overexploitation of natural resources.

The direct threats for biological diversity are as follows:

- elimination and scattering of natural ecosystems,
- introduction of alien species,
- overexploitation of species of plants and animals,
- soil, water, and air pollution,
- global climate changes,
- industrial agricultural and forestal systems,
- environmental pollution,
- degradation of ecosystems,
- modernization of agriculture.

Most of the threats mentioned above act currently in Poland. In our opinion the careful introduction of alien species does not have adverse effect on biological diversity. The cooperation of the government administration with scientists, the support from the community and the cooperation with the communities from other countries is necessary for the effective conservation of genetic resources.

7.2 CENTRAL ADMINISTRATION LEVEL

The main problem on this level is the lack of coherence in the measures taken by the central administration which results from the traditional, bureaucratic way of thinking. An effective governmental policy of conservation of biological diversity requires:

- modification of the crucial legislative acts,
- passage of a new Biological Diversity Conservation Act which will replace the ineffective Nature Protection Act,
- coordination of the measures taken by the ministries,
- appointment of a minister plenipotentiary responsible for conservation of biological resources, establishment of a Biological Diversity Conservation Council, (involving representatives of different ministries and acting as interministerial body) and of the National Secretariat of the Convention,
- involvement of the local administrations and governments in the measures taken,
- improvement of management of local natural resources, promotion of sustainable use of natural resources,
- economical measures taken to promote sustainable use and conservation of biological diversity (preferential taxes, subsidies, agricultural management support),
- support of measures taken for *in situ* and *ex situ* conservation.

It can be stated, that the forms of *ex situ* conservation are measures taken for conservation of domesticated species, for which no other ways of conservation exist, and which are threatened by market mechanisms. Nevertheless, the *in situ* conservation should include as much species as possible. For this purpose the participation of the state administration in such programmes and in international cooperation is necessary.

- Monitoring of biological resources.

Training

Training in order to educate staff for sustainable use and conservation of biological diversity is needed. Separate training programmes should be elaborated for different sectors and administrative levels. The training programmes should promote the philosophy of ecologically oriented development, ecological and economical aspects of biological diversity conservation, and measures taken in particular sectors. Awareness should raised with central and local administration authorities. A separate programme should be addressed to the local governments.

Public education

The understanding of importance of, and attitude toward, the conservation of biological diversity are crucial for effectiveness of the conservation programmes. To promote the goals of the Convention the educational programmes should:

- promote the ideas of the Convention,
- create conditions for understanding of the importance of biological diversity for humankind,
- create conditions for understanding the economical aspects of biological diversity and of its conservation.

The establishment of protected areas and other measures taken for conservation of biological diversity often lead, under the circumstances of poor common knowledge, to conflicts between the local communities and the authorities endeavouring to create conditions for biological diversity conservation.

7.3 CROP PLANT GENETIC RESOURCES

Measures taken for conservation of biological diversity require coordination of the activities, and cooperation between, institutions interested. The present system lacks coordinator and reduces the effectiveness of the conservation programmes. The goals are as follows:

- establishment of a Board for Plant Genetic Resources,
- establishment of a coordinated crop genetic resources programme,
- development of a strategy for conservation of genetic resources.

Inventorying and documentation of the collected resources

In 1990 61,681 accessions were stored within the National Programme of Plant Genetic Resources Conservation. 44,500 accessions are stored currently in the long-term storage localized at the Plant Breeding and Acclimatization Institute. The lower number of accessions stored does not mean, that they are lost, because they are present in collections maintained by other institutions, the Institute of Herbage Plants, Institute of Potato Breeding, Institute of Agricultural Technology, for example. This means, however, that no or little information concerning those accessions is available. It can be assumed, that more than 70,000 accessions are stored as genetic resources (tab. 2).

The goals are as follows:

- inventorying of accessions stored in the collections maintained by institutes, universities and plant breeding stations,
- unification of the documentation systems,
- creation of conditions for fast access to the collection data,
- connection of the documentation system to the European documentation system.

Creation of appropriate conditions for *ex situ* conservation of collected materials

Materials gathered into collections should be stored in conditions enabling their conservation in the living state (long-term storage of seed, plantations of vegetatively propagated plants, *in vitro* culture, liquid nitrogen storage).

The goals are as follows:

- modernization of the facilities for long-term storage,
- elaboration of new storage methods for the most valuable genotypes (*in vitro* cultures, liquid nitrogen storage),
- evaluation of rejuvenation standards assuring the genetic purity of the accessions,
- storage of the duplicates of the most valuable genotypes in other gene banks.

Exploration of the country's regions maintaining traditional agricultural systems with the aim to collect endangered ecotypes and local crop plant varieties

The goals are as follows:

- preparation of lists of crop plants and related species occurring in Poland,
- creation of an interdisciplinary group of specialists with the aim to systematically collect the local ecotypes of plants (crop plants, vegetables, fruit and ornamental plants).

- selection of sites for *in situ* conservation of wild species related to crop plants (in national parks and other protected areas).
- selection of areas for on farm conservation of local varieties on small farms maintaining traditional agricultural management systems.

Estimation of the feasibility of the programme

The goals described above are a part of the programme of the Minister of Agriculture and Food Industry to provide financing for the preparations made for establishment of a system of genetic resources conservation. The duration of the project is planned for 2 years. During this time the fundamentals of the system of genetic resources conservation will be prepared and implemented and technical means for its realization will be provided. On the basis of the research results the national programme for genetic resources conservation and utilization will be elaborated. The Board for Plant Genetic Resources should be established as supervisor of the programme and new measures taken in this field should elaborated.

Effective utilization of plant genetic resources for plant breeding and research purposes.

The measures taken on genetic resources conservation and utilization will act over a long time. The genotypes collected are source of genetic diversity required for plant breeding carried out by the present and future generations.

The goals are as follows:

- identification, characterization and evaluation of the materials collected,
- evaluation of the genetic resources by the methods of computational analysis of protein electrophorogrammes, computer image analysis, and others,
- promotion of utilization of, as well as research on, lesser known plant species with potential value as crop plants,
- promotion of crop diversification in agricultural systems,
- basic research in taxonomy, phytogeography, computer software, molecular genetics, cryopreservation, *in vitro* for the purposes of genetic diversity conservation,
- education of staff needed for collection, evaluation, and utilization of biological diversity in all fields of the national economy.

The most important factor ensuring that the goals, described above, will be accomplished is the public education with the aim to raise the awareness of the community and state administration on all potential advantages of biological diversity conservation.

CHAPTER 8
Proposals for the Global Action Plan

Some measures, essential for biological resources conservation (protection against air and water pollution, climate protection, for example), are not mentioned, because they are the subjects of attempts made by the international community and the subject of other programmes for improving the life conditions of the human population.

Following initiatives, essential for the global and national programmes of genetic resources conservation, should be considered:

- the access of the Polish national gene bank (44,000 accessions stored) to the international *ex situ* collection network under the auspices of FAO,
- establishment of areas for *in situ* conservation in Poland, under the auspices of FAO,
- development of the international network of basic collections for different plant species,
- establishment of an International Genetic Resources Fund to provide financing for *in situ* and *ex situ* conservation of genetic resources,
- elaboration of a system of unlimited access to collection data. Elimination of technical and political restrictions imposed on the utilization of genetic resources,
- establishment of a forum for discussion and cooperation in the field of resources conservation (both plant and animal resources) under the auspices of the modified FAO Commission on Plant Genetic Resources,
- determination of the status of the collected materials. Despite the fact, that they are a part of national heritage, no restrictions should be imposed on their utilization, in order to meet the needs of the people of the world for sufficient food,
- further strengthening of regional collaboration in the framework of ECP/GR and EUFORGEN,
- elaboration of mechanisms to keep under review the implementation of the Global Action Plan in countries being the Parties of the Plan.

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