COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

UKRAINE

SECOND COUNTRY REPORT

ON THE STATE OF PLANT GENETIC RESOURCES

FOR FOOD AND AGRICULTURE IN UKRAINE

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CONTENTS

ACRONYMS AND ABBREVIATIONS

CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IRRI	International Rice Research Institute
MTA	Material Transfer Agreement
NAS of Ukraine	National Academy of Sciences of Ukraine
NSC	National Science Centre
NCPGRU	National Centre for Plant Genetic Resources of Ukraine
PGR	Plant Genetic Resources
SDPPVU	State Department for the Protection of Plant Varieties of Ukraine
UAAS	Ukrainian Academy of Agrarian Sciences

INTRODUCTION

Ukraine is located in Central and Eastern Europe, south-eastern part of the East European plain, between 44"20 'and 52"20' N and 22"5 'and 41"15' east longitude. Ukraine has a wide outlet to the Black Sea and Sea of Azov that link it with countries of the Mediterranean basin. Also through the sea Ukraine borders with Bulgaria, Turkey and Georgia. From the west, the land borders with Poland, Slovakia, Hungary, Romania, Moldova; from the north – with Russia and Belarus. Area is 603.7 thousand square meters, the border is 6 500 km (1 050 km of sea). Length: from west to east is 1 316 km, from north to south - 893 km.

In Western countries are the Ukrainian Carpathians (the highest point is the mount Hoverla, 2 061 m). On the Crimean peninsula in the south are the Crimean mountains (highest point is Mount Roman-Kosh, 1 545 m); the flat area is part of the East European Plain. Valleys occupy 70% of the country, on average 175 m above sea level.

The largest river of Ukraine is Dnipro. Other major rivers are the Southern Bug and Danube. The largest reservoirs - Kremenchuk, Kakhovka, Dniprodzerzhins'k, Kyiv and Kaniv. Dnipro shares the Ukraine at the right (Volyn-Podolskaya height, Eastern Carpathians, Polissya) and Left Bank (Naddnipryans'ka lowlands, Donetsk height), the southern Black Sea lowland. 14% of the territory is covered with forests.

Climate in the East European Plain (95% of the area) and medium Ukrainian Carpathians and Crimean mountains (5% of the area) is mostly temperate continental, on the southern coast of Crimea has a subtropical Mediterranean-type features. Annual rainfall on different parts of the plain is from 300 to 1 200 mm. Average winter temperature: from -8 ° to -12 ° C (from 17.6 ° F to 3 ° F). In the Southern regions average winter temperature is 0 ° C (32 ° F). The average summer temperature: from 18 ° to 25 ° C (from 64.4 ° F to 77 ° F), although the day it can reach more than 35 ° C (95 ° F). Average longterm Temperature -5° C in January, 20 ° C in July.

Bowels of the earth in Ukraine are rich in natural resources: coal, iron and manganese ore, uranium, graphite, rock salt and construction materials. Industry diversified: complex mining industries, ferrous and nonferrous metallurgy, machine-many (energy, transport, technical) and instrumentation, light and food industries, advanced energy (power stations, hydro, nuclear power).

2/3 of Ukrainian soil is black soil (chernozem). By estimation of experts, in the territory of Ukraine are the fourth of the world black soils.

Agriculture has certain favorable conditions. 62% of total production are grain, potatoes, sugar beets, sunflower, forage, technical crops. Livestock: cattle ranching, pigs, sheep breeding. There are well developed ransport (railway, highway, air, river and sea fleet), energetic infrastructure. There are attractive recreational area (Crimea, Carpathians). Trade ties with more than 180 countries. Major trading partners: Russia, Turkmenistan, Germany, China, Belarus. Main ports: Odessa, Illichivsk (ferry to Varna), Kherson, Kerch, Yalta.

The structure of Ukraine includes 24 regions (oblasts), Autonomous Republic of Crimea and 2 cities of state subordination - Kyiv and Sevastopol. Total in Ukraine there are 490 districts, 446 cities, 907 towns and 10 196 villages.

1. Soils

The area of Ukraine is 60.4 million hectares, of which 41.4 million hectares are agricultural lands. It is hosted in three zones: the Polissya, the Forest and the Steppe of East European Plain. It includes also part of the Carpathians and the Crimean peninsula. The soil of Ukraine is very diverse. The soil nomenclature includes about 650 types, and taking into account differences in soil - 4 000 taxonomic soil units.

Surface area of individual groups of soil in absolute and relative performance and degree of their arableness is shown in Table. 1. The most common among arable land is black soil – chernozem (common, ordinary, south), which is 60.6%, and gray forest soils - 21.3%. Together, these soils are the main fund of arable lands of Ukraine. The territory of Ukraine has three soil-bioklimatyc zones:

1. boreal (temperate cold - Polissya),
2. subboreal (moderate - most of the country),
3. subtropical (warm temperate - part of the Southern coast of Crimea).

In turn, the zones and areas are divided into groundwater zones.

TABLE 1
Area of major soils and their arableness

Soil types	Soil area		Arable land area	
	Thousand ha	%	Thousand ha	Total %
Soddy-podzol supeschanye and clay-sand	1 573.0	3.5	1 015.0	64.5
Soddy-podzol ogleennye	1 916.0	4.3	1 140.7	59.5
Gray forest	7 924.0	17.8	6 719.1	84.8
Chernozems typical on the loess	6 272.2	14.1	5 731.4	91.4
Chernozems common on loess	10 395.0	23.4	8 760	84.3
Chernozems south on the loess	6 237.9	14.1	4 662.4	74.7
Meadow-chernozem on the loess	1 124.9	2.5	700.7	62.3
Dark brown and brown	1 489.9	3.4	1 241.0	83.3
Meadow mainly on eluvium	1 936.1	4.4	663.0	34.2
Bog, peat-bog and turf	2 061.8	4.6	78.5	3.8
Alcaly and solodic	537.8	1.2	256.1	47.6
Sod	1 627.1	3.7	396.3	24.4
Brown, mountain-meadow	41.8	0.1	7.2	17.2
Yields on the rocks ashpit	311.0	0.7	21.6	6.9
Total	**44 406**	**100**	**31 586.3**	**71.7**

2. Population and demographic trends

On January 1, 2009r. in Ukraine, an estimated 46 143.7 million people lived. During 2008 the population declined by 229.0 thousand people, or 5.0 persons per 1 000 inhabitants. The population decreases only by natural reductions (243.9 thousand people), which do not overlap a small migratory population growth (14.9 million people). Compared with 2007, natural reduction in the volume decreased by 46.3 thousand persons or 6.2 to 5.3 persons per 1 000 inhabitants. The number of births continues to increase (by 37.9 thousand persons). Birth rate has increased overall from 10.2 to 11.0 babies per 1 000 in population and the mortality rate decreased from 16.4 to 16.3 persons. Migratory population growth that changed permanent residence in 2008 compared with 2007 decreased from 16.8 thousand to 14.9 thousand peoples. The overwhelming majority of immigrants (79.3%) were coming from the CIS countries. Among the retired 65.9% went to countries of CIS and 34.1% - to other countries.

Ukraine is on the 5th place in Europe by a population (after Germany, Italy, Britain, France) and 21 place in the world. On it falls 7.3% of European i 1% of world population.

Titular nationality Ukraine - Ukrainian according to the latest census, represent 77.82% of the total population of the state. The Russian took the second place – 17.3%. Local law Crimea indigenous people are recognized as the Crimean Tatars (0.51%), Karaimes (1 196 pers.) and Krymchaks (406 pers.). The other ethnic groups of the population of Ukraine are: Belarus (0.57%), Moldovans (0.54%), Bulgaria (0.42%), Hungarians (0.32%), Romanians (0.31%), Poles (0.30%), Jews (0.21%), Greeks (0.19%), Armenians (0.21%), Tatars (0.15%), Roma (0.10%) , Azerbaijanians (0.09%), Georgians (0.07%), Germans (0.07%), Gagauzi (0.07%).

Outside of Ukraine (in Russian, United States, Canada, Kazakhstan, Moldova, Romania, Poland, Brazil and Argentina) live 11-15 million ethnic Ukrainians.

Economically active population (2008): 22 397 thousand people (aged 15-70 years), 20 676 thousand people (of working age). Distribution of population by economic sectors is a such: industry 20.1%, agriculture 23.1%, construction 5.5%, transport and communications 6.5%, trade, public catering, procurement 18.0%, health, physical education, social security 6.3%, education, culture, art, science 7.7%, other 12.8%.

3. Agricultural description

Agriculture is the primary link of the agroindustrial complex (AIC), along with food and some light industries (textile, leather, fur) is its basis.

Agricultural lands occupy 42 million hectares, or 70% of the general land fund. Structure of agricultural land is as follows: 78.9% - arable land and perennial plantings, 13.0% - pastures, 8.4% - hayfields. The highest share of arable land is in the steppe areas (70 - 80%) and forest area. Pastures are concentrated mainly in the Carpathians, in Polissya and south-eastern steppe regions, haying lands - in river valleys of Polissya and Forest-Steppe zones.

Among the socio-economic prerequisites, an important role in agriculture play human resources (rural areas of Ukraine provided sufficient), especially land tenure, the relations of land ownership and agrarian policy.

In Ukraine, a long time land was the state owned and large collective farms, at present it is the property of peasant unions and farmers. Changes in land ownership are taking place very slowly. New impetus for further reform farm was the adoption in the 2001 Land Code.

The percentage of land that is owned by farmers (those in Ukraine, more than 36 thousand households) is only 2% of the total area of agricultural land. The development of farming and the establishment of cooperatives farmers, land owners will significantly raise the level of agricultural production in the country.

Irrigated land is located in the south of Ukraine, their area is 2.5 million hectares. In overhumid waterlogged and marshy areas of the Forest Zone and northern Forest-Steppe drainage is carried out on 3.3 million ha.

Currently the territory of Ukraine is one of the most over in Europe and worldwide arable land: it occupies 1/2 of its area.

Crop production is the basic branch of agriculture, which provides 60% of gross agricultural production. It is divided into (properly) agriculture (growing crops on arable land), orcharding (growing perennial plantations) and meadow production (improvement of natural pastures and hayfields and growing of sowing grasses).

The arable is mostly occupied by crop fields. In recent years the sown area reduced. This is because that part of arable land not cultivated (so-called clean pair), part transferred to other crops (pastures and hayfields) or withdrawn from agricultural use (for housing, for industry, transport and others). If changing the structure of agricultural land in the reduction of arable land is a phenomenon necessary and progressive, the transformation of fertile land in to non-agricultural lands is a serious problem.

The main agricultural industry is cereal growing - growing food grain (wheat, rye, triticale, buckwheat, rice, millet); fodder (barley, oats, maize); leguminous (peas, beans) crops.

The most important crop is wheat (occupies 2/5 area of grain crops). Winter wheat is grown, usually, mostly in Forest-Steppe and Steppe zones. In the east of these zones, where winter snow cover mostly small, dominated Spring wheat is grown as insurance crop, which replece winter wheat on the areas where it dies out in severe winters.

Rye is grown mostly in Polissya and Before-Carpathian zones where conditions are is not quite favorable for wheat: excessive moisture, not very fertile soil. Rye gives lower yields than other cereals, but it is a valuable food crop. Barley, corn and oats are used as fodder crops, but they have great food value. Barley grown everywhere, but most in the southern areas. The largest area of corn crops is in the northern and central parts of the Steppe, the southern Forest-Steppe, where it gives the highest yields. Oats are grown, mainly in northern and western parts of Ukraine. Sown areas under spring barley and oats are grown in those years when fields of winter crops died because severe winters (heavy frosts, no snow cover) are being sown by these crops.

Because of the drought resistance, millet grows mainly in the plain; the rice (hydrophillic) is grown only on irrigatied steppe lands. Buckwheat is grown in the Forest-Steppe and Polissya regions for its demanding to moisture. Areas under its are very significant.

Leguminous plants (peas, beans, fodder lupine, vech) grown in the Forest-Steppe and the Polissya.

Technical crops provide raw materials for industry. They are classified in the fiber - fiber flax, cotton, hemp; the oil - sunflower, crown flax, rape, soybean; volatile - cumin, mint, rose; sugar bearing - sugar beets.

The largest area of industrial crops in Ukraine are sunflower and sugar beet. For the production of these crops Ukraine sat a long time leader in Europe and part of the world leaders. However, reducing demand for Ukrainian sugar has caused a sharp reduction in the sown area of sugar beet and fees. Instead, the area under sunflower has increased dramatically - up to 70% of the sown area of industrial crops, Ukraine, together with Argentina heads the list of manufacturers of this important crop in the world (an annual yield of 3 - 3.5 million tons).

Sugar beets requires heat, light, moisture, fertile soil, therefore their basic growing regions are Forest-Steppe and northern Steppe zones.

The best conditions for growing sunflower are in the steppe and the southern Forest-Steppe zone. Besides it, the important oil crops are rape (Polissya and Forest-Steppe), soybean, castor-bean, crown flax.

Main fiber crop in Ukraine is fiber flax. Its main area are Polissya and Before-Carpathian, where summer is cool and wet. This crop is largely replaced hemp - fibrous traditional crop in Ukraine, whose area have declined sharply in the second half of XX century. There is a small area of hemp in Dnister region, in Mykolayiv and Odessa regions, where they were grown mainly for seed (oil produced from it). In recent years in the Southern regions of Ukraine resumed the cultivation of cotton, crops which occupied significant area in the early last century.

In Ukraine there are growed and stored up many medicinal and volatile plants (about 100). There are cultivated valerian, cumin, horseradish, sage, lavender, peppermint, fennel, belladonna etc. Volatile crops are grown in the southern Steppe zone, the largest in Crimea.

As industrial crops in Ukraine are growing hops (in Polissya, the largest in the Zhitomir region), which is used mainly in the brewing industry, and tobacco (south of Forest Steppe and Steppe), which is the feedstock for the production of cigarettes.

A potato growing and gardening are of importance in plant production in Ukraine. Potatoes are grown in all areas, but its highest yields one obtain in Polissya and Forest-Steppe. Vegetable producing is developed everywhere; the largest crops are in the farms of Forest-Steppe and Steppe zones. In northern and central parts of the country dominated cabbage, carrots, red beets, cucumbers, in the south - tomatoes, peppers, eggplants, onion. Large areas in Ukraine are under melon crops: squash, watermelons, melons, zucchini, custard squash, which are valuable food. Major areas are in the steppe zone.

More than a third of the sown area is occupied by forage crops. Among them, the highest proportion of annual and perennial grasses, corn; also forage root crops are grown.

Mild climate and the availability of fertile soil in Ukraine is favourable for horticulture, that causes large areas of gardens. Pomous crops (apple, pear) best bear fruit in the Forest-Steppe and the Polissya, and stone fruit crops (sour cherry, cherry, plum, apricot, cherry-plum, etc.) - in the Steppe. In all areas of Ukraine are frequent berries - currant, currents, raspberry, gooseberry, and others. In southern and central parts of the Steppe, in the foothills of Crimea and the Transcarpathian is developed viticulture.

4. Agricultural profile description

The data about dynamics of production of the main crop groups since 1996 to 2007 are given in the Table 2.

For harvest 2008, crops were sown in Ukraine on the area 27 million hectares, including in agricultural enterprises - on 19.3 million hectares (71.6% of total area), in households - on 7.7 million hectares (28.4 %). As compared with the year 2007 the total cultivated area increased by 927 hectares (by 3.6%), including in rural enterprises - by 733 hectares (by 3.9%), households - by 194 hectares (by 2.6%). As compared to 2007, the sowing area increased in the 21 region. The most increase was in Khmel'nyts'kiy region (by 109 thousand hectares or 12.5%), Mykolayiv (by 159 thousand hectares or 12.0%), Sumy (88 thousand hectares or 9.8%), Chernihiv (by 89 thousand hectares or 9.3%) and Chernivtsi (22 thousand hectares or 8.5%) regions.

More than half of planted areas (58.0%) are sown by cereals - 15.7 million hectares (at 3.5% more than at harvest in 2007). The increase in sown area of grain crops is recorded in 20 regions, most of them - in Chernihiv (by 111 thousand hectares or 19.2%), Sumy (by 106 thousand hectares or 19.1%), Ivano-Frankivsk (by 21 thousand hectares or 18.5%), Khmel'nyts'kiy (73 thousand hectares or 14.5%) and Lviv (30 thousand hectares or 12.0%) regions.

In the group of technical crops increased areas under sunflower (by 618 hectares or 17.1%) and winter and spring rape (by 523 thousand hectares or 58.7%). At the same time, the area under sugar beet (factory) decreased against last year's by 220 hectares (by 36.0%), soybeans - by 114 hectares (by 16.9%).

The area of fodder crops is 2.7 million hectares. It decreased as compared to 2007 by 358 hectares (by 11.8%) due to a significant reduction in rural areas of agrarian enterprises (by 20.6%).

TABLE 2
Dynamics of production of the main crop groups since 1996 to 2008

Year	Cereals and leguminous crops	Sugar beets (factory)	Sunflower	Potatoes	Vegetables of open ground	Forage crops
Area under the main crops, thousand ha						
1996	13 248	1 359	2 107	1 547	476	11 026
2008	15 115	610	3 604	1 453	451	3 028
Production of the main crops, thousand ton						
1996	24 571*	23 009	2 123*	18 410	5 070	1 924
2008	29 295*	16 978	4 174*	19 102	6 835	1 470
Yield capacity of the main crops, ton per 1 ha of harvested area						
1996	1.96*	18.3	1.05*	11.9	11.2	3.06
2008	2.18*	29.4	1.22*	13.1	15.2	6.17

* weight after processing

According to preliminary data, in 2008 total volume of agricultural products against 2007 increased by 17.5%, including agricultural enterprises - by 35.2%, in households - by 5.8%. Total crop production increased by 30.5%.

Farms of all categories harvested the greatest in the history of Ukraine production of grain crops (including maize in weight after processing) - 53.3 million, that 1.8 times more than in the 2007. This is due to increase in yield capacity of grain crops - in 1.6 times, due to increase in harvested area in 14%). Agricultural enterprises produced 42.1 million ton of grain (79% of the total yield), households - 11.2 million ton (21%). Yield of grain crops in agricultural enterprises (35.5 t per 1 ha) is more than in households by 3.6 kg.

Collected in 2008 harvest of wheat (25.9 million ton) is 1.9 times greater than in 2007, barley - 12.6 million ton (2.1 times more), corn for grain - 11.4 million ton (1.5 times more), rye - 1.1 million ton (1.9 times more), oats - 0.9 million ton (1.7 times more), millet - 220.7 tons (in 2.6 times more) due to increase their collection areas and increase yield capacity. More donated buckwheat - 240.6 thousand t (by 10.7%) - due to an increase in yield from 1.5 t ha 1 (by 21.4%). At the same time less than in 2007, was gross yield of rice - 100.7 thousand tons (by 6.8% less), due to a reduction of its area of harvest.

Sunflower production was 6.5 million ton and, compared with 2007, increased by 56% (for an increase in the quarter as a gathering area, as yield); of sugar beet (factory) - 13.7 million t or 19% less (only by a reduction by almost a third of their harvest area, while increasing yield by 21%).

Production of vegetables (8.0 million t) increased by 16.5%, potatoes (19.5 million t), fruit and berries production (1.5 million t) - by 2% (due to the growth yield by 5 -14%).

Due expansion of rape collected areas (by 0.6 million hectares, or 72.5%) and increase its yield (59%) total yield increased to 2007 in 2.7 times and amounted to 2.9 million t, of which 98% of winter rape.

Households in 2008 produced 98% of the total harvest of potatoes, 86% vegetables, 85% fruits and berries, 21% corn, 14% of sugar beet (factory) and 19% sunflower.

CHAPTER 1

THE STATE OF DIVERSITY

1.1 Diversity of natural flora

The territory of Ukraine belongs to Cyrkumboreal and partly (Southern coast of Crimea) to the Mediterranean regions of boreal subkingdom of Holarctic floral kingdom, and has the vegetation characteristic for these regions.

Flora and geography in Ukraine are fairly well explored. Ukraine belongs to countries with a large variety of flora. From 300-350 thousand species of higher plants there are in the world, in Ukraine there are over 25 thousand, including algae - about 4 thousand, mushrooms - over 15 thousand, lichens - more than 1 thousand , mossy - almost 800 and vascular plants - more than 6.5 thousand species.

The natural flora of vascular plants includes 4 523 species. The most species belong to the families *Asteraceae, Poaceae, Fabaceae, Rosaceae, Lamiaceae, Brassicaceae, Caryophyllaceae*. There are growing about 80 species of trees, 280 shrubs, 985 of annual herbaceous plants. Among the higher plants 600 species are endemic, almost equal quantity are rare and endangered plants. Over 150 species of plants brought to the first edition of the Red Book of Ukraine, which was founded in 1976; the second edition got more than 400 species of vascular plants. Especially, many endemic, rare and endangered species are in the Crimean and Carpathian mountains - almost half of the endemic and 30% of all rare and endangered species. Natural vegetation is remain only on 20% of the country's territory; over a thousand plant species are cultivated. In the process of production activities flora has changed: during the XVI - XIX centuries in the forest-steppe zone of forest area decreased by more than five times, and the area of most valuable oak and beech forests only in the XIX century. decreased by a quarter.

On over 30% of territory of Ukraine there is natural or secondary seminatural vegetation, among which a wide specific composition have medical (100), vitamin (200), oil bearing (300), honey (over 1 000), tanning and painting (by 100). Harmful in the flora of Ukraine are about 600 species of weeds.

Natural vegetation is mostly saved in the forests, protected areas, the permanent meadows and pastures, hills of ravins.

Woody plants are presented in Ukraine by over 100 species. The forest area of state significance is 6.2 million hectares (in 1961 - 5.4 million hectares). It is 14.3% of total territory. Ukraine has considerable reserves of valuable forest species: oak plantings are of 15%, beech - 20%, ash 10% of respective plantations of former Soviet Union. The area of these valuable species is growing most rapidly. At the same time, the area of less valuable species (aspen, hornbeam) is decreasing.

The forests are rich in berries, mushrooms, fruits of wild plants, medicinal plants. They play the important water protecting role, are used for the rest of population. In the forests grow edible mushrooms. Widespread are pear, apple, cherry, currant, buckthorn, dog-rose, hazel, blackthorn, hawthorn, strawberry, raspberry, blackberry, blueberry, etc.

Among the valuable plants used in medicine, 250 species are recognized as the medical, including 150 in scientific medicine. The others are used only in folk medicine. About 100 species are being collected for use, 40-50 of them in a big way. The main regions where medic plants are being collected for use are Forest Zone (Polissya), Forest-Steppe and Carpathians.

Ukraine is rich in medical herbs such as valerian, dog-rose, violet threecolor, clary, datura, dandelion, origanum, periwinkle, Acorus roseau, dwarf everlast, wild strawberries, *delphinium* medicinal, elfwort, camomile, cranberries, black currents, blueberries, raspberry, *viburnum*, lavender, peppermint, pheasant's eye, *melissa*, European centaury, dioecious nettle, celandine, hypericum, waybread, buckthorn, wild chicory, bearberry, spores, Lily of the Valley and others. Many species of wild medicinal plants has brought in to the Red Book of Ukraine. These are bear onion, yellow gentian, Erianthous milk vetch and others. Most medicinal plants are growing in natural conditions, some are cultivated by man. For medical purposes are used the leaves, stems, fruits, roots. Harvesting is carried out mainly in spring, summer and autumn (less in winter).

In the forests of Ukraine are harvested annually about 25 tons of birch juice, 150 tons of commercial honey, more than 7 thousand tons of dried mushrooms, 7 thousand tons of wild fruits and berries, and also more than 5 thousand tons of medicinal plants. In connection with the accident at the Chernobyl, a large area of central and northern regions of

Ukraine and the surrounding areas dropout from plant economy. It, first, reduced the area for harvesting of wild fruits and berries by almost a third, and, secondly, increased stress on other areas of the forest area of the country, which in turn increases the need to protect their plant resources. In the forests are living a valuable animals and birds.

The major crops in Ukraine are cereals – wheat, rye, triticale, barley, oat; groat crops – buckwheat, millet, rice; maize; leguminous crops – pea, *Phaseolus* bean, soybean, lupine, vetch; technical – sunflower, rapeseed, sugar beet, flax, hops; forage grasses – alfalfa, clover, bromegrass, fesque, ryegrass, timothy grass; vegetable and melon crops - tomatoes, peppers, eggplants, cucumbers, cabbage, carrots, beets, dill, parsley, watermelon, melon, pumpkin, zucchini; fruits and berries - apple, pear, plum, cherry, cherry, raspberry, currant, gooseberry, grape. The other should be related to minor crops.

1.2 Diversity of crop varieties

Mainly breeding varieties are grown in Ukraine. Landraces are grown on small area in small private farms.

Ukraine is member of the International Union for the Protection of New Varieties of Plants (UPOV). Implementation of state policy in shaping the national resources of varieties, intellectual property protection for plant varieties has the State Department for the Protection of Plant Varieties of Ukraine (SDPPVU). This activity is governed by the laws of Ukraine "On the Protection of Plant Varieties", "On addition of Ukraine to the International Convention for the Protection of New Varieties of Plants", Regulations of the Cabinet of Ministers of Ukraine and Ministry of Agrarian Policy, normative acts. These documents provide a transparent system of registration of proprietary intellectual property rights on plant varieties and agreed with relevant documents and the provisions of the Council of the European Union.

The SDPPVU, together with leading institutions of UAAS, has developed, in accordance with the recommendations of UPOV, 285 methodical principles for qualification examination of plant varieties.

During 2007, for example, the SDPPVU accepted applications for examination of 5 346 plant varieties. Ukrainian and foreign breeders obtained 3 811 certificates on authorship for plant varieties. The owners of proprietary intellectual property rights became 326 government institutions, 232 private entities, 8 individuals and 110 foreign residents. New property rights to distribute a variety or it commercialization acquired 244 state, public, private individuals.

The resources of plant varieties of Ukraine consists of varieties and hybrids of 297 crops including cereals 11 crops, groat 6, leguminous 5, feed 49, technical 17, volatile oil bearing 40, vegetable, melon and potatoes 52, fruit, nut, grape 35, medical and ornamental 67, forest 12, mushrooms 3. The resources of plant varieties of Ukraine include 3 637 varieties and hybrids, among them 2 594 are of Ukrainian origin, 1 043 foreign.

In the State Register of Plant Varieties Suitable for Distribution in Ukraine, the share of varieties created by Ukrainian scientists in 2007 was 71% versus 47% in the 1991.

Experts of the World Intellectual Property Organization and the European Bureau for Plant Varieties recognized resources of plant varieties of Ukraine the best in the Eastern and Central Europe for the quantitative and qualitative composition, structure, frequency of change.

The resources of plant varieties of Ukraine provide raw materials for food, pharmaceutical, chemical, light industry; forestry; municipal and private farming, production of which determines economic and social development of Ukraine.

Varieties and hybrids provide growing at a high technological level of the vast majority of crops in soil-climatic zones of Ukraine, especially of food grains. 93% of all wheat varieties permitted to distribution are classified to the categories of strong and valuable wheats. Premium yield caused by the introduction of new varieties is 15 to 25%. Valuable is the progress in breeding new crops for Ukraine: spring triticale; a sunflower hybrids with high content of oleic and palmitin acids; three-null rape cultivars; varieties and hybrids of vegetable and fruit crops that give fruits with high vitamins content and high endurance of the to store; varieties of medical plants with high content of active substances and so on.

Meanwhile, the Ukrainian breeding behind the foreign about share of hybrids which stated in Ukraine in 2-2.5 times less than foreign companies.

Landraces of the major crops are maintained mainly in collections of plant breeding and research institutions, botanical gardens. In particular, 6 749 accessions of landraces of Ukrainian origin are maintained in the National Genebank of Ukraine.

Because a strong pressing of contemporary breeding cultivars and hybrids, whose seed and planting material are being introduced in each distant village, the landraces are grown in a small localities.

In Carpathian region (L'vivs'ka, Ivano-Frankivs'ka, Chernivets'ka, Transcarpathian regions), in private farms are grown still spring rye, "Hutsul" flint maize, Faba bean, "Kalus'ka" vech (Vicia sativa). In Western Ukraine including, besides the

Carpathian, also Ternopil's'ka, Khmel'nyts'ka, Vinnyts'ka oblast's is grown wide diversity of *Phaseolus vulgari*s and Ph. *coccineus*. In Volyn' region (Volyns'ka, Zhytomyrs'ka, Rivnens'ka regions) in some farms are grown rape (*Brassica rapa*), garden rocket (*Camelina sativa*), mustard. In West-South of Ukraine – Odesa region, farmers of ethnic groups Gaghauses and Moldovans, less Ukrainians grown local forms of chickpea and grasspea. In different localities of Ukraine, in old orchards are single trees of local forms of apples, pears, plums, sour and sweet cherry, apricot, walnut.

Folk breeders-amateurs in different places carry out perennial selection of the best forms of vegetable crops as garlic, onion, tomatoes, potatoes, fruit, berry and nut crops. As initial material are used bred varieties and hybrids of crops.

1.3 The main factors affecting the state of diversity

In the before period, the crop diversity was decreased because replacement of landraces and bred cultivars of a much crops by a few high productive cultivars and hybrids, destined to intensive technologies and belonging to a most profitable crops.

At present, Ukrainian and foreign agricultural firms are introducing to the country a much varieties and hybrids for trials and production growing. Among them, also some non traditional crops. In particular, amount of introduced genetic modified varieties increases.

As to natural plant genepool, so more than 400 species of vascular plants are included into the second edition of Red Book of Ukraine. The reason of extinction of a number plant species is change of land plots destination as result of privatization and economic activities: allotment for building sites, and arable fields etc., contamination by industrial and domestic wastes. An important influence exerts also pollution of soil, water, air; change of climate followed by droughts, flooding in Carpathians, increase of soil salinity in south of the country, fires in forests and steppes including preserves etc. For saving the diversity it must be implemented a legislative, organization, engineering, protection measures.

CHAPTER 2

IN SITU CONSERVATION AND MANAGEMENT OF PLANT GENETIC RESOURCES

The most efficient means of protecting the unique biodiversity and natural systems is a preservation. Institutional and legal framework of reference of preserves provide the Laws of Ukraine "On ratification of the Convention on Biological Diversity", "On environmental protection", "On the natural-reserved fund of Ukraine", "On the Red Book of Ukraine", Forest Code of Ukraine, "On the National Program of national ecological network in Ukraine for 2000-2015 years", other acts of legislation adopted pursuant to it.

Genetic resources of wild relatives of agricultural plants which are sources of valuable genes for resistance to diseases and pests, adverse abiotic environmental factors, quality of products etc., are stored *in situ*, i.e. in terms of their natural growth, including nature reserves, national parks, etc.. Because these genetic resources are often endangered due to negative effect of anthropogenic factors, they must be saved also *ex situ* - in the Genebank, according to the Convention on Biological Diversity, ratified by Ukraine in 1994. In Ukraine, by Disposition of the Cabinet of Ministers from September 22, 2004 No. 675-p, is approved the National biodiversity conservation program for 2005-2025 years.

Nature of Ukraine is considered as part of the global system of natural areas and objects under special protection (Table 3), and includes 7 032 territories and facilities with total area of 2 900 hectares, representing 4.95% of the territory of Ukraine. During the last three years the reserved area increased by 2 time. But it is double lesser than in the countries of the European Union.

TABLE 3

Biosphere and natural reserves, national parks in Ukraine

Order No.		Year when organi zed	Area, hectares	Region, district	Zone	Number of plant species included to Red Book of Ukraine
Biosphere reserves						
1	Askaniya-Nova	1898/1985	33 308	Khersons'ka	Steppe	22
2	Chornomors'kiy	1927/1984	98 407	Khersons'ka and Mykolaiivs'ka	Steppe	24
3	Karpats'kiy with branches: Ugolsko-	1968/1992	57 800	Tyachiv, Rakhiv, and Khust districts of the Zakarpats'ka	Ukrainian Karpaty mountains	92
3a	Shyrokoluzhans'kiy					
3b	Chornogir massif					
3c	Marmaros'kiy massif					
3d	Svydovets' massif					
3e	Khust massif					
4	Dunais'kiy	1968/1998	46 403	Odes'ka	Steppe	8
Nature reserves						
1	Krymskiy	1923	44 175		Krym mountains	79
2	Kanivs'kiy	1925	2 027	Cherkas'ka	Forest-Steppe	26

Order No.		Year when organi zed	Area, hectares	Region, district	Zone	Number of plant species included to Red Book of Ukraine
3	Ukrainian Steppe with branches:	1961	2 768	Doniets'ka, Zaporizhz'ka, Sums'ka	Steppe	46
3a	Khomutivs'kiy Steppe			Donets'ka	Steppe	
3b	Kam'yani Mohyly	1927		Zaporizhz'ka	Steppe	
3c	Mykhailivs'ka Tsilyna			Sums'ka	Forest-Steppe ("Northern Steppe")	
3d	Melova Flora	1988		Donets'ka	Steppe	
4	Lugans'kiy with branches:	1968	1 576	Lugans'ka	Steppe	32
4a	Stanychno					
4b	Luganskiy					
4c	Striltsivs'kiy Steppe					
4d	Provals'kiy Steppe					
5	Polis'kyi	1968	20 104	Zhytomyrs'ka	Mixed forest	17
6	Yaltyns'kyi Mountain	1973	14 584	AR Krym	Krym mountains	82
7	Cape Mart'yan	1973	240	AR Krym	Krym mountains	36
8	Karadag	1979	2 874	AR Krym	Krym mountains	77
9	Roztochchya	1984	2 080	L'vivs'ka	Forest-Steppe	32
10	Medobory	1990	10 455	Ternopils'ka	Forest-Steppe	29
11	Dniprovs'ko-Orel's'kyi	1990	3 766	Dnipropetrov s'ka	Steppe	9
12	Yelanets'kyi Steppe	1996	1 676	Mykolaivs'ka	Steppe	17
13	Gorgany	1996	5 344	Ivano-Frankivs'ka	Forest-Steppe	15
14	Kazantyps'kiy	1998	450	AR Krym	Krym mountains	18
15	Opuks'kiy	1998	1 592	AR Krym	Krym mountains	14
16	Rivnens'kiy	1999	47 047	Rivnens'ka	Mixed forest	
17	Cherems'kiy	2001	2 976	Volyns'ka	Mixed forest	
National parks						
1	Karpats'kiy	1980	50 303	Ivano-Frankivs'ka	Ukrainian Karpaty mountains	78
2	Synevyr	1989	40 400	Zakarpats'ka	Ukrainian Karpaty mountains	40
3	Azovo-Syvas'kiy	1993	57 400	Khersons'ka	Steppe	7
4	Vyzhnyts'kiy	1996	7 928	Chernivets'ka	Ukrainian Karpaty mountains	31
5	Podil's'ki Tovtry	1996	261 306	Khmelnyts'ka	Forest-Steppe	60
6	Svyati Gory	1997	40 589	Donets'ka	Steppe	48
7	Yavorivs'kiy	1998	7 079	Ivano-Frankivs'ka	Forest-Steppe	
8	Desniano-Staroguts'kiy	1999	16 215	Sumy	Mixed forest	
9	Skolivs'ki Beskydy	1999	35 684	Lvivs'ka	Ukrainian Karpaty mountains	
10	Shats'kiy	1983/2002	48 977	Volyns'ka	Mixed forest	32
11	Uzhans'kiy	1999	39 159	Zakarpats'ka	Ukrainian Karpaty mountains	
12	Gutsulschchyna	2002	32 271	Ivano-Frankivs'ka	Ukrainian Karpaty mountains	

Order No.		Year when organi zed	Area, hectares	Region, district	Zone	Number of plant species included to Red Book of Ukraine
13	Galyts'kiy	2004	12 159	Ivano-Frankivs'ka	Forest-Steppe	
14	Great Meadow	2006	16 756	Zaporiz'ka	Steppe	
15	Gomil'shans'kiye Forests	2004	14 315	Kharkivs'ka	Forest-Steppe	
16	Ichnyans'kiy	2004	9 665	Chernihivs'ka	Forest-Steppe	
17	Mezins'kiy	2006	31 035	Chernihivs'ka	Deciduous forests	

CHAPTER 3

THE STATE OF *EX SITU* MANAGEMENT

3.1 The state and types of collections

The *ex situ* collections in Ukraine are of a such categories:

- National collections included in the National Plant Genebank;
- Collections of research institutions and botanical gardens which don't enter in the National Plant Genebank;
- Working collections of breeding and research institutions;
- Private collections.

The first two groups of stakeholders overlap about 204 thousand samples (table 4).

The collection of cereals and their wild relatives, Institute of Plant Production n.a. V.Y. Yurieva

The main holder of *ex situ* PGR collections having actual or potential value for food and agriculture in Ukraine is System of PGR of Ukraine including 35 leading research and breeding institutions. The institutions of the System are working in the sphere of PGR under scientific and methodical leadership of the National Centre for PGR of Ukraine (NCPGRU) which is the structural unit of the Institute of Plant Production n.a. V.Y. Yuriev of the Ukrainian Academy of Agrarian Sciences (UAAS). The state program "Plant Genetic Resources" is worked out by the NCPGRU, approved by UAAS and entered in force in 1992. It is financed entirely by the state budget.

In framework of the Program is created and is being maintained the National Plant Genebank whose collections include at present 130,7 thousand accessions which belong to 347 crops, 1255 plant species (tables 5). The Genebank accessions are grouped by their main aim of use (tables 6).

The maize collection of the Institute of Plant Production n.a. V.Y. Yuriev

TABLE 4

The most significant collections are being maintained in institutions of Ukraine

Institution or organization structure	Sample number
The System of Plant Genetic Resources of Ukraine	130 771
Pryluky Experimental Station of UAAS	419
Institute of Plant Physioligy and Genetics of NAS of Ukraine	3 275
Institute of Cell Biology and Genetic Engineering of NAS of Ukraine	5 000
National Botanical Garden n.a. M.M. Hryshko of NAS of Ukraine	13 180
Doniets'k Botanical Garden of NAS of Ukraine	8 358
Botanical Garden n.a. O.V. Fomyn of Kyiv National University	7 438
Botanical Garden of L'viv University, L'viv	3 353
Botanical Garden of Chernivtsi University	3 642
Botanical Garden of Kharkiv University	7 054
Botanical Garden of Odesa University	3 800
Botanical Garden of Dnipropetrovs'k University	3 000
Botanical Garden of Zhytomyr Agroecological University	1 000
Kremenets' Botanical Gardens of NAS of Ukraine	1 150
Arboretum «Sofiivka» of NAS of Ukraine	3 323
Arboretum «Trostyanets'» of NAS of Ukraine	1 950
Arboretum «Olexandriya» of NAS of Ukraine	2240
Arboretum Germakivsky	1 500
Arboretum Druzhba	2 000
Arboretum Horostkivsky	1 500
Total	**203 953**

The most important collections of the Ukrainian Plant Genebank were assigned to research facilities, which are national treasures by decision of Cabinet of Ministers of Ukraine № 527 dated 1.04.1999. They collections obtain financial support by the state.

Also to the category of national treasures are assigned the collections of the Institute of Grape and Vine "Maharach", Institute of Plant Physioligy and Genetics, Institute of Cell Biology and Genetic Engineering, National Botanical Garden n.a. M.M. Gryshko, Doniets'k Botanical Garden, Arboretum «Sofiivka», Department of Sericulture of the Institute of Experimental and Clinical Veterinary Medicine.

A series of collections of the National Plant Genebank of Ukraine are of European and World significance.

Genetic diversity of leguminous and groat crops of National Plant Genebank of Ukraine

Among them are the collection of cereals and leguminous crops of the Institute of Plant Production n.a. V.Y. Yuriev of UAAS (32.3 thousand samples); millet (5.8 thousand), buckwheat (1.6 thousand), Phaseolus bean (2.5 thousand), grasspea (1.2 thousand), oil poppy (1.1 thousand), potatoes (0.6 thousand) of the Ustymivka Experimental Station of the Institute of Plant Production n.a. V.Y. Yuriev of UAAS; wheat (5.0 thousand) and barley (2.3 thousand) of the NSC Breeding and Genetics Institute of UAAS; lupin (5.8 thousand) of the Institute of Agriculture of UAAS (0.9 thousand) and Chernihiv Institute of Agroindustrial Production of UAAS (0.6 thousand); flax (1.2 thousand) and hemp (0.5 thousand) of the Institute of Bast Crops of UAAS; tobacco of the NSC Institute of Grape and Wine 'Maharach' of UAAS (1.0 thousand) and Transcarpathian Institute of Agroindustrial Production of UAAS (0.4 thousand); volatile and medical plants of the Institute of volatile and medical plants of UAAS (1.5 thousand); tomatoes (2.3 thousand) and Capsicum pepper (0.6 thousand) of the Institute of Vegetable and Melon Growing; potatoes of the Institute of Potato Production of UAAS (2.9 thousand); apple of the Institute of Pomology n.a. L.P. Symyrenko of UAAS (1.0 thousand) and the Podillia Experimental Station of Horticulture of the Institute of Horticulture of UAAS (0.7 thousand); fruit and nut crops of NSC "Nikits'kiy Botanical Gardens" with the Crimean Pomological Station (9.8 thousand); minor and underutilized fruit crops of the Artemivs'k Experimental Station of Nurseries Cultivation of the Institute of Horticulture of UAAS; grape of the NSC Institute of Grape and Wine 'Maharach' of UAAS and of the Institute of Viticulture and Winemaking n.a. V.E. Taiirov of UAAS.

The sunflower diversity collection , Institute of Plant Production n.a. V.Y. Yuriev

The collections of forage, industrial and vegetable crops, Ustymivka Experimental Station of Plant Production

TABLE 5

Collections of the institutions working in the System for Plant Genetic Resources of Ukraine

Institution holding PGR collections	Accession number		Crops/Plant species
	Total	Including originated from Ukraine	
Institute of Plant Production n.a. V.Y. Yuriev	32 761	8 835	*Triticum, Secale, Hordeum, Triticale, Zea, Panicum, Setaria, Pennisetum, Pisum, Glyzine Phaseolus, Cicer, Lens, Helianthus*
Ustymivka Experimental Station of Plant Production	25 314	7 402	Cereals, pulses, groat crops, forages, oil crops, vegetable and melon crops, potatoes, forest and wood ornamental plants - more 110 crops
NSC Breeding and Genetics Institute	7 128	2 309	*Triticum, Hordeum*
Myronivka Institute of Wheat n.a. V.M.Remeslo	5 703	904	*Triticum, Hordeum*
Institute of Agriculture	1 864	215	*Glyzine, Phaseolus, Lupinus, Lolium, Trifolium*
Institute of Grain Farming	4 480	3 247	*Sorghum* sp., *S. sudanense, Zea mais*
Institute of Agriculture of Southern Region	1 036	389	*Glyzine, Medicago, Bromopsis, Dactylis, Gossypium Sorghum* sp., *S. sudanense, Zea mais*
Institute of Agriculture and Livestock of Western Region	1 909	1 046	*Vicia, Faba, Avena, Phaseolus, Linum, Trifolium, Lotus, Phleum, Dactylis, Lolium, Arrenatherum, Festuca, Poa, Lupinus*- 16 crops
Luhans'k Institute of Agroindustrial Production	1 937	378	*Pisum, Cicer, Lens*
Chernihiv Institute of Agroindustrial Production	596	192	*Lupinus* sp.
Institute of Rice	603	206	*Oryza*
Institute of Oil Crops	1 586	523	*Sunflower, Ricinus communis, Glyzine, Sesamum indicum, Carthamus tinctorius, minor oil crops* - 16 crops
Ivano-Frankivs'k Institute of of Agroindustrial Production	684	100	*Brassicaceae oil crops* - 13 crops
Institute of Sugar Beet	400	177	Sugar beet, fodder beet
Institute of the Root Crops	167	155	*Beta vulgaris L.* ssp. *vulgaris* var. *alba DC.*, var.*saccharifera Alef.; Cichorium intybus*
Institute of Bast Crops	1 720	236	*Linum usitatissimum, Cannabis sativus*
Ukrainian Experimental Station of Tobacco	159	52	*Nicotiana* sp. - *2*
Institute of Agriculture of Polissya	213	58	*Humulus lupulus*
Institute of Volatile and Medical plants	1 592	657	Essential oil and medical plants - 1600 specieses and forms
Research Station of Medical Crops	861	675	*Medical plants* - 378 specieses and forms
Institute of Forages	771	69	*Medicago, Trifolium, Lotus, Ornithopus, Bromus, Festuca, Phleum, Lolium, Arrenatherum, Agropyron, Elytrigia, Roegneria, Elymus, Agrostis, Deschampsia* -
Poltava Institute of Agroindustrial Production n.a. N.I.Vavilov	317	92	*Medicago, Bromopsis, Vicia sativa, V. villosum Festuca, Phleum, Lolium, Arrenatherum, Agropyron, Elytrigia, Roegneria, Elymus, Agrostis, Deschampsia* -
Institute of Vegetable and Melon Growing	5 848	2 085	*Vegetable and melon crops - 60 crops*

Institution holding PGR collections	Accession number		Crops/plant species
	Total	Including originated from Ukraine	
Kolomyia Experimental Station	187	145	Underutilized vegetable crops
Institute of Potato Production	2 886	1 894	Potatoes
Transcarpathian Institute of Agroindustrial Production	419	406	Tobacco
Institute of Horticulture	412	249	*Malus, Pyrus, Prunus s.l., Ribes, Rubus, Lonicera, Corylus, Hippophan, Craetegus, Viburnum, Aster, Actinidia, Schizandra sinensis*
Podillia Experimental Station of Horticulture	677	164	*Malus*
L'viv Experimental Station of Horticulture	509	171	*Ribes nigra, R. rubra, R. uva-crispa etc.*
Artemivs'k Experimental Station of Nurseries Cultivation	1 521	252	Minor fruit crops - 59 родів 13 родин
Prydnistrovs'ka Experimental Station of Horticulture	214	75	*Pyrus, Juglans*
Institute of Pomology n.a. L.P. Symyrenko	1 849	674	*Malus, Pyrus, Prunus s.l., Ribes, Rubus, Cornus, Lonicera, Corylus, Hippophan, Craetegus, Viburnum,Syringa*
Institute of Irrigated Horticulture	904	432	*Pyrus, Prunus s.l., Malus*
NSC "Nikits'kiy Botanical Gardens"	13 763	3 525	Fruit crops (including the subtropical); medicinal and essential oil bearing plants; dye bearing plants; ornamental tree and herbaceous plants
Crimean Pomological Station	3 003	658	*Malus, Pyrus, Cydonia, Prunus armeniaca, P. domestica, P. cerasifera, P. persica, P. amygdalus, Juglans, Corylus,*
NSC Institute of Grape and Wine 'Maharach'	3 200	329	Grapevine
Department of Tobacco of the Institute of Grape and Vine "Maharach"	1 004	78	Tobacco
Institute of Viticulture and Winemaking n.a. V.E. Taiirov	482	136	Grapevine
Institute of forestry and agroforestry	770	770	Forest species
Total	**130 771**	**40 513**	

The National collection of potatoes genetic resources is one of the largest in Europe

TABLE 6
Composition of the National Plant Genebank of Ukraine by crop groups

Crop group	Accessions number
Cereals	36 083
Maize	9 922
Groat	11 459
Leguminous	19 352
Oil bearing	3 985
Industrial	5 189
Medicinal and volatile plants	4 752
Forage	3 332
Vegetable and melon	7 872
Potatoes	3 456
Fruit and nut	14 633
Berry	918
Grapes	3 682
Forest and ornamental woody	4 289
Ornamental floral and herbaceous	1 826
Total	**130 771**

Onion diversity Institute of Vegetable and Melon Growing

TABLE 7
Composition of the National Plant Genebank of Ukraine by accession's status

Group by accession status	Accessions number
Bred cultivars	50 178
Landraces	20 886
Breeding lines	35 697
Genetical lines	1 967
Synthetic populations	806
Hybrids*	4 793

Group by accession status	Accessions number
Clones*	807
Wild relatives	8 099
No known	7 587
Total	**130 771**

* These groups are maintained in the Genebank only for vegetatively propagated crops

3.2 Roles of botanical gardens and other institutions

A valuable collections of food, feeding, medicinal, technical, spicy-aromatic, fruit, nut, ornamental crops, adapted to the respective climatic zones are maintained in a number of scientific institutions, botanical gardens, universities, colleges.

In particular, Podillya State Agricultural University created a unique buckwheat collection of over 900 samples.

The Institute of Plant Physiology and Genetics of National Academy of Sciences of Ukraine (NAS of Ukraine, Kyiv) maintains the collection of 2 069 varieties and mutant lines of winter wheat; 1 206 mutant, and inbred recombinant lines of maize, which are recognized the national scientific domain.

In the National Botanical Garden n.a. M.M. Gryshko of NAS of Ukraine, Kyiv are maintained 13 180 plant genepool samples including collections of fodder plants representing more than 120 species of 12 families; spicy-taste plants of 115 species belonging to 55 genera, 12 families; medicinal plants - 274 species of 208 genera, 65 families; vegetable plants - 47 species of 16 families; fruit and berry crops - over 100 species, 1500 forms and varieties etc.

The National Collection of explants and Germplasm Bank of plants of World flora is maintained in the Institute of Cell Biology and Genetic Engineering of NAS of Ukraine, Kyiv. It includes the samples belonging to nearly 4 000 species of flora of Europe, Asia, America, Africa. Among them, the seed bank has about 5 000 plant samples belonging to more than 1 000 genera and 187 families. On the basis of a seed bank, bank of cell lines *in vitro* is created.

The Sofiivka National Arboretum, Uman', Cherkasy region

The National Park Arboretums «Sofiivka» of NAS of Ukraine, Uman has the collections of plants from various botanical and geographical regions unique by qualitative and quantitative composition. They include 3 323 samples of filbert, hazelnut, apple, hawthorn, rowan, roses and others. The scientific value and unique of collection of the Donetsk Botanical Garden of NAS of Ukraine, Donetsk - one of the largest in Europe - is due to original species and forms diversity aimed at the survival of plants in extreme conditions of droughty steppes and industrial pollution. It includes 550 samples (including 447 representatives of 103 species and varieties) of non-traditional food and other useful plants, 626 samples

(including 567 representatives of 59 species and varieties) of new forage plants.

Collection of the Botanical Garden of Zhytomyr Agroecological University accounts 200 species of trees and bushes; more 750 species of herbaceous plants.

Rich genetic diversity is maintained in collections of other botanical gardens and arboretums (Tables 8 and 9). These most PGR of these collections don't belong to the ones for food and agriculture and represent ornamental trees, bushes, lianes and herbaceous plants, medicinal plants.

TABLE 8

The main botanical gardens of Ukraine

Name	Area, ha	Year of establishing	Number of species and forms
National Botanical garden n.a. M.M. Gryshko, Kyiv	130	1 936	13 000
Botanical Garden of Kharkiv University, Kharkiv	5.5	1 804	1 700
Nikits'kiy Botanical Garden, Authonomous Republic of Crimea	147.9 (876.6 with branches)	1 812	13 800
Botanical Garden n.a. O.V. Fomyn of Kyiv National University, Kyiv	22.5	1 841	10 000
Botanical Garden of Dnipropetrovs'k University, Dnipropetrovs'k	18	1 930	3 000
Botanical Garden of Zhytomyr Agroecological University, Zhytomyr	35.4	1 933	1 000
Botanical Garden of Volyn' University, Luts'k	10	1 977	500
Botanical Garden of L'viv University, L'viv	18.5	1 911	1 200
Botanical Garden of Odesa University, Odesa	16	1 880	2 000
Botanical Garden Uzhhorod University, Uzhhorod	4.5	1 946	300
Botanical Garden of Chernivtsi University, Chernivtsi	3.5	1 877	1 300
Doniets'k Botanical Garden, Doniets'k	275.5 (350.5 with branches)	1 965	8 600
Kamenets'-Podil's'kiy Botanical Garden, Khmel'nyts'kiy region	17.5	1 930	2 800

TABLE 9

Major arboreta (dendrological parks) of Ukraine

Dendrological parks name	Region	Area, ha	Year of establishing	Number of species and forms
Askania-Nova	Kherson	210	1887	1 000
Veseli Bokovenki	Kirovograd	109	1893	800
Vysokogirny (High Montane)	Ivano-Frankivs'k	100	1967	200
Germakivsky	Ternopil'	56	1956	1 500
Dibrova	Ivano-Frankivs'k	8	1972	300
Druzhba	Ivano-Frankivs'k	10	1970	2 000
Obroshinsky	L'viv	5	1730	30
Oleksandriya (Alexandria)	Kyiv	201.5	1793	800
Rudkivsky	L'viv	59	1967	280
Syretsky	Kyiv	6.5	1875	400
Sofiyivka (Sophiyivka)	Cherkasy	152	1796	3 000

Dendrological parks name	Region	Area, ha	Year of establishing	Number of species and forms
Storozhynetsky	Chernivtsy	17.5	1912	800
Trostyanetsky	Chernihiv	204	1834	500
Ustymivsky	Poltava	8.9	1983	470
Horostkivsky	Ternopil'	18	1972	1 500
Arboretum of Chernivtsi University	Chernivtsy	4.8	1876	100

3.3 Private sector

A number of valuable crops forms, created by folk breeding, are constantly maintained and used in peasant farms on-farm. In mountainous districts of Carpathians, the local population grows high adapted forms of spring rye, curling *Phaseolus* beans. In central and western regions of Ukraine in the gardens are grown valuable landraces of grain *Phaseolus* bean, turnip, Swedish turnip, garlic, apple, pears, cherries, plums, apricot and other crops. These plant varieties are elements of traditional forms of agriculture as a cultural heritage of the people, which are stored on-farm.

On-farm conservation of maize in Carpathian region

Many people's maintain private collections of vegetable, fruit, ornamental, medicinal plants. These collections include from several dozens to several hundreds samples. They are used as for own consumption as for commercial aims.

3.4 Collecting

One of main tasks of the PGR National Program is gathering of local genetic diversity of crops and their wild relatives from all regions of Ukraine. Ancient forms of spring rye, maize, *Faba* bean, *Phaseolus* bean, garlic, onion, potatoes, apple, pear, berry crops, cultivated medicinal plants were founded in the Carpathian region, in Polissya (northern forest region). The most interesting in relation to wild crops relatives is Crimea. In different Ukrainian regions are folk breeders which create valuable crop forms. There is important to identify them in order to draw these forms to the National Genebank and to provide these peoples with possible support.

The institutions of the PGR System of Ukraine carried out 15 collecting missions since 1996, which gathered more 3 thousand samples. 12 of these collecting missions were organized together with and funded by the National Genebanks of Poland, USA, Canada, Republic of Korea. The missions overlapped east, southern, west and partly northern and central parts of Ukraine. Scientists of the PGR System participated also in the expeditions in Moldova, Russia, Italy, Turkey. Every year 1-3 expedition are organized.

Collecting missions of the National Centre for PGR of Ukraine

Drawing to the Genebank of plant cultivars and experimental forms as also samples belonging to other genepool categories, carrying genes of economic valuable traits, with the aim to provide breeding programs with initial material is also an important task. First the Ukrainian cultivars, bred and experimental forms are being gathered and concentrated in the Genebank.

With this purpose the NCPGRU is carrying out germplasm registration with issuance special Certificates identifying authorship for a germplasm samples and germplasm collections. It ensures protecting of intellectual rights on the germplasm samples and contributes to storage in Genebank and effective use of them, keeping equitable distribution of benefits. 486 germplasm samples of 30 crops and 52 germplasm collections are registered with issuance of the Certificates at the end of the 2008.

A significant amount of samples is obtained in framework of science collaboration and exchange with international centers for agricultural researches of CGIAR, genebanks, breeding institutions and firms etc. in different countries.

Every year institutions of the Ukrainian PGR System introduce 6-7 thousand samples. A equivalent number of samples are issued from the Genebank to the users in Ukraine and other countries.

3.5 Storage facilities

The base collections of seed propagated species of the National Plant Genebank are stored in the National Depository of PGR Samples Seed which is functioning in the NCPGRU. In the Depository is provided currently long-term storage of more 45.0 thousand samples of 453 seed-propagated plant species belonging to 45 families. There is continued growing and laying in the Depository of seed of remain samples of the National Genebank collections.

The National Crop Diversity Samples Seed Depository, National Centre for PGR of Ukraine

The seed samples set destined for longterm storage is subdivided into parties containing no more 50 samples. In each the party is definited the check sample which is layed in double amount of seed. One of the amounts serves to monitor the viability of seeds by periodic sampling of seeds and their germinating.

Before laying in storage, the seed is being dried to the humidity level specific for each crop and placed in to hermetically closed foil pouches. Among the storaged 45 thousand samples, 16 thousand are kept in the freezing chamber at the temperature of -20°C, 13 thousand at the temperature 4°C, 16 thousand are kept at irregulated condition, but are being steady transferred into the freezing chamber.

In Doubled Depository of Ustymivka Experimental Station of Plant Production, 24.4 thousand seed samples of the National Genebank are kept on long-term storage, of which 14.3 thousand at the temperature 4°C.

The viability state of seed samples in the Depositories is being monitored after each 5 years by germinating of seed chosen from the check sample. To prevent the loss of viability, regeneration is required when the germination capacity falls below 85%.

Seed of 75 thousand genepool samples of active collections of the PGR System institutions are stored most at irregulated conditions in paper pouches.

National genepool of vegetatively propagated crops totaling 33.8 thousand samples is maintained in the field collections. They are fruit, berry, nut, some forage, vegetable crops, volatile oil bearing, medicinal ornamental plants.

In the Institute of Vegetable and Melon Crops is begun establishing of *in vitro* meristem conservation of garlic samples; cryopreservation is begun. As it is showed above, in the Institute of Cell Biology and Genetic Engineering of NASU, Kyiv is kept in tissue culture *in vitro* nearly 4 000 species of World flora. *In vitro* cultivation of potatoes tissues is carried out in the Institute of Potatoes of UAAS.

Researches for creation of cryobank of vegetatively propagated crops are carrying Institute for Problems of Cryobiology and Cryomedicine of NASU, Institute of Livestock of UAAS together with the Institute of Plant Production n.a. V.J. Yuriev of UAAS and the Institute of Vegetable and Melon-Production of UAAS (all are situated in Kharkiv).

The rising of security of conserved genotypes is the main objective of the genebank, related to improvement of facilities, methodologies and research on plant and seed physiology. All the actions promoted by NCPGRU are focused on a better protection of national agrobiodiversity.

3.6 Security of stored material

In Depository of Ustymivka Experimental Station of Plant Production, for safety storage, 24.4 thousand seed samples of the National Genebank are kept, 14.3 thousand of them at the temperature 4°C.

Significant part - 61.8 thousand samples of the total 130,8 thousand samples of National Genebank collections, or 47.2% are doubled in two or more institutions. It is for the need to use these accessions in breeding and research programmes and safety duplication.

3.7 Documentation and characterisation

For effective solving the tasks of preservation, enrichment, investigation, use and management of plant genetic resources of Ukraine, in the NCPGRU (Institute of Plant Production n.a. V.Y. Yuriev, Kharkiv city) is created and carried out the Information System "Plant Genepool". It consists of three components:

1. the databases,
2. reference subsystem,
3. software.

1. The Passport database is the central and main part of the 1st component. It is constructed in accordance with the structure of Central Crop Database and the database of EURISCO. But some additional fields are added according to needs of Ukrainian peculiarities: synonym of accession name, introduction number of sample, author of the sample, sample value etc. The Passport database contains basic data about the accessions: number, common crop and botanical names, sample name, data about it origin: country, place of collection, donor, author etc., status, life cycle, development type etc. The passport data of 62 thousand samples are accessible in the EURISCO Catalogue.

The Trait database contains data of evaluation and characterization of genepool samples.

In the database of accessions pedigrees is registered genealogy and history of creation of the samples.

Genetical database contains information on presence in the genepool samples of genes or gene complexes determining economical, agronomical and biological traits.

In the Database on Immunological characteristics are data of samples estimation for resistance to biotic factors – diseases, pests etc., obtained during their investigation.

Meteorological database contains data about wheather conditions in the years of study of genepool samples, in order to explain they behaviour in these years and estimate ecological adaptability.

In the Information database is gathered information from literature and other sources relating to a genepool samples: their localization, characteristics, origin etc. It serves to introduction of a samples, determining ways of their use etc.

The Database on genepool samples storage contains data about availibility, amounts and places of seed samples keeping in the National Depository and doubled depositories, state of their viability and quality before laying for storage and during the storage etc.

The Database of requests for genepool samples contains data on requests are comed from users and serves for their fulfilment in time and adequately.

The Introduction database contains data about a samples are obtained and drawn to the Genebank: place of gathering with it geographical characteristics, institution or person whofrom obtained etc. It is the same as the Passport database in it structure.

The Database for genepool samples distribution contains data on sending, transfering or giving the samples to users.

The last three databases permit to monitor the obligations according to the agreements terms and conditions, on which the samples are obtained by NCPGRU and transfered from the National Genebank.

2. The reference system includes Descriptors for all the fields of the databases.

3. The documentation of the National Genebank is based in the main on the ACCESS software. Different versions of Excel and Statistics programmes are used for data mathematic treatment.

The Information System "Plant Genepool" facilitate access to the plant genetic diversity gathered in the National Genebank of Ukraine.

All National Genebank samples are being characterized by economic and biological characteristics. The characterization by morphological traits is based on the methodics and descriptors worked out in the NCPGRU and other institutes of the PGR System of Ukraine as also on the descriptors lists kindly given by the N.I. Vavilov Institute of Plant Indistry (Russia) and by the IPGRI. Also special estimation of the collection samples for resistence to biotic and abiotic stresses, products quality traits (technological, biochemocal) etc. is carried out in laboratories of the research and breeding institutes. Lack of funding and insufficient equipment, the need for isolation of cross-pollinated plants, can be considered as main constrains and the causes for an accumulation of regeneration backlog.

Identification of the Genebank accessions is regarded as important work direction. It is carried out still by morphological traits and by some molecular characteristics as electrophoretical composition of storage proteines, isoenzimes etc. The necessity of DNA marker analyses should be underlined, to provide valuable information on genebank collections, to get a duplicate screening and a future rationalization of samples conservation.

The data of characterization is being kept in the trait databases, which are not free accessible.

3.8 Keeping authenticity of genepool samples in collections

For effective use, optimizing of collections size and reliable preservation of plant genepool samples, it is necessary to monitor their authenticity. The identification by modern methods is need for that, in particular, using DNA markers.

This method is applied in Southern Biotechnical Center of UAAS (Odesa), in the State Service on Right Protection for Plant Varieties, Institute of Cell Biology and Genetic Engineering of NAS of Ukraine. More widely are used electrophoretical analyze of grain storage proteins and isoensymes. These researches are carried out in the Institute of Plant Production n.a. V.Y. Yuriev of UAAS, NSC Breeding and Genetics Institute of UAAS, Institute of Horticulture of UAAS, Southern Biotechnical Center of UAAS, Institute of Grape and Wine 'Maharach' of UAAS and some other institutions. As these methods are expensive, there are used mostly morphological, phenological, physiological methods.

CHAPTER 4

UTILIZATION OF PLANT GENETIC RESOURCES

Collections of plant genetic resources of Ukraine are widely used in breeding programs, in fundamental and applied scientific researches, in education process. From 6 to 7 thousand samples are issued annually for these purposes from the National Plant Genebank of Ukraine, among them from 5.5 to 6 thousand samples to users in Ukraine, 1-1.5 thousand samples to users in other countries.

4.1 Use of the plant genetic resources in the breeding

On the base of the samples transferred from the Genebank during last 5 years, were developed in Ukraine about 350 varieties of different crops. In particular, the Institute of Plant Production n.a. V.Y. Yuriev, based on the PGR collections, released resistant to biotic and abiotic factors spring barley varieties Zdobutok, Aspect, Parnas, Vyklyk, Yavir having yield capacity 9-9.5 t/ha; high-yielding varieties of winter triticale Harroza and Etel, early and middle ripening varieties of soybeans good adapted to growing conditions: Versiya, Skelya, Velychava. The spring triticale variety Caravay kharkivs'kyi, which was included to the State Official List of Plant Cultivars in 2007, has improved baking properties and destined to grow without use of fungicides, as characterized by bulk resistance to diseases. Leftless varieties of pea for grain use Deviz, Modus, Kamerton, Tsarevych, Gljans are resistant to lodging, abscission and dry growing conditions. Wide recognition in Ukraine and abroad got created in the last time on the basis of collection lines new varieties and hybrids of sunflower that differ in biochemical composition of oil and directions of use: confectionery varieties Ranok and Solaris, high productive and high-oil hybrids Romans, Forward, Rakurs, hybrids with a high content of oleic acid Quinn, Bogun, with high content of palmitin acid Kapral etc.

The fruit crops collection of the Institute of Horticulture

In the Myronivsk'y Institute of wheat n.a. V.M. Remeslo the winter wheat varieties Voloshkova and Kolos myronivschyny created from spring collection samples are more resistant to lodging, abscission and drought, hardy to pest and diseases and give high yield in the Forest-Steppe zone and Polissya. Also, during the 2006-2008 biennium were released a new varieties of spring durum wheat Zhizel' and high-yielding spring brewing barley varieties Avgiy and Psiol.

Sweet corn varieties Arthur and Glamour released by the Institute of Grain Growing, are characterized by sugar content in grain 19%, and high yielding variety of grain maize Vodohray is resistant to lodging, drought and common smut.

Winter rape variety Cheremosh created in the Ivano-Frankivs'k Institute of Agroindustrial Production has low level of erucic acid and glucosinolates and can generate biological yield within 6-10 t / ha and shows high frost resistance.

Wheatgrass variety Columb released in 2008 by the Institute of Forages has improved adaptive potential and resistance against major diseases. The lupin variety Serpnevyi of the Institute of Agriculture is characterized by a high protein content in grains.

Based on the PGR collection of the Institute of Vegetable and Melon Growing, are developed high-yielding super early hybrids of eggplant: Adonis F1, Ultraranniy F1, high-yielding varieties Fialka, Premier, Bila liliya; indeterminant high productive tomatoes variety Udavchyk for filmy greenhouses; the garlic variety Merefyans'kiy which is white, of universal use, drought and winter hardy, resistant to diseases; onion variety Amphora for salad use, semi sharp, high able to storage; sweet onion variety Bilyavka; winter hardy variety of onion-batun Stasya; variety of Fragrant-flowered garlic (Allium odorum) Zoryaniy for use for the salad leaf and as a ornamental; high-yielding varieties of mustard Zoryana, watercress Merezhyvo and others.

Genetic diversity of non- traditional fruit crops of Artemivs'k Experimental Station of Nurseries Cultivation

The Institute of Horticulture (Kyiv) and Institute of Pomology n.a. L.P. Symyrenko, using collection samples, created a number apple varieties: Amulet, Harant, Blagodat', Lyubava, Skifs'ke zoloto, Miss, Jvileyne, Vlasta and others. They are resistant to biotic factors and adaptive to growing conditions. Among high tolerant to drought and diseases gooseberry varieties created at the Institute of Horticulture should be noted Karat, Zlatogor, Oksamyt, Slavuta and Knyazhych. Institute of Irrigated Horticulture n.a. M.F. Sydorenko created for the Steppe zone apricot varieties of universal use: Kumyr, Tashenaks'kiy, Dar Melitopolya, Sadovyi and cherry Lubitelskaya, Vidrodzhennya, Erudytka, Zminschytsya, Zgoda, Notka and others. Actively used collection of subtropical fruit crops in Nikita Botanical Garden is the base for creation and release of varieties of persimmon Gora Roman Kosh, Gora Hoverla, Gora Rogers, Novinka.

Base for creating new varieties of grapevine is the second largest collection in the world of this crop, concentrated in the Institute of Vine and Wine "Magarach". Among the many created in recent years varieties should be marked Granatoviy

Magaracha - very early variety, resistant to mildew, grape *Oidium* and gray rot; Pamyati Holodrygy - late variety of technical use having juicy and hard crumb; Intervidis Magaracha – variety for dining use, highly transportable and others.

On the basis of collections genepool is expanding assortment of grown crops by the way of introduction of valuable new and neglected ones.

In particular, the Institute of Oil Crops is implementing a crops that contain oil with high medical, dietary, food properties. Are created safflower cultivar Sonyachnyi resistant to fusarium and rust, adapted to mechanized harvesting; high productive varieties of lallemantia Rozhevokvitkova, peanut Urozhainiy 3, chufa Novynka and others.

Grape genetic diversity of the Institute of Viticulture and Winemaking n.a. V.E. Taiirov

Artemivs'k Experimental Station of Institute of Horticulture carry out researches in order to implement such valuable fruit crops as medlar, which ripes latest among fruit crops and prolongs the period of fresh fruits consumption, winter hardy crops - aronia, barberry, hawthorn, honeysuckle, buckthorn, rybelaria, bird-cherry, sorbaronia; crops with the fruits of high taste, having high content of vitamins and other useful substances - henomeles, actinides, schizandra, pawpaw, ziziphus, persimmon and others; highly decorative species - louiseania, sakura, decorative forms of apple, peach, plum and others.

Institute of Plant Production n.a. V.Y. Yuriev, based on collections working on a revival of ancient, now neglected types and forms of cereals - emmer, spelt, hulless barley, lentil which have the unique grain quality, taste and are demanded in the world.

Great work on the implementation and breeding of new and innovative fodder, medicinal, fruit, ornamental crops carry out the botanical gardens – National n.a. M.M. Grishko, Nikitsky, Donetsky and others.

4.2 Use of the PGR in fundamental and applied researches

Genetic diversity, concentrated in the National Plant Genebank and in collections of other institutions, serves as material for basic and applied researches in institutions of NAS and UAAS, Universities etc.

In particular, based on species and varietal diversity of oilseed crops, are being solved problems of biodiesel, quality improvement of food and technical oil (Institute of Plant Production n.a. V.Y. Yuriev, Institute of Oil Crops, Ivano-Frankivs'k Institute of Agroindustrial Production, etc.).

On the basis of diversity of maize, wheat, barley, rye, triticale and other crops for genes that control composition and forms of starch, is worked out the problem of bioethanol, are created new and better diet food products, technical

materials (Institute of Plant Production n.a. V.Y. Yuriev, Institute of Breeding and Genetics, Institute of Grain Growing and others).

Collection genepool of volatile and medicinal plants is the basis for widening assortiment of essential oils and improvement of their quality, creation of raw materials for pharmaceutical, food industry including natural flavorings, additives (Institute of Volatile Oil Bearing and Medicine Crops, Research Station of Medicinal Crops, Nikitskyi Botanical Gardens).

Investigation on the stability of grain, vegetable, sunflower, fruit and other crops to diseases and pests is also based on PGR collections (Institute of Plant Production n.a. V.Y. Yuriev, Institute of Breeding and Genetics, Institute of Vegetable and Melon Growing, Institute of Plant Protection etc.).

Collections of leguminous and grain crops is used for the development of actual problems of biological Nitrogen fixation by symbiotic and associative microflora (Institute of agricultural microbiology, Institute of Agriculture etc.).

The Institute of Animal Science and the Institute of Vegetable and Melon Growing are working out the technology of cryoconservation of vegetatively propagated crops.

Based on the genetic diversity of National Genebank, in the institutions of PGR System of Ukraine are developed techniques for evaluating varieties of different crops on ability to protecting owner rights (DUS test); are worked out more than 10 State Standards.

Since 1996, based on PGR diversity of the National Genebank, botanical gardens and other institutions, more 50 candidate and 15 full doctor theses were defended.

4.3 Use of the PGR for education

Collections and samples of genetic resources of plants are available for use in educational programs of universities and colleges of agricultural and biological profiles, schools, houses for creativity of children and young peoples and others.

At collection fields and plantations are conducted training to improve skills of agriculturists, teachers; are held "Field days", tours for students and pupils.

Institutes of PGR System made and implemented more than 40 collections of genetic diversity of crops for peculiarities of seeds. Based on the National Genebank of Ukraine, using samples of the gene pool and under the leading of researchers, students and pupils prepare course, dissertations and other scholarly work.

For use in educational purposes are produced manuals on genetic diversity of sunflower, maize, pea and soybean.

National Center for PGR in collaboration with Kharkov National Agrarian University n.a. V.V. Dokuchayev and the National Agrarian University (Kyiv) developed and implemented in universities the education program "Plant Genetic Resources".

CHAPTER 5

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

During 1997-2008, there was carried out an active regional and international cooperation in the field of plant genetic resources. It was in the following areas:

- Exchange of PGR samples and information about them;
- Joint collecting missions for PGR samples gathering;
- Training of scientists in PGR institutions to improve the professional skills and exchange experience;
- Joint activities in a reliable preservation of gene samples as an integral component of global plant genetic diversity;
- Joint researches and creating of scientific products (breeding varieties and hybrids, scientific publications, obtaining a patent for utility model or a certificate of invention, development of guidelines, etc.).

At the regional level in Ukraine, 43 breeding and research institutions of the PGR System of Ukraine cooperate in scientific and technical program «The Plant Genetic Resources» aimed at forming and maintaining the National Plant Genebank. Collaboration with other breeding and research institutions, educational institutions, botanical gardens and arboretums, farming producers, private persons in Ukraine has the main aim to ensure breeding, scientific, educational and other programs with genepool samples. For that purpose each year is transferred to the institutions in Ukraine 5-6 thousand samples of different crops. In turn, breeding and research institutions are giving to the Genebank their varieties, lines, forms of plants, including registration, annually in the number of 2-2.5 thousand samples. Also carried out joint research and breeding programs. The institutions of the PGR System of Ukraine are taking part in the development and implementation of training programs on PGR and others.

Cooperation of botanical gardens between themselves and with other institutions is guided by the Council of Botanic Gardens and Arboretums of Ukraine, headed by the National Botanical Garden n.a. M.M. Gryshko.

At the international level, institutions for PGR of Ukraine collaborate with Bioversity International, the International Centers for Agricultural Research - CIMMYT (Mexico), ICARDA (Syria), ICRISAT (India), IRRI (Philippines), CIP (Peru) and others; genebanks, breeding and research institutions in more than 40 countries of 5 continents: Russia, Belarus, Latvia, Lithuania, Estonia, Moldova, Kazakhstan, Sweden, Poland, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Serbia, Croatia, Slovenia, Germany, Austria, Switzerland, Italy, France, Spain, Turkey, Israel, China, Republic of Korea, Australia, USA, Canada, Argentina, Chile etc.

Since 1999, between National Centre for PGR of Ukraine and 24 research institutions of 14 countries (including Russia, Belarus, Moldova, Latvia, Serbia, Bulgaria, Kazakhstan, Azerbaijan, Uzbekistan, China, South Korea, Thailand, Canada , USA) were concluded the agreements on international cooperation.

Since 2008, Ukraine is a member of the European Cooperative Program on PGR (ECPGR). Ukrainian scientists are involved in the meetings of Working Groups on different crops, meetings of the Steering Committee. There is carried out a wide exchange of genepool samples and collections. Each year, 1.5 - 2 thousand genepool samples are being given from the National Genebank to institutions in other countries and 3.5 - 4 thousand samples are being obtained from foreign institutions. Institutions of the PGR System of Ukraine in 1997-2008 was carried out 9 international expeditions to collect plant gene pool samples. The expeditions were sponsored and in them participated scientists from Russia, Poland, Slovakia, Moldova, USA and Canada.

The Institutions of the PGR System are involved in laying the seed samples of plant gene pool for long storage in to Svalbard Global Seed Vault (in 2009 are handed over about 1 000 samples of 7 crops), in a European (EURISCO) and the World (WIEWS) Catalogues of PGR, creating integrated European plant genepool collections (AEGIS).

International cooperation of botanical gardens in Ukraine is carried out in framework of the International Association of World Botanical Gardens, the International Organization for Protecting of European Flora "Planta Europa". The National Botanical Garden n.a. M.M. Grishko was one of the participants of international project GEF on preservation of bioversity in delta of Danube and other programs.

Since 2007 Ukraine has elected a member of the International Coordinating Council of the UNESCO «Man and the Biosphere» (MAB-MKP). Ukrainian scientists involved in the cooperation of Alpine and Carpathian regions in frameworks of SAVE and other international organizations.

CHAPTER 6

ACCESS TO PLANT GENETIC RESOURCES

Every year the institutions of the PGR System of Ukraine issue from the National Genebank to users seed or planting material of 6-7 thousand accessions.

In Ukraine there is not any special legislation which regulates on national level access to plant genetic resources. It is partly regulated by the legislation on protection of intellectual property. As to commercial varieties it is regulated by the law "On the Protection of Plant Varieties". According to it, access to the patented varieties for commercial purposes is provided only on the author's terms and conditions. There is free access to all varieties for breeding and research purposes.

Ukraine is still not member of the International Treaty for Plant Genetic Resources for Food and Agriculture. But there is carried out preparing to the addition to the Treaty: project of the Law of Ukraine on Joining to the Treaty is being regarded by the Verkhovna Rada – Parlament of Ukraine. So, access to the samples of National Plant Genebank is being provided on the conditions which agree with the principles of the Standard MTA.

The System of PGR of Ukraine provides access to PGR samples on the base of Material Transfer Agreement (MTA), whose conditions depends on user and on purpose of sample use. It is being took into account whether the accession is connected with any third party obligations and restrictions; in this case these obligations and restrictions are fulfilled.

Mainly the samples are issued from the Genebank for the purposes of research; plant breeding; training. A recipient should use the Material on the base of author right protection and Breeders Code of Ethics. In particular, it is required written approval of the Donor for use of the Material in following directions: for testing in international nurseries; increase and release as a cultivar; reselection from within the stock; use as a parent of a commercial F1 hybrid, synthetic or multiline cultivar; mutation breeding; selection of somaclonal variants; use as a recipient parent for asexual gene transfer, including gene transfer using molecular genetics techniques. The recipient shall not distribute the Material to third party; shall provide to Donor any information and results relating to trials assessment and experiments carried out by the Recipient on the Material. The Recipient shall not claim ownership nor to seek Intellectual Property Rights (IPR) over the transferred Material.

In depending on the aims of use of the germplasm samples issued from the Genebank, additional conditions may be included to the MTA, in particular they may be following.

When on the genetical ground of transferred germplasm samples, a commercial cultivars will be bred and claimed for release.

At present there is worked out project of the Law of Ukraine "On Plant Genetic Resources" which is in the stage of preparing to presenting to the Ukrainian parlament Verkhovna Rada.

Share of the Genebank ownership in created varieties and lines if one sample is used in the first cycle of hybridization is 10%, if two samples - 15%, if in the second and third cycles, or as a donor in backcrosses - 7%, at the direct selection - 40%. The share of remuneration (royalty) should be respective if the varieties and source materials, created using these samples, will be used in commercial purposes.

If the issued samples or specially created collections are accompanied by information on their economic and useful qualities, there might be charge a price.

In the case when to the client, on his application, are given repeatedly the samples that have already passed to him before, it remains valid MTA, accompanied with samples of first giving. A Register of concluded MTAs is carried out in the form of especially developed database in electronic and in written form.

Keepers and researchers of National Plant Genebank of Ukraine, Kharkiv