RUSSIA:

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

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Table of Contents

CHAPTER 1
Characteristics of the Country and its Agricultural Sector

By January 1st, 1994, the Russian Federation occupied the area of 17,097.00 sq.km. Its population is 148.2 mln people with an average density amounting to 8.2 people per 1 sq. km (Annex 1). The territory of the Russian Federation incorporates extremely diverse natural environments. In the western part of the country vast plains prevail (East European and West Siberian plains divided by the Ural Mountains). In the East there are plateaus and mountainous areas of Southern and North Eastern Siberia and the Far East. In the South of the European part of Russia there are the chains of the Greater Caucasus and the mountain of Elbrus. In Russia climate varies from the sea climate in the extreme North West to the continental one in a range of climate zones from the Arctic belt to the Subtropical one. Average temperatures of January is negative (from 1°C to 50°C almost everywhere, except the Black Sea Coast in the Caucasus). Summer Average temperatures of July are within the scope from 1°C to 25°C.

Annual precipitation level is from 150 mm to 2,000 mm. Permafrost is typical for the soils in many areas of Siberia and the Far East. In the country's territory there are more than 200,000 lakes and an extensive network of great and minor rivers.

Soil and vegetation zones are as follows (from north to south): Arctic desert, tundra, forest tundra, forest, forest steppe, steppe and semidesert. Altitudinal belts are typical for mountainous regions, especially for the Caucasus and Altai. 44% of the Russia's territory are covered by forests. Natural environments in many regions are unfavourable for agricultural production, being deficient of water and warmth. A considerable part of lands needs melioration. The country is conventionally subdivided into 12 economic regions: Northern, North Western, Central, Volga Vyatka, Central Black Soil, Middle Volga, Lower Volga, North Caucasian, Ural, West Siberian, East Siberian and Far Eastern regions (Annex 2).

In spite of rich natural resources, the level of agricultural production in Russia has ever been lower that it could have been potentially due to a number of reasons. Nevertheless, agriculture has been playing a vitally important role in the national economy with its 25% of net production output, employment and capital investments.

Until the recent times this sector exhausted a considerable part of Russia's budget and hard currency resources, while consumers spend up to 65% of annual income to satisfy their demand for food products. In 1970's the growth rate of agricultural production began to show continuous decrease, falling down to negative figures in 1990's. In the nearest future no tangible changes of the situation towards improvement are expected. The yield of major crops has remained unchanged on the level of 10-30%. Gross agricultural production irrevocably continues to decline, having decreased by 22% on the national level in general, but for instance in the Altai region this parameter has fallen down by 30%. One of the reasons of the reported decrease of the production rate in 1994 was a severe soil drought in the major areas of priority crop cultivation, i.e. cereal grain production: Krasnodar and Stavropol Territories, Rostov, Volgograd, Saratov, Voronezh and other Provinces of the Central Black Soil area of Russia. In 1995, according to the draft estimates of some scientists of the Russian Agricultural Academy (RASKhN), about 2 million hectares of winter cereals will be damaged. This may result in the expected loss of grain yield by no less than 4.5 or 5.0 mln tons.

Rotting and snow mould may also damage crops in the fields. By now many farms have got no funds to buy fertilizers, fuel and chemicals for plant protection. Relatively low level of agricultural production may be largely due to general worsening of the macroeconomic situation, absence of efficient incentives (resulting from distortion of the price formation structure in the chain "expenditures agricultural production output"), worsened terms of trading in agricultural products, breaches in trading and marketing procedures (caused by disruption of traditional market relations in major spheres of agricultural production between the states of the former USSR and the East European countries which previously were partners of socialist cooperation), disintegration of the former common market and system of payments, reduction in financial resources (brought by a decrease in crediting for production purposes and cutdown of subsidiesearmarked to agricultural enterprises, and weak connections between agricultural research and its practical implementation.

With this, such burning problems as agricultural producers are now facing in the sphere of improvement of management structures and agricultural technologies cannot obviously be approached.

One the reasons of the critical situation in national agriculture is the fact that scientific research activities in the sphere of agriculture have been steadily would up. The amount of 132 billion Rbl. funding from RASKhN approved for 1995 was cut down by the State Duma to 79 billion Rbl. By November 1, 1994, the RASKhN network embraced 228 scientific institutions, including 195 research institutes, 29 experimental stations, 47 breeding centres (39 of which were involved in plant breeding, and 8 in animal breeding), 4 biotechnological centres and 4 scientific coordination centres. Among other reasons

there are an exceptionally low level of remuneration in the agricultural sector, severe problems in the social sphere in agricultural areas, and illogical system of land management relations. In addition, road construction in rural areas became 12 times lower than before.

This should be considered with reference to the exchange rate of U.S. $ 1 = 5,000 Rbl. (for April 3, 1995).

During the past four years (1990-1994) gross output of the agri-industrial complex in Russia became twice as low, while agricultural production declined by 24%. Consumption of meat per capita decreased by more than 21%, milk by 24%, eggs by 16%, fish and fishery products by 40%, sugar by 34%, vegetable oil by 31%, vegetables and horticultural crops by 20%, fruits and berries by 17%, etc. General nutrition level of the population was reduced in the average from 3,380 kcal per day per capita in 1987-1989 to 2,552 kcal in 1993 (by 25%). Protein deficiency in consumable food products reached 25%, and vitamin deficiency 50-60%. Over 20% of population (34 mln people) are systematically underfed.

Historically Russian agriculture has always suffered from low productivity of crop fields and livestock farms, exceedingly high consumption of power and materials and low production rate. Agricultural engineering, servicing and processing industries have also been notably lagging behind the international standards, and this gap shows an unavoidable tendency to increase. However, it should be marked that more than 70% of the country's territory is situated in the zones of either extremely cold climate, or extremely arid environments.

Bioclimatic potential of Russia's major agricultural areas is 2.4 3.2 times lower than in Western Europe and the United States. 222 million hectares of arable lands include 49 mln ha of acidic soils, 15 mln ha of saline soils, 24 mln ha of soils with alkaline components; 54 mln ha are affected by water or wind erosion, 25 mln ha are water logged or swamped, and 10.5 mln ha suffer heavy industrial pollution. Three years of radical reforms have led to disfigurement of the traditional land management, agricultural system, crop rotations, intensive technologies of crop cultivation, integrated plant protection systems, and cessation of land reclamatio activities. Due to economic or often even political reasons application of fertilizers has decreased 5 times. In accordance with the six or eight year cycle of examinations, in 1994 phytosanitary monitoring of the current state of arable lands was performed in Bryansk, Oryol, Moscow, Vladimir, Kirov and Nizhny Novgorod provinces as well as in Tatarstan and the Republic of Mari El. Winter rye plantings manifested snow mould epiphytoty and aggravation of rhynchosporium incidence; spiky cereals were reported to show from moderate to strong development of rust diseases, powdery mildew and from week to moderate development of septoria leaf and helminthosporiosis diseases. Losses caused by diseases of cereal crops

are estimated to reach 15-30% in the Western and South Western regions of the Non Black Soil Area, 15-40% in the Central region, 15-20% in the Eastern and South Eastern regions, and 20-40% in the Volga Vyatka and Middle Volga regions.

For the first time in Russia sunflower was reported to have a disease caused by *Fusarium* spp. and manifesting itself in the form of infection mixed with rust pathogens *Sclerotinia* and *Botrytis*.

95% of arable lands need improvement of this or that nature. In 1994, state purchasers received from all agricultural producers only 12.1 mln tons of grain(43% of the 1993 amount), 0.7 mln tons of potato (44%), 1.4 mln tons of vegetables (68%), 4.6 mln tons of livestock and poultry (live weight) (77%), and 18.8 mln tons of milk (76%).

The table below presents major crop production figures of plant industry (in thousands of tons)

	Grain	Sugarbeet (factory produced)	Sunflower	Potato	Vegetables
1993	98,981	25,468	2,800	37,656	9,897
1994	81,282	13,901	2,553	33,780	9,613

One of the most important branches of Russia's agri industrial complex is forage production. This branch not only determines the level of livestock industry development, but also has influence on the situation in agriculture in general. About 80 mln hectares of pastures and hay producing lands and 40 mln ha of arable areas are used for forage production. Over 70% of gross grain harvest is used for feeding poultry and livestock. However, negative processes in animal breeding still go on. The stock of all kind of cattle suffered an abrupt decrease (by 30-40%) and lost productivity (by 30-35%). During 1990-1994 the stock of pedigreed cattle decreased from 460 to 85 thousand *capita*, swine from 600 to 104 thousand *capita*, and sheep from 635 to 152 thousand *capita*.

The table below represents production of animal breeding industry in Russia in 1994

Meat (carcass weight)		Milk		Eggs	
thous. tons	% of 1993	thous. tons	% of 1993	mln.units	% of 1993
6,861	91.2	42,811	92.0	37,392	92.8

The most complicated problem of land reformation is to alter property relations, which affects individual interests of all workers within the agri industrial complex and all rural population. 73% of arable lands have been transferred into private property free of charge. Such land redistribution was based on the average district rate of free entitlement of all agricultural workers, rural old age pensioners and employees of the rural social sphere with proprietary rights on land.

This provided for easy and efficient formation of inner economic production units and helped to reduce existing agricultural enterprises to smaller ones. However, such approach revealed some imperfections: 40% of land shares are to be assigned to pensioners and social workers who are unable to cultivate the land. This results in inefficient utilization of the transferred areas, while the low average district rate leads to establishment of such farms that are too small and have low productivity. The most popular and widely collectively managed orchards and gardens. There are over 20 millions of them varying by size from 0.04 ha to 0.5 0.6 ha. They produce from 65% to 90% of potato and vegetables, 40% of milk, cattle and poultry.

There 280 thousand farms managed by individual farmers. On an average each farm occupy about 43 hectares of land. They are poorly equipped and supplied and are quite different by nature. Of all farmers 27% are urban residents, retired officers and such other people that have no farming experience. Financial results in 1993 proved to be unfavourable. After four years of reforms up to 40% of farms turned bankrupt and 982 thousand hectares of arable lands (12%) remained unused. During only 9 months of 1994 18 thousand farms ceased to exist. Support from the federal budget to one farm amounts to 260,000 Rbl. No positive changes are expected to take place in 1995 either. In 1994, such farms produced up to 1.5% of the total yield of potato, vegetables, meat and milk and 5.7% of the total grain production.

Stock companies, partnerships and other new commercial establishments for the most part are large agricultural enterprises numbering approximately 15,000. Their property is either private, or represents mixed forms of ownership. There is little difference in sown areas, production volumes,number of

personnel and remuneration level between these enterprises and collective or state farms which number over 10,000. Such agricultural enterprises together with collective and state farms remain main producers of grain (93%), sugar-beet (95%), sunflower (86%), flax and hemp, forages, cattle and poultry (60%), and eggs (70%). RASKhN has in its structure a number of experimental farms and possesses 1.3% of arable lands (7.4 mln ha in total) which in addition to science oriented production yield annually about 2% of the total gross output and marketable goods of Russia's agri industrial complex. This figure includes 1.5 2.0 mln tons of grain, 600-900 thous. tons of dairy products, over 100 thous. tons of meat and 60-80 thousand of pedigreed cattle capita. Resources of larger farms, i.e. forages, fuel, equipment and means of transport are one of the reasons of their stability. Therefore, the future of agriculture as an entire economic system is determined by the situation in large agricultural enterprises. There is no noticeable evidence of any advantages of one or other organizational form. Multifunctional production enterprises with well developed social structure, such as large scale industrial livestock complexes, poultry factories, pedigreed cattle farms, seed production enterprises and glass house plant production centres, concentrate considerable capital funds. For these agricultural enterprises adaptation to the new conditions is especially difficult, since their traditional technological processes display serious breaches and their production volumes suffer decline.

The results of the past fiscal year have revealed that thousands of agricultural enterprises are under the threat of bankruptcy.

At the same time, it should be mentioned that in such a difficult economic situation collective and state farms have not disintegrated, as collective organization of labour and principles of public ownership help them to survive under extreme conditions. Lifestyle provided by economically strong collective and state farms better satisfies the requirements of their workers.

There is a tendency to shift from selling agricultural products to processing them by their own units and arranging storage of large stocks of goods, so that they could be sold without intermediate negotiators through their own trading structures with as high surplus as possible.

For several decades the country's seed production functioned as a centralized and unified in all aspects branch of agriculture. Previously it was accepted that seed production industry essentially consists of two closely interlinked processes: substitution of cultivars and introduction of new cultivars.

Three seed production systems were consistently developed: in cereals, legumes and perennial grasses. They were substantially different from each other, but were commonly targeted at accelerated introduction of new varieties instead the old ones.

This process was regarded as regular and mandatory. It was predetermined that the seeds used in agriculture should be replaced by the seeds of more elite reproductions of the same cultivars after a strictly fixed number of years.

The seed production system is now being re adjusted on all levels and will be oriented towards substitution of cultivars. Thus, introduction of new cultivars will be transformed from being a planned and mandatory measure into simple replacement of seeds and will be performed at the discretion of the seed farms themselves in accordance with the results of trials and only when it is necessary to replace impure or contaminated seeds or those with low germination ability with certified commercial seeds of the same cultivar. Now when farms are able to acquire such seeds as they need it became possible to establish a periodically renewable and reliable national stock of certified commercial seeds and its regional divisions by accumulating large lots of valuable seeds already introduced in production practice as well as of new cultivars.

Development of market relations preconditioned the process of profound structural, organizational and economic reformation of the agri industrial complex, which has given birth to absolutely new structures based on the principles of autonomous operation and market oriented competitiveness: plant breeding and seed production associations, seed firms and companies and other organizations. Today most promising are associations based on plant breeding centres.

Such associations having direct organizational and economic links between seed production and plant breeding practice, are capable of more rational structural adjustment of the seed production system to free market conditions in all the country's regions. Seed production enterprises without their own plant breeding base will obviously have short life.

Perhaps they would either transform into combined breeding/seed production structures, or wind up their activities. However, for the time being they successfully interact with breeding institutions participating in selling certified seed starting from the elite phase.

Their intrusion in the pre elite seed production with reproduction and reselling of seeds at initial phases is unacceptable because it will ruin all the traditional system of elite seed production.

Reformation years have shown that in Russia market attributes acquire unpredictable shapes. Unwise introduction of private ownership of land may bring negative results. State support of agriculture has been motivated by objective reasons, but its forms, methods and extent depend on each given circumstance.

The concept of state control and economic conditions of the agri-industrial complex's functioning for 1995 is hardly different from the one in 1993-1994. Besides the restructuring of economically inefficient enterprises, it is expected that definitely targeted financial support will be enhanced and integration of agricultural, processing and trading enterprises will be augmented. New
methods are the following: bankruptcy as a way to revitalize this branch and guaranteed purchase prices. However, it is very doubtful that bankruptcy could help to solve difficult tasks of the agrarian sector, as there are very few volunteers to invest national or foreign capital in agriculture.

It should be noted that Russia's global agrarian reforms have never reached a logical conclusion. However, every such effort has stimulated the development of agriculture of the whole nation or separate regions, and only the present reform is still producing negative results. The country is at the end of the fourth dozen by the nutrition level. The Government undertakes certain measures through supporting the production of separate types of agricultural goods, earmarking certain funds to buy equipment and organizing leasing sale.
Nevertheless, such measures are evidently insufficient.

CHAPTER 2
Aboriginal Plant Genetic Resources

Over 500 species of wild relatives of cultivated plants grow on the territory of Russia and make a part of its native flora. Being genetically and evolutionary close to the cultivated species, they are introduced into cultivation and used in crosses aimed at developing new varieties. These wild species include over 200 forages, about 100 fruits, around 90 small fruit species and approximately the same number of industrial plants, over 70 vegetables, about 20 cereals, 20 nuts and a dozen small grain species. The major part of Russia belongs to one floristic region, and as a result many families and genera are present in floras of most country regions. At the same time, diversity of natural conditions has determined intraspecific type formation, while the influence of the neighbouring floristic regions had its effect on the peculiarity of specific composition in some regions of Russia.

Attached is a brief description of wild relatives of cultivated plants in the major regions Russia is conventionally subdivided into, namely European part, North Caucasus, Western Siberia and the Altai, Eastern Siberia and the Far East
(See Annex 3).

All the mentioned plants still occur in the wild nature of Russia. However, due to the anthropogenic pressure (like uncontrolled or exceccive forest felling, overgrazing, road construction, disruption of the water regime, industrial activities, etc.) some species now are under the threat of extinction. Populations of many wild relatives have reduced in numbers, e.g. *Rhaponticum carthamoides, Glycyrrhiza uralensis, Rheum altaicum, Viburnum opulus, Hypericum perfoliatum, Hippophae rhamnoides, Allium altaicum, A.victorialis, A.microbulbum* in the Altai and Siberia; some *Actinidia* species, *Schizandra chinensis, Pueraria lobata, Vitis amurensis, Juglans ailanthifolia, Malus zieboldii, Armeniaca sibirica, A.mandshurica, Cerasus Kurilensis, Rubus pseudojaponicus, Rubus crataegifolius, R.parvifolium, Fragaria iinumae, F. yezoensis, Corylus mandshurica* in the Far East; a series of *Berberis, Ribes, Sorbus, Rubus, Rosa,* and *Crataegus* species, *Hippophae rhamnoides, Cornus mas, Vaccinium arctostaphylos, Pistacia mutica, Raphanus maritimus, Beta macrorrhisa, B. corolliflora* in the Caucasus, etc.

The present large scale impoverishment of the taxonomic composition and the structural simplification of many ecosystems deprive them of the optimum degree of functioning and stability. Shrinking of populations brings about the irreversible erosion of germplasm, the loss of potentially valuable genetical materials. At present, the tendency of increasing plant genetic resources erosion is

visible in the country. Nature and biodiversity protection activities lack both volume and magnitude. In order to ensure control over the status of wild relatives of cultivated plants in Russia, a general program of monitoring these species in all regions is necessary, as the program of protecting genetic materials shall have the information on the location of the species as it theoretical basis. At the same time, it is advisable to participate more actively in the international programs concerned with studies of environmental changes and ecological monitoring carried out under the aegis of various international organizations. At present time, the Government is unable to prevent the threat of genetic erosion, as this process is beyond the governmental control due to a series of objective and subjective reasons.

The uniqueness of genetic diversity of wild relatives of cultivated plants of Russia is determined by a number of factors. To begin with, the greater parts of the areas of distribution of many wild relatives are located within the country.

The multitude of habitats favours the development of numerous forms differing from each other by various characters. These forms are valuable from the point of view of their potential value for breeding since they ensure a wide spectrum of initial breeding materials.

Disappearance of any of these forms means the loss of a unique specific set of genes valuable for the man in quite many cases.

Specificity of characters of many species is connected with their belonging to a certain floristic region. For instance, *Poaceae* and *Fabaceae* from the European Siberian floristic region, as representatives of a younger flora, are free from protective poisonous substances and thus make a far better genepool of forage grasses if compared to those from the older floras of Eastern America and Eastern Asia.

Linaceae and *Labiatae* species, characteristic of the Eurasian North, yield wonderful drying oils in the high latitudes. Some *Euphorbia* species manifest their rubber bearing capabilities in humid and relatively warm conditions of the moderate belt in Western Russia. Thanks to its specific nature, the Altai features some species combining plant height and earliness (e.g. *Dactylis glomerata, Allium schoenophrasum*). Wild relatives of cultivated plants are of interest to a contemporary breeder from two points of view. First of all, it is the use of wild forms for hybridization with the cultivated ones, since a number of existing genepools of cultivated plants lack separate valuable characters which are present in the wild relatives.

For example, the genepool of alfalfa, the oldest forage crop, had been missing genotypes with sufficient graught resistance. Hybridization of wild steppe forms of *Medicago falcata* with the cultivated *M.sativa* has yielded hybrid alfalfa adapted for cultivation in steppe regions. The wild *Malus baccata* from Siberia has been used for quite a long time for improving varieties of the cultivated *M.pumila*. *Ribes dikuscha*, a species from Yakutia, is involved in developing large fruited varieties of currant. Wild growing ecotypes of meadow grasses belonging to *Festuca*, *Bromus, Alopecurus, Phleum, Dactylis*, and *Poa* have served as initial materials for breeding many varieties of forage crops. Secondly, direct domestication of separate wild species is of special importance. For example, *Melilotus album, Agropyrum sibiricum* and *A. cristatum* have been introduced into cultivation as forage grasses in the Lower Volga Region. *Hippophae* rhamnoides is being introduced into cultivation in Siberia as a vitamined plant. *Ribes rubrum*, a wild species of red currant, has been domesticated likewise. *Vitis amurensis* has been introduced into cultivation and served as a basis for developing varieties of grape in the Far East.

The search for the forms possessing valuable characters is carried out permanently.For instance, relatively large seeded forms of *Vicia grandiflora* have been found, and this character may facilitate easier germination of the covered seeds. Tall forms with a weaker stem branching in some representatives of *Apocynum*, *Abutilon*, and *Cannabis* are of interest for breeding fibre crops. Some populations of *Agropyrum* species from Yakutia are known to withstand (at tillering nodes) winter frosts down to 50°C; also, populations of forage grasses with high protein content and unique frost and draught resistance have been found in the Altai; soybean populations from the Far East have been discovered to have high protein quality and high rate of disease immunity; some Siberian *Malus* species have been found to resist freezing out at 50°C. However, utilization of wild relatives of cultivated plants is far from completion, and the multitude of their for are still not studied in detail.

Many species of wild relatives of cultivated plants are very important local sources of plant production. Among them are *Allium ursinum*, *A. victorialis*, *A. altaicum* and other *Allium* species which are used by the population of the Far East, the Altai, Siberia, and the Caucasus as vegetables. In Northern regions of the forest tundra belt, berry bearing shrubs like *Rubus chamaemorus, R. arcticus, R. saxatilis, Oxycoccus palustris, Vaccinium vitis idaea, V. uliginosum* quite often are the major sources of plant products.

In the Russian central belt, such forest berries as *Fragaria*, *Rubus, Ribes* are very popular with the people for their flavour, and in the Far East the above also relats to *Lonicera* and *Actinidia* species.

In the North Caucasus, they don't experience any deficiency in the diversity of cultivated crops, and nevertheless, the local population follows the tradition of including in the diet wild fruit of *Malus, Pyrus, Prunus, Mespilus, Cornus, and Cydonia.* Many species of the *Brassicaceae* family are edible and their young plants are used in the North Caucasus as *spices* and salad components; for instance *Brassica campestris, Brassica juncea, Bunias orientalis, Camelina caucasica, Eruca sativa, Isatis tinctoria, Lepidium sativum, Raphanus raphanistrum, Sinapis arvensis.* Many *Asteracea* species, e.g. *Cartamnus lanatus, Lactuca serriola, Sonchus arvense, Cichorium intybus, etc*. are used in the national cuisine
in the region.

The attitude of the local population to the existing genetic diversity is that of consumers; plant resources are used for food, and no interest in preservig them is being revealed. Quite often, special devices allowing for a more rapid harvesting, are used when gathering cowberry, bilberry, etc. it resulting in tearing off of leaves and shoots the restoration of which requires many years.

In order to harvest fruits of *Hippophae rhamnoides*, the oil of which is used for medicinal purposes, complete branches are cut off, as access to the berries is difficult due to the surrounding long sharp thorns. *Actinidia colomicta* in the Far East is being cut down to the root in order to get the fruits located high on the liana, and the same relates to *Schizandra thickets*.

The ecological situation in the country, deterioration of soils and forests, and the policy of natural resources utilization are big concerns with the scientific community.

The most characteristic features of the post Communist Russia, in fact, are the dramatic reduction of state funding for the nature protection activities, enormous large scale plunder of natural resources, management disorganization, a sharp increse in pollution of the environment by means of transportation and industry, deterioration of the drinking water quality, and decreasing soil
fertility. Ill management of the nature makes a real threat to plant genetic resources.

A tendency to increase forest felling, the volume of which reaches 12mln ha annually, is observed. It results in the disturbed water regime of a locality, structural changes in ecosystems, undermining of their stability and functioning, and as a consequence, it causes extinction of species many of which are wild relatives of cultivated plants (inhabiting lower layers and borders of forests).

The threat of plant genetic resources extinction can be lifted only through changing the system of natural resources utilization, devising and adopting a State program of protection of wild relatives of cultivated plants, through development of international programs that would involve and unite efforts of many scientists, universities, governmental bodies, NGOs and other interested organizations.

CHAPTER 3
Plant Genetic Resources Conservation Activities on the National Level

In recent years, and especially in 1994, the works of environmental protection and rational utilization of land resources have been abruptly reduced, while the practical scientific projects have stopped being implemented due to the lack of funding, as for example "The State Complex Programme of Increasing Soil Fertility in Russia". This is the reason of aggravated process of soil deterioration and pollution, destruction of the soil surface, degression of the quality of surface and subsurface waters. The area of overmoistured soils is gradually expanding as well as the area of flooded lands. For instance, the overflow of the level of the Caspian Sea in Daghestan and Kalmykia resulted in flooding and overmoisturing of 500 thousand very acute is the problem of reconsolidation and deterioration of soils by heavy agricultural machinery. Anthropogenic pollution of land with radionuclides is reported to occur in 20 administrative sectors of the country (17 of them are in the European part). Lands polluted with toxic substances of industrial nature, pesticides and agricultural chemicals cover an area of approx. 74 million hectares.

Of late there has been observed a tendency towards a decrease of the amount of pesticides applied, but soil pollution by their residues remains significantly high. The regions demonstrating high levels of soil pollution include Moscow and Irkutsk Provinces, medium levels Central Black Soil Area, Kurgan Province, Northern Caucasus and Lower Volga. In the last three years many regions of Russia have shown a negative balance of nutrients: depleting has exceeded accumulation by 30-60 kg/ha, whereas in the Northern Caucasus by over 100 kg/ha.

The most active water erosion is reported in Chuvashia (78.5%), Udmurtia (67%) and Bashkiria (51.5%). The highest level of soil deflation is observed in Kalmykia (29.4%), Krasnodar Territory (22.6%), Tuva (37.6%), Buryatia (27.5%) and Omsk Province (27.3%).

Considering the fact that the problem of environmental protection and reducing the anthropogenic effect on the nature in the process of agri industrial production remains excruciating, it is necessary to undertake urgent measures to preserve plant genetic diversity *in situ*.

In the country there are national wildlife reserves, protected botanical zones and landscape reservation sites. The most comprehensive protection of natural

resources is maintained in national wildlife reserves. In Russia there are 89 reserves where over 200 spp. from ca. 500 spp. of wild crop relatives are preserved.

Expanses occupied by national wildlife reserves in Russia are very great. For example, Kronotsky reserve occupies 964,000 ha, while Altaisky reserve 863,805 ha. According to the national concept wildlife reserves are such lands where natural objects of special value are located (typical or rare landscapes, communities of plant or animal resources, rare plant or animal species). Russia contains numerous foci of concentration of wild relatives of cultivated plants, though the existing national wildlife reserves presently fail to encompass sufficient number of them. Less than a half of such foci are being saved in natural reserves, and only one fourth of 103 endemic spp. and of 62 spp. now and then occurring within Russia are reported to be found in these reserves (25 endemic and 15 rare species). These examples prove the need to open new national wildlife reserves in such regions as Siberia, the Far East, the Non Black Soil Area and the Ural River. National wildlife reserves remain the most well organized and strict forms of protecting special sites that are supported by the state.

In Russia all natural zones are represented in the reserves where lasting stationary research has been carried out by, first of all, the workers of each reserve. All kind of economic activities are prohibited there, so everything within a reserve remains inviolable.

Another form of *in situ* conservation are protected zones. Responsibility to safeguard such zones is vested in the users of lands within them. There are permanent and temporary protected zones. The latter are established in order to restore the balance in a certain eco geographic area. In Russia there are protected botanical zones with valuable or unique arboreal species, relic forest plants, shrubs and grasses. Among the examples of preserving valuable plant species in protected zones there are Bekeryukovsky Pinewood with *Pinus sylvestris* var. cretacea in Belgorod Province, a part of the forest with *Picea glehnii* in the Isle of Kunashir (the Kurils), a relict of Cretaceous oak groves *Quercus robur* in Volgograd Province, cedar groves of *Pinus sibirica* in Arkhangelsk and Ivanovo Provinces. Protected zones have been established in the steppe regions of Russia: Poperechinskaya Steppe in Penza Province, Khrenovskaya and Kamennaya Steppes in Voronezh Provinces. There are also protected swamp zones: for instance, Nikandrovskiye Marshes in Pskov Province where rare species and phytocoenoses are preserved and Mokhovoye Swamp, the only one in Saratov Province. Protected botanical zones also exist in the northern regions of Russia as well as in the southern European part of the country. Presently their approximate number is 850, their area being 1.5 mln ha. It is necessary to open protected zones in Sakhalin and in the southern part of Primorsky Territory in order to preserve small fruit patches, fruit bearing plants and valuable cereal grasses, as well as in Stavropol Territory,

natural boundaries of Gadam and woody ravine of Kolbashi in Karachaevsky District to save unique filbert, apple and pear groves. In the protected botanical zones it is allowed to build cottages and recreation areas and to perform economic activities, but only in strictly fixed seasons, during a certain period and on such scale as to avoid damaging the protected objects.

Protection of wildlife botanical objects is an exceptionally important governmental task requiring a specially developed system of practical measures for each region. It is imperative to introduce regular annual control over the state of vegetation with identification of the factors violating natural vegetation of a protected zone or natural reserve and leading to decreases in the number of certain species.

Each national wildlife reserve did and should make inventories of the vegetation, mapping and identification of typical and rare plant communities and register all natural phenomena. These complex activities require scientists and experts with high qualification.

The work on preservation of wild nature needs considerable financial inputs that by now cannot be recovered, but partial measures may harmfully affect the country's plant genetic diversity.

3.1 *EX SITU* COLLECTIONS

The N.I. Vavilov All Russian Research Institute of Plant Industry is the only research institution in Russia that is involved in collecting, studying and preserving in live condition genetic resources of cultivated plants and their wild relatives.

The Institute's collection has been attributed the status of the "Russia's National Collection".

3.1.1 The fundamental objectives of the Institute's scientific activities are as follows:

- to collect plant genetic resources both within and outside the country in order to accumulate specific and varietal diversity of cultivated plants and their wild relatives in the Institute's genebank;
- to maintain accessions of the world collection in viable conditions and to provide for the long term storage of them;
- to study world wide plant genetic diversity with the goal of identifying promising materials for breeding and donors of most important commer-

cial traits required for breeding of new cultivars and hybrids in different regions of Russia;

- to establish, study and preserve genetic collections of cultivated plants and donors of productivity, resistance and quality in order to accelerate the breeding process and augment the genetic research in Russia;
- to develop theoretical bases, principles and methods of efficient plant genetic resources evaluation by their major biological and commercial properties for further utilization in plant production and breeding;
- to develop a software system to support the establishment, maintenance and analysis of computerized databases on plant germplasm collections with a goal of making the data on the collections immediately available for breeding centres and facilitating the data exchange with other genebanks;
- to work out theoretical bases and advance methods for breeding practice.

The history of the Institute and creation of the collections dates back to 1894 and is inseparably connected with the name of Acad. N.I.Vavilov. The theoretical basis for setting up, preserving, studying and using the collections was composed of the Vavilov's concept of the centres of origin of cultivated plants, law of homologous series in hereditary variation, studies on the problem of a species as a system, etc., as well as other priority concepts by contemporary scientists.

The VIR's collections include the following PGR:

- wild species relatives of cultivated plants incl.weedy plants (the most important ones from the centers of origin of cultivated plants);
- landraces (varieties of folk breeding), especially from the countries covering the initial centers of origin of cultivated plants, and from the regions with extreme environmental conditions;
- bred varieties and breeding lines combining a complex of commercially valuable characters and biological properties;
- rare botanical forms, mutants, new species of agricultural crops, vanishing taxa;
- new forms, sources and donors developed in course of genetical experiments by means of cell and gene engineering (lines, varieties, constant remote hybrids, mutants with identified genes or gene combinations controlling morphological, biochemical, physiological, cytological characters);
- plants modified by means of gene engineering.

The National PGR collection of Russia numbers over 333 thousand accessions of cultivated plants and their wild relatives representing 81 botanical families, 425 genera and 2,102 species (Annex 5).

The collected samples of plant resources are preserved at the Institute in collections of the following types: base, working, duplicate, genetic, international, and core collections.

The base collections include all accessions preserved in the genebank and are not used for the current exchange.

Working collections and maintained in live condition by means of scheduled regeneration at the experiment stations. These collections are used as a source of materials for research at the departments of plant resources of VIR, for extensive exchange, and for supplying the breeders.

The duplicate collections include the major part of accessions from the base collection which are duplicated at the VIR's experiment stations. These collections are placed at certain stations in compliance with the eco geographical origin of accessions. The duplicated stock is regularly enriched with new accessions. Seed regeneration at experiment stations is carried out in compliance with a schedule that ensures safe replacement of accessions in the working collection in case they die. The duplicate collections contain seed quantity enough for regeneration in duplicate/triplicate.

Genetic collections and donors (combination of lines bearing identified alleles, not necessarily identified) consist of the collection of lines bearing valuable genes, as well as others having no breeding and commercial importance, and of the collection of donors of valuable characters.

The core collections are meant to maintain the major genetic diversity of a species by the minimum number of accessions.

International collections contain those accepted by VIR from genebanks and national collections of foreign countries, as well as those placed by VIR for conservation in other countries.

Replenishment of PGR collections is effected through collecting missions, mail orders and scientific exchange, donations, and keeping collections accepted from international organizations and other PGR holders.

Research institutions of Russia which submit new varieties and hybrids to State Trials, supply the Institute with standard samples of those and annually add a fixed quantity of seeds.
Samples of all crops introduced from foreign countries (with exception for seeds of ornamental and arboreal crops) are subject to obligatory testing at introduction quarantine nurseries performed in compliance with the

"Regulations on quarantine inspection procedures concerning seed and planting materials on the territory of the Russian Federation".

The structure of VIR includes 9 departments of plant resources each of which is responsible for a certain group of agricultural crops, 13 methodological departments and laboratories, 6 auxiliary divisions, 12 experiment stations and 2 experimental farms. Structure of the Institute. Funding of the Institute is provided from the State Budget. VIR's activities are coordinated by the Ministry of Science of the Russian Federation and by the Russian Academy of Agricultural Sciences (RASKhN).

Besides, VIR also maintains a herbarium (over 250 thousand sheets) which is the only one in Russia that contains documentation on taxa of cultivated plants and their wild relatives.

3.2 DEPARTMENTS OF PLANT RESOURCES

Department of Wheat maintains and studies the genetic resources of gen. *Triticum* L., including wild and cultivated species, varieties and forms from over 70 countries. The Department also holds the specific diversity of gen. *Aegilops* L., a rich collection of *Triticale*, and other *amphydiploids* from different parts of the world. The collection numbers more than 54,000 accessions.

Department of Rye, Barley and Oats is in charge of the world wide diversity of rye, barley and oat species, varieties and wild relatives. Total number of accessions is over 36,000, namely: rye 3,000 accessions, barley 20,000 (24 species), oat 13,000 (21 species). The staff of the Department works with the donors of CMS, dwarfness and immunity and performs other research.

Department of *Leguminous* Crops stores a collection of 42,000 accessions, representing more than 160 species, belonging to 15 *genera* of the family of legumes, including pea, kidney beans, soybean, vetch, Faba beans, lentil, everlasting pea, chickpea, cowpea and other legumes. The Department studies regularities in variation and inheritance of plant characters, and selects donors and sources for breeding the intensive type cultivars.

Department of Maize and Small Grains supervises species and varieties of maize, sorghum, buckwheat, rice, millet, green foxtail, foxtail millet, paisa and Sudan grass. The collections of these crops cover in total more than 57,000 accessions. There is also a collection of maize mutants. The staff works on the problems of creating *heterosis hybrids* of maize and *sorghum.*

Department of Forage Crops maintains a rich collection of species, varieties and wild populations of alfalfa, sainfoin, clover, melilot, Dakota vetch, timothy, fescue, brome grass, meadow grass, cock's foot, ryegrass, bentgrass, arid and silage crops. All in all there are about 20,000 accessions of 66 *genera* and 486 species. Research is conducted on the problems of heterosis, CMS, selfincompatibility and structure of populations.

Department of Industrial Crops is responsible for the collections of fibre and oil crops (over 20,000 accessions in total). These are cotton, flax, hemp, kenaf, jute, China jute, sunflower, castor beans, rapeseed, mustard, groundnut, false flax, sesame, safflower and poppy.

The Department works on identification of donors of valuable characters in fibre and oil crops.

Department of Tuber Crops stores a potato collection of over 10,000 accessions. It is comprised of wild, primitive and cultivated potato species introduced from the centres of origin, as well as potato cultivars from all the countries in which this crop is cultivated. The Department develops methods to overcome incompatibility, techniques of interspecific hybridization and procedures of growing potatoes from seed. Its interspecific hybrids are used in breeding practice.

Department of Vegetables and Melons controls 49,000 accessions representing 282 species of tomato, cabbage, pepper, eggplant, spinach, lettuce, dill, carrot, spicy roots, radish, beet, onion, garlic, cucumber, melon, watermelon, pumpkin, rare vegetables and other crops. Its research activities include identification of sources and donors of different properties, heterosis, extending of vegetable production areas to new regions and widening of the range of vegetable cultivars in open field and in greenhouses.

Department of Fruits, Berries, Grapes, Ornamental and Subtropical Crops maintains *in vivo* collections at the Institute's experiment stations. Over 23,000 accessions are concentrated there, including varieties and species of apple, pear, quince, cherry, sweet cherry, plum, apricot, peach, small fruit and nut bearing plants, subtropical and citrus crops, grape and ornamental plants.

These accessions are studied for their ability to be used in breeding programmes and fruit production.

Methodological departments and laboratories specialize in various fields of plant biology. They perform thorough analyses of plant genetic resources from the genebank in order to select new donors and sources of commercially valuable characters to be used in breeding programmes. They perform theoretical studies aimed at the development of new plant breeding methods, iden-

tification of phylogenetic relations and variability mechanism in biological characters of various crops. They also analyze collection accessions by separate characters and properties, identify and create genetic sources and donors of commercially valuable characters, work out and develop plant research methods, and publish the results of the research.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

Traditional agriculture in Russia has always been dependent on severe climatic conditions, poor soils, various diseases and pests characteristic of each individual region. In recent years, the situation has been aggravated by worsening of ecology at both global and regional levels, as well as by social and economic changes in the country. A necessity has appeared to start in Russia cultivation of non traditional crops which previously had been grown in republics of the former USSR.

Plant genetic resources accumulated in the VIR's global collection, donors and sources of various valuable characters identified or created at the institute have determined success of breeding programmes that involved practically all crops cultivated in the former USSR, as for quite many years VIR has been responsible for strategic supplies of germplasm throughout the Soviet Union.

For instance, the global collection has served as a source for breeding 2,500 varieties, 450 of which are still cultivated on over 60 mln ha. For wheat, it makes over 80% of all varieties, including Bezostaya 1, Mironovskaya 808, etc. Up to 90% of the established millet varieties have been bred on the basis of the VIR's collection. The same refers to 50% of all varieties of vegetable crops (for tomatoes it is even 80%), and to 90% of watermelon varieties. By now, a great number of hybrid pest and disease resistant potato varieties have been developed in the country, and 92% of them have progenitors from the collection at VIR.

Genes of resistance to rust in flax have been identified for the first time in accessions of the VIR collection and were used for creating 10 donors of resistance to the disease. The further creation of donors for flax breeding will be targeted towards combining such characters as fibre quality, early maturing and disease resistance.

Production of forages has always been a weak spot in national agriculture. Therefore, a search for initial material for breedin high protein and valuable perennial forage crops, as well as for those possessing tolerance to saline and acid soils is carried out at VIR.

The collection utilization rate in forage cultivar breeding makes 56.0% on the average. In the new cultivars commercialized during the last 10 or 15 years the percentage of utilization of the collections of major forage is 60 70%, while for some crops, such as alfalfa, this rate approaches 100% (of the number of breeding cultivars). As for unconventional crops (*Galega orientalis, Elymus, Agropyron, Psathyrostachis juncea*, *Silphium perfoliatum*, etc.), such cultivars are quite few (25%).

State breeding programmes still dominate in the country while private breeding firms are just emerging. Some foreign companies are importing seed into the country, but take practically no participation in national breeding programmes.

Farmers and other users get easy access to products of breeding programmes through purchases of superelite and elite seed from the breeding centers of the country. At the same time, the farmers are practically not involved in plant breeding activities. In present day Russia, the bottleneck in agricultural production is not the availability of good varieties but social and economic patterns of agricultural organization. Budgeting of scientific and breeding research is scanty and the link between science and production is weakening.

In previous years VIR had close and fruitful collaboration with breeding centers in the country: the institute rendered assistance in developing breeding methods, participated in various breeding programmes, trained PGR experts, mailed on a regular basis catalogues of the global collection which included characteristics of accessions and methodological advice, and carried out field workshops.

These activities have to be revived, as the link in a chain "genebank users" is the most important one for the breeding process aimed at developing new varieties possessing a complex of valuable characters.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

5.1 NATIONAL PROGRAMMES

A proper National PGR Programme does not exist as such, though it is needed badly. As it has been mentioned previously, VIR has acquired the status of a Federal Scientific Center; it is financed from the State Budget and carries out a series of important national projects such as "Perspective processes of agricultural production", "Plant genepool", "Plant genepool and Agrobank", "Interbioazot", "Biotechnology of vegetable plants", "Genetical bases of crop breeding", and "Priority trends in development of genetics". All these projects are financed by the Russian Agricultural academy and the Ministry of Science.

The total budgetary appropriations for 1995 have been planned in the volume of 11 bln Roubles. However, due to the rate of inflation this sum, even if paid by the Government in full, would not provide for the normal operation of the institute and its experimental network. Obviously, in the nearest future the Government will be discussing the issue of the National PGR Programme the major component of which will be the VIR's network.

5.2 TRAINING

Due to the versatility of its activities, VIR has always been attributing special importance to training PGR experts skilled in various aspects of PGR research. Post graduate training has been an aspect of VIR's activities since 1928 and currently offers the following specializations: crop breeding and seed science, plant protection from diseases and pests, agrometeorology, molecular biology, biochemistry, botany, plant physiology, genetics, biotechnology, and application of computers in biological research work. VIR is training experts not only for itself, but also for other research institutes and other CIS countries. In previous years Vir has also been training foreign doctoral students, for instance from COMECON countries, Syria, Mexico. Within the framework of the UNEP IBPGR VIR agreement, in 1987 through 1991 VIR organized 4 training courses for students from the developing countries. All in all, 29 students from Columbia, Venezuela, China, Iran, Iraq, Syria, Brazil, Argentina and other countries participated in these training courses.

VIR is ready to continue with organizing such courses varying in duration from 10 days up to 1 month, because the necessary qualified personnel and facilities are available at the institute.

Unfortunately, due to low salaries in research institutions, they are losing young specialists who prefer to try a career in private business. Post graduate trainees at VIR are paid very low scholarships, and as a consequence their number reduced two times in 1995.

The problem of retaining qualified experts and technical assistants, and of training young scientific cadre is quite acute, especially taking into consideration the fact that the average age of researchers at VIR is 54.

International cooperation provides possibilities for training young scientists abroad, but there are no guarantees that after training the scientist still would not seek a much better paid job.

5.3 NATIONAL LEGISLATION

Many legal acts related to PGR import/export, quarantine procedures, sales and distribution of seed, Intellectual Property Rights, etc. are at the stage of development and preparation for adoption. The legal acts, etc. issued by various ministries, Customs Committee and governmental bodies are subjects to numerous amendments, additions, etc.

The major documents regulating VIR's activities are "The Status of Global Collections" and "The Guidelines for the Work with the VIR's World Collection". These two documents specify basic objectives and tasks of the Institute and its experimental stations; regulate the structure and the personnel of the research divisions; the system of PGR management; the organization of cooperation between the institute's departments with its experimental stations, national plant breeding centres and foreign research institutions and genebanks within national PGR programmes of other countries. These documents have been elaborated by VIR's experts and approved by the Scientific Council of the institute and the Russian Agricultural Academy.

5.4 THE EXCHANGE OF ACCESSIONS IS CARRIED OUT IN COMPLIANCE WITH THE FOLLOWING GUIDELINES

All accessions from the working collections of VIR which are not subject to any restrictions stipulated by "The Guidelines for Maintenance and Work with the Global Collection of Plant Genetic Resources at VIR" or the Laws of the Russian Federation shall be freely available on gratis terms.

Unstudied accessions of wild and semi wild relatives of cultivated plants, some old landraces, samples from the genetic collections and donors shall be available of a limited basis (by special Director's permission).

The transfer of herbarium samples for temporary usage shall be performed on the basis of special agreements containing explicit formulation of terms, amounts and other obligations of the parties.

All and any operations with the plant genetic resources stored by the Vavilov Institute of Plant Industry shall ensure their safety as a priceless heritage of all mankind (see Annex 9).

CHAPTER 6
International Collaboration

As Acad. Vavilov stressed in the 30's, "Crises do not exist in the scientific world. On the contrary, scientific problems show themselves every day, and they are to be solved from both theoretical and practical points of view. Those problems are endless, and they can be solved on the basis of international scientific collaboration only".

Since 1961, when FAO started paying special attention to the problems of PGR, VIR has been participating in these activities in this or that form. Since 1988 the management of VIR has been thoroughly considering options of joining the FAO Commission on PGR. Proceeding from the scope and value of the VIR's collections, the institute was unanimously approved as a representative of the Russian Federation at a meeting of the FAO Commission in 1991, but due to some legal circumstances did not join the Commission. However, VIR adhered to "The International Undertaking" as the representative of the Russian Federation. This act urged the State authorities to pay more attention to the problem of preserving diversity of cultivated plants and their wild relatives, to place this problem among the major priorities when elaborating national long standing strategies. In order to tackle all aspects of the problem, i.e. protection of the environment, biodiversity, etc., it is necessary to elaborate a proper national programme. This work shall involve the most competent representatives of the scientific community, representatives of ministries, organizations, institutes and universities.

Many national programmes experience shortage of finances, and therefore creation of an international fund within the FAO network could give a chance to solve the most urgent problems of national programmes which, if unsolved, may cause the loss of plant germplasm of international importance.

An international expert committee shall be set up to govern this fund. From our point of view, the Russian Federation could act as both donor and user of such a fund.

In 1994 the Russian Federation joined CGIAR. Evaluation of collaboration for such a short period would be premature. However, it should be mentioned that VIR has been maintaining long standing scientific contacts with the majority of centers within CGIAR, and has been collaborating with IPGRI and ICARDA on the basis of agreements.

The joining of CGIAR by the Russian Federation has facilitated the broadening of mutually beneficial collaboration with the international centers and the expansion of the range of PGR activities. Collaboration should be organized in such a way which would exclude, as far as possible, duplication of activities and rationalize research through sharing of responsibilities.

At present, a programme of regional international activities joining the efforts of CIS countries is being discussed at the governmental level. The component of the programme devoted to PGR related activities is still being drafted.

ECP/GR makes a good example of collaboration within the framework of a regional international programme. VIR is a member of the programme and actively participates in activities of the crop working groups. The principle of setting up working groups on the crop basis allows the scientists themselves to develop and implement joint projects in the sphere of PGR through putting together individual experience of each of the participating countries, exchanging opinions, joining efforts in collecting, preserving and studying the crops possessing economic value for the region. The number of working groups will grow depending on the revealing of new gaps in PGR activities.

From 1985 till 1990, COMECON member countries conducted 2 to 3 international collecting missions a year. Also, successful joint Russian Japanese collecting missions under the aegis of IPGRI, as well as Russian American and Russian Dutch missions should be mentioned (Annex 9). In each separate case, both complex and crop based collecting missions had some strong and weak points. Anyway, objectives of each team had been reached and each time rich plant materials became available to the international scientific community.

International collaboration is a major aspect of VIR's activities. The institute collaborates with over 100 countries on various aspects of PGR research and utilization. These are projects on bilateral, multilateral and intergovernmental bases. Annex 10 lists the most important projects.

CHAPTER 7
National Needs and Opportunities

During the last 3-4 years VIR and its State Seed Store have found themselves in the worst situation in terms of financing, as it has been mentioned above.

The international community got deeply concerned with the fate of VIR and started rendering technical aid to the institute. For instance, the USDA supplied over a dozen of computers which are used for computerization of passport data and developing various databases. In 1994 an agreement on the development of PGR databases was signed with Germany for a period of 3 years. Similar projects have been launched together with the Netherlands. For a period of 1994-95 the USAID has allocated $900,000 for the purpose of upgrading the equipment in the VIR's network and at the Seed Store. VIR has already received the most necessary drying, freezing, seed packing and other equipment worth $400,000. These supplies will continue in 1995 and the first half of 1996. Together with IPGRI, a project entitled "N.I.Vavilov Institute of Plant Industry (VIR)" has been elaborated and submitted to the World Bank for approval. The project features a 5 year plan of actions and is worth 9 mln US dollars. A decision of the WB on the project is expected by the
end of 1995.

Current status of VIR saturation with equipment and laboratories in comparison with the minimum requirements of a modern genebank.

	Modern genebank with minimum equipment	Vavilov Institute network and genebank	Quantity needed
1	Facilities for base collections storage at: 5°C 10°C 20°C for *in vitro* storage fcr conservation	 not available not available not available not available not available	
2	Facility for the working collection storage at +5°C	One in St.Petersburg, requires overhaul; One in Gulkevichi, (Kuban Exp.Station) currently under restoration	
3	Facility for the duplicate collection storage	Not available	
4	Storage facility for genetic and core collections (chest like freezers)	12 pcs available Received in 1994 from USAID/IPGRI	34 pcs
5	Laboratories and systems for providing virus free seeds and vegetative organs (prior to installation into storage facilities)	Not available	
6	Systems for providing bacteria free seeds and meristems	Not available	
7	Systems for providing fungus free seeds and meristems	Not available	
8	Quarantine nurseries with express diagnostics laboratory equipment for testing viruses, bacteria, fungi and other quarantine objects	Not available	
9	Systems for seed drying under low temperatures	5 systems were received in August 1994 from USAID/IPGRI.4 systems will be installed in 1995	
10	Systems for analyzing and controlling genetic shifts in seeds and structural changes in populations during storage	Not available	
11	Systems of analyzing natural populations for organization of *in situ* conservation	Not available	

	Modern genebank with minimum equipment	Vavilov Institute network and genebank	Quantity needed
12	Systems of vacuum packing of seeds in foil bags	5 systems were received in August 1994 from USAID/IPGRI	
13	Vegetation boxes for cross pollinating crops	1,000 boxes are available (1995, from funds of USAID/IPGRI)	1,000 pcs
14	Computer hardware and software for seed and meristem preservation and systems for providing optimum reproductions	Not available	
15	Small plot equipment mini threshers, winnowers, dryers, sowing machines, motor units, etc.	Equipped to 5% of the required quantity with out date machinery	
16	Reconstruction of *in vivo* collections of perennial crops (fruit and berry collections)	Burning need for all experiment stations	
17	Fire protection, fire control and alarm systems	Not available in the Institute's HQ Not available at the Pushkin laboratories Not available at the Kuban Seed Store	
18	Collecting and exploration equipment (means of communication, safety, defence and maintenance, cross country cars	Not available	
19	Telecommunication systems fax machines, e-mail, etc	Not available between the HQ and the experiment stations, plant breeding centers	
20	Computer hardware and software for the HQ and experiment stations	Equipped to 40% of the required quantity	

CHAPTER 8
Proposals for a Global Plan of Action

To increase efficiency of complex studying and practical utilization of the world's plant genetic resources under different agriecological conditions is an international task which requires certain amounts of funding and time. Solution of this problem implies uniting of the efforts and resources of the world's nations coordinated and standardized by FAO.

In general, software support technologies for this task has practically been developed and finalized. The next stage will involve funding and organization of joint activities targeted at the development of unified databases of PGR evaluation and models of such complex traits as productivity, quality and resistance worked out for the most vitally important crops.

VIR's experts have developed a software system to support PGR collections.

The purpose of this system is to increase the efficiency of complex studying and practical utilization of such collections. The two most important aspects of the software support of PGR collections are as follows:

- establishment of national networks of passport and evaluation data banks with compatible software for all plant species which are available in the collections; and integration of such networks in the European and world wide systems of data exchange via computerized telecommunication facilities;
- application of new technologies for the establishment of cor collections and computer aided analysis of PGR evaluation data bases with an aim of working out mathematical models (needed by PGR researchers and breeders) which would provide linkage of complex characters of plant productivity, quality and resistance with biological parameters of plants and ecological conditions of environments.

For PGR research, the scientists of VIR have developed the mathematical theory of states within the system "plant variety ecological environmental conditions". This theory includes such aspects as monitoring, diagnostics, prognostication, analysis of states, control of states and development of equipment for intellectual diagnostics. Methodological base of this mathematical theory is statusmetry.

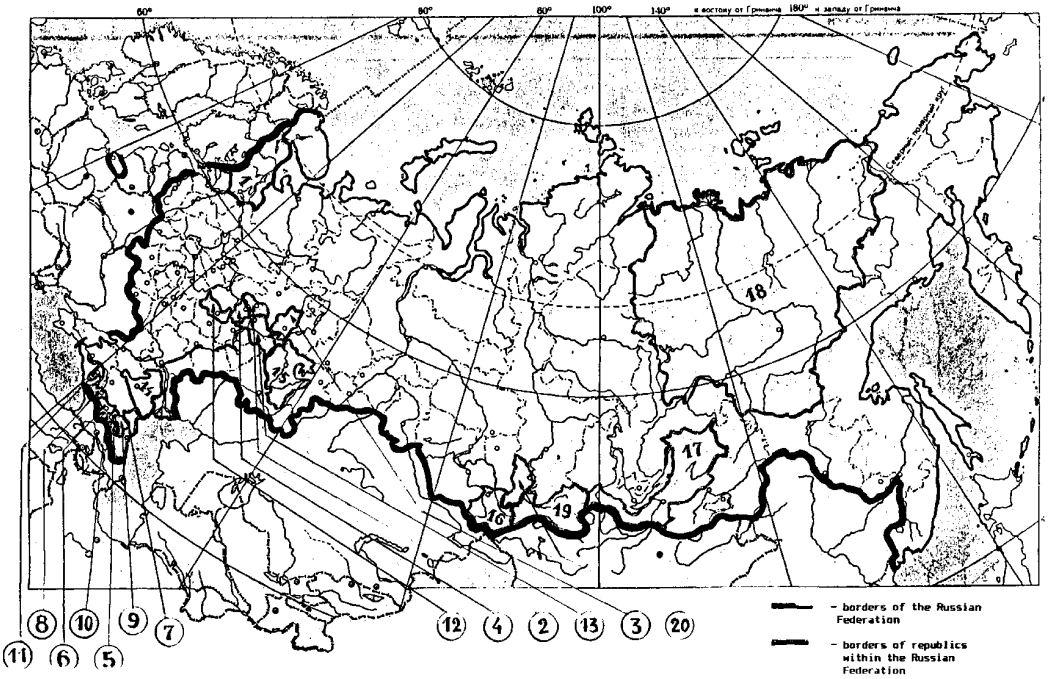
Statusmetry helped to work out the theory of functional modelling of complex plant characters. The models link complex characters of productivity, quality and resistance with ecological conditions of environments. The mathematical theory of arrangement of complex characters is also an instrument for software support of ecogenetical control of a complex plant character.

Within this project VIR is capable to provide the following:

- establishment of a unified system of collecting evaluation data for each crop and arrangement of such data in a data bank;
- development and practical implementation of the ideology of increasing crop productivity and quality by identification and utilization of the genetic potential of the plant genetic resources stored in the world's genebanks and by taking into account their natural resistance to unfavourable factors of climate and ecology;
- application of new technologies for establishment of core collections and computer aided analysis of PGR evauation databases;
- development (on the basis of PC's and microprocessors) of specialized intellectual equipment and software of statusmetrical expert systems for evaluating and predicting seed germination and viability under different storage conditions;
- development of statusmetrical expert systems for diagnostics of the plant's states and prognostication of crop productivity.

ANNEX 1

THE RUSSIAN FEDERATION

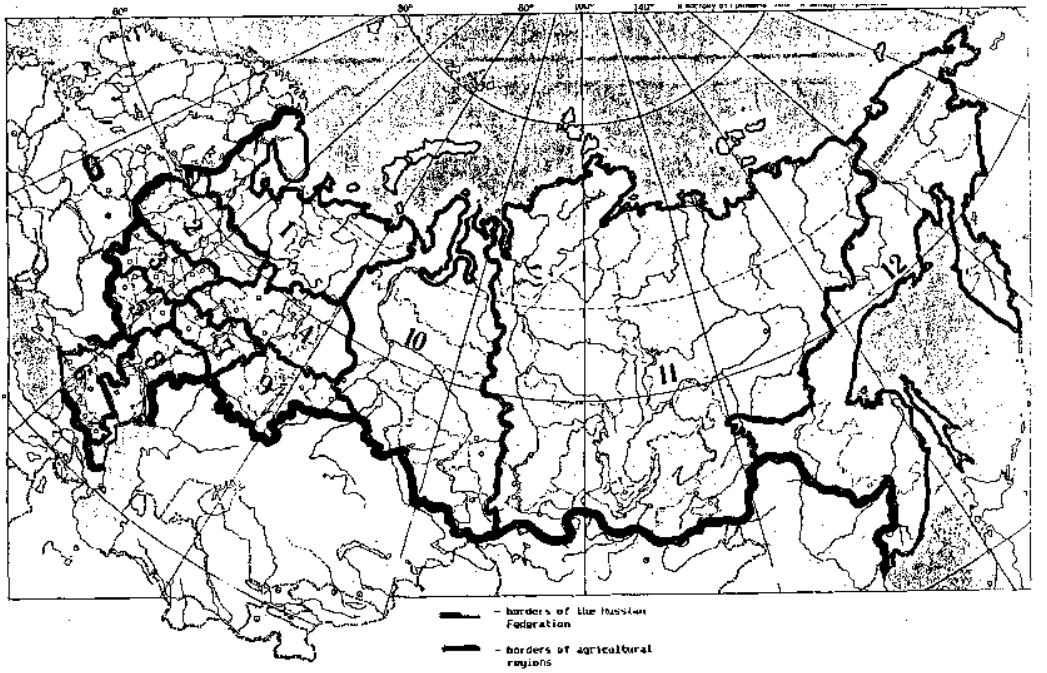


THE RUSSIAN FEDERATION

1. Karelian Republic
2. Republic of Mariy-El
3. Udmurt Republic
4. Chuvash Republic
5. Ingush Republic
6. Kabardino-Balkarian Republic
7. Republic of Daghestan
8. Karachayevo-Cherkess Republic
9. Chechen Republic
10. North-Ossetian Republic
11. Republic of Adygei
12. Mordovian Republic
13. Republic of Tatarstan
14. Kalmyk Republic
15. Republic of Bashkortostan
16. Republic of Altai
17. Buryat Republic
18. Sakha Republic
19. Tuva Republic
20. Khakass Republic

ANNEX 2

AGRICULTURAL REGIONS OF THE RUSSIAN FEDERATION



ANNEX 3

3.1 THE FAR EAST

The Tertiary flora of the Far East, conservative by its nature, had been enriched in the courseof time with complexes of species which migrated into the region mostly from the South, South East, and South West. The present day territory of the Far East with its original wild andcultivated floras is one of the most promising territories from the pointofview of PGR exploration and utilization. For instance, specific conditions of the Far East provided for the formation of special biological groups of forms of some forage, leguminous, but mostly fruit andmedicinal plants.

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
CEREALS			
1. *Avena sativa*	Primorski Territory	Annual plant. Satisfactory condition of the population	
FORAGES			
2. *Echinochloa frumentaceae*			
3. *Lathyrus subrotundus*	Ussurian Territory	Endemic species. Herbaceous perennial plant. Satisfactory condition of the population	
4. *Vicia unijuga*	Throughout the territory	Satisfactory condition of the population	
5. *V. venosa*			
6. *V. multicaulis*			
7. *V. amurensis*			
8. *Heracleum dulce*	Kamchatka Peninsula	Endemic species. Large herbaceous edible plant(young stems and skinned leaf stalks). More or less satisfactory condition of the population	
9. *Glycine soja*	Zeya, Bureya Regs. Ussurian Terr.	Endemic species. Segetal ruderal, climbing herbaceous plant. Population is shrinking	

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
10. *Pueraria lobata*	Only S. of Primorski Terr.	Rare leguminous edible plant (high content of starch in roots). Also can be used as a forage and ornamental plant. Tolerant to different soils. High growth rate	Requires protection
FOOD PLANTS			
11. *Actinidia colomicta*	S. of Khabarovsk Terr. S. of Primorski Terr. Southern Sakhalin Kuril Isles	Liana producing very healthy and tasty fruits with high vitamin and other substances content. Sharp decrease of the natural population due to barbaric cutting down of plants during the harvest period in order to collect fruits	Introduced into cultivation on a small scale, requires protection in the nature
12. *A.arguta*	Kuril Isles (Kunashir Isl.), S. of Primorsky Terr.		
13. *A.giraldii*	S. of Primorski Terr.		
14. *A.chinensis*	"		
15. *A.plygama*	Kuril Isls only	Liana. A very rare species on the brink of extinction	Needs to be saved
16. *Schizandra chinensis*	Primorski Terr.., S. of Khabarovsk Terr., Sakhalin Isl, Kuril Isls	Liana producing valuable fruits with a complex of vitamins, tonic and other substances. Sharp decrease of the natural population due to barbaric cutting down of plants during the harvest period in order to collect fruits	Requires protection
17. *Vitis thuenbergii*	Sakhalin Isl, Kuril Isls	Liana, not introduced into cultivation. Satisfactory condition	
18. *V.amurensis*	Primorski Terr., S.of Khabarovsk	Terr. Liana, introduced into cultivation The most Northern representative of the genus. Rather rare	Requires protection
19. *Allium sacculiferum*	Zeya, Bureya Regs Ussurian Terr.	Promising for introduction into cultivation. Satisfactory condition of the population	

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
20. *Juglans mandshurica*	Primorski Terr., S.of Khabarovsk Terr.	Big tree. Fruits with thick skin. Center of forms diversity is in S E China. Sometimes used for parks landscaping. Promising for cultivation as a food crop.	
21. *J.ailanthifolia*	Sakhalin Isl only	In recent years, only single trees have been found. Threate Urgently ning condition of the population	Requires protection
22. *Pyrus ussuriensis*	Primorski Terr., S.of Khabarovsk Terr. Very tall tree. The most cold resistant for in this country Extremely rare, in taiga	Requires protection	
23. *Malus baccata*	Primorski Terr., Khabarovsk Terr. Single trees in the zone of coniferous and broad leaved taiga. More or less satisfactory condition		
24. *M. mandshurica*	S.of Primorski Terr., Khabarovsk Terr.		
25. *M.zieboldii*	S.of Sakhalin Isl., S.Kuril Isls	Population is decreasing	Requires population

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
26. *Armeniaca sibirica*	S W regions of the Far East	Endemic species. Spread to the Northernmost border of distribution of cold resistant forms of the species	Requires protection
27. *A. mandshurica*	S.of Primorski Terr. Very narrow area of distribution: Sumgari River only	Single trees survived, and those introduced from Manchuria are on the brink of extinction due to road construction in the region	Needs to be saved
28. *Prunus Ussuriensis Asian origin*	Largest populations are in the Bolshekhikhtsersky Natural Reserve	Wide polymorphism by the fruit's characters. Suffers from the an thropogenic pressure in the form of barbaric harvesting	Requires protection
29. *Cerasus sachalinensis*	Primorski Terr., S.of Sakhalin Isl Kuril Isls Condition is satisfactory, though slight decrease of the population is observed		
30. *C. kurilensis*	Kuril Isls only	A very rare species	"
31. *C. maximowiczii*	Primorski Terr.	A very large tree, wide distribution	
32. *Rubus pseudojaponicus*	Kunashir Isl. only	A very rare species	"
33. *R. crataegifolius*	Primorski Terr., W and S.of Khabarovsk. Terr.	Comparatively rare species	"
34. *R. parvifolius*	Kunashir Isl. only	Bush of up to 1m high, comparatively rare species	"
35. *R. horridum*	Sakhalin Isl., Primorski Terr.	Highly desirable for introduction into cultivation	

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
36. *R. fragrans*	N.of Amur River, Okhotsky Sea Reg	Rare, grows only on rocks and colluvia	Requires protection
37. *R. procumbens*	Primorski Terr.	The shoot is of interesting type,Far East endemic as it stretches on the water plant surface	
38. *R. ussuriensis*	S W.of Primorski Terr.	A very rare species	Requires protection
39. *R. dikuscha*	N.of Primorski Terr.	High yielding species. Promising for introduction into cultivation	
40. *Grossularia burejensis*	Primorski Terr., S.and W.of Khabarovsk Terr.	Promising for introduction into cultivation	
41. *Fragaria orientalis*	S.of Khabarovsk Terr., S.of Primorski Terr.	Promising for introduction into cultivation	
42. *Fr. iinumae*	S.of Sakhalin Isl., Iturup Isl. (S.of Kuril Isls)	A very rare species	Requires protection
43. *Fr. yezoensis*	S.Kuril Isls	A comparatively rare species	"
44. *Lonicera coerulea*	the Far East	Promising for introduction into cultivation, important as an edible berry plant	
45. *L.. edulis*	"		
46. *L.. gmelini*	"		
47. *Pinus koraiensis*	Along Amur and Ussuri rivers	Source of nuts and cedar oil. Population is reducing	"
48. *Corylus*	Primorski Terr., W.and S.of Khabarovsk Terr.	Populations are reducing due to *heterophylla* forests felling	"
49. *C. manchurica*	"	A tendency to extinction is taking shape	"
INDUSTRIAL PLANTS			
50. *Euonimus maackii*	the Far East	An oil bearing species, grows in forests	" .

3.2 WESTERN SIBERIA AND THE ALTAI

About one third of all plant species in Western Siberia and the Altai possess economic value as fo age, medicinal, food, nectariferous, or dye stuff plants. In general, Siberian wild flora is considerably richer than that of the Russian Plain. However, few local species and forms have been introduced into cultivation, so far. The Altai flora is of special interest from the point of view of its exploration and utilization.

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
FORAGES			
1. *Elymus sibiricus*	Throughout the region	Promising for cultivation on arable lands, incl. slightly saline ones	
2. *E. dahuricus*	N E Altai Mntns	"	
3. *Hedysarum gmelini*	N., W Altai, Sayany Mntns	Possesses good nutritional properties; can also be used as a medicinal, nectariferous and ornamental plant	
4. *H. neglectum*	Alpine regs.of N., E. Central Altai	Relict plant from the Pleistocene dry and cold climate Good as a forage plant Population is decreasing	Requires protection
5. *H. consanguineum*	"	"	
6. *Lathyrus gmelini*	Throughout the region	Rich inprotein, ascorbic acid,calcium, phosphorus; can be used as a medicinal plant	
7. *Onobrychis*	"	Winter hardy, draught resistant, arenaria forage plant. Good medicinal and rous properties. Introduced into cultivation	

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
8. *Trifolium lupinaster*	"	High protein content. Occurs in forest *coenopopulations*. Promising for introduction into cultivation	
9. *Astragalus danicus*	"	Highly nutritional range and fodder plant	
10. *Rhaponticum carthamoides*	Altai, Sayany Mntns.	Endemic plant. Good forage plant, possesses medicinal properties. Populations are decreasing due to anthropogenic influence	Requires protection
Food plants			
11. *Ribes hispidulum*	Throughout the region	The Altai populations differ by colour, size (max.1.5cm d.), and taste of berries	
12. *Lonicera altaica*	N E Altai Mntns	Produces berries with high vitamin content. Can be used as medicinal and dye stuff plant	
13. *Viburnum opulus*	Throughout the region	Dessert, medicinal, nectariferous, ornamental plant. Population is decreasing due to anthropogenic pressure	Requires protection
14. *Hippophae rhamnoides*	Tuva Republic, N E Altai and Sayany Mntns Dessert, medicinal, nectariferous dyestuff, tanning, phyto melioration plant. Population is rapidly decreasing due to barbaric harvesting methods	Urgently requires protection	
Vegetables and spices			
15. *Rumex acetosa*	Throughout the region	Vitamined vegetable plant. Also can be used as fodder and tanning plant. Satisfactory condition of the population	
16. *R.thyrsiflors*	"	"	
17. *Hypericum perforatum*	"	Spicy plant,used in fish canning, and as tea substitute. Nectarife rous, medicinal plant. Population is decreasing due to uncontrolled harvesting	Requires protection
18. *Rheum altaicum*	Central Altai Terr.	Rare species; high vitamin content in plants. Population is decreasing	"

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
19. *Allium altaicum*	Angara, Sayany, Dauriya Regs, Central Altai Sayany Mntns, Tuva Rep	Progenitor of the cultivated Welsh onion. Very popular with the local people. Population is decreasing	"
20. *A. victorialis*	S.of Ob' and N.of Upper Tobol Rivers, N E. Altai Mntns	Used for food by the local people. Population is rapidly decreasing	"
21. *A. nutans*	Throughout Altai Terr. W.Siberia	Of interest as salad and vitamin containing plant. Satisfactory condition of the population	"
22. *A. lineare*	"	"	
23. *A. schoenoprasum*	W.Siberia	A rare species. Satisfactory condition of the population	
24. *Polypodium*	Throughout the region	Of value as a sugar substitute.virginianum Satisfactory condition of the population	
25. *Glycyrrhiza uralensis*	Khakass Rep., Tuva Rep N. and Central Altai Mntns	Licorice sugar. Population is decreasing due to virgin lands reclamation	Requires protection
Industrial plants			
26. *Linum perenne*	Throughout the region	In the last century was used as a source of coarse fibre. Satisfactory condition of the population	
27. *Bergenia crassifolia*	Altai, Sayany Mntns, Tuva Rep	Used in skin tanning and dyeing, and as a phytoncidal medicinal plant. Satisfactory condition of the population	
28. *Polygonum bistorta*	Throughout the region	"	
29. *P. alpinum*	"	A source of natural dyeing ubstances. Satisfactory condition *of the population*	
30. *Filipendula ulmaris*	"	"	

3.3 EASTERN SIBERIA

Plant diversity, especially of forages, is identical to that of the European part of Russia. However, Siberian populations are characterized by winter hardiness, a shorter vegetation period, and higher salt tolerance.

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
1. *Beckmania syzigachne*	Throughout the region	Noted for high winter hardiness. Sati sfactory condition of the population	
2. *B. eruciformis*	"	"	
3. *Agropyron cristatum*	"	Draught resistant, introduced into cultivation	
4. *Panicum mileaceum*	"	One of the most draught resistant grasses	
5.*Melilotus albus*	"	Promising species for solonetz reclamation	
6 *M. dentatus*	"	Coumarin free, "sweet" plant	
7.*Lathyrus pisiformis*	"	May be grown for up to 12 years in grass stands	
8.*Lespedeza bicolor*	Dauriya Reg	Endemic species. Valuable forage plant. Essential source of food for punctate deerall year round. Introduced into cultivation	Requires protection
FOOD PLANTS			
9. *Allium condensatum*	Chita Reg	Noted for high vitamin content	Requires protection
10. *A stellerianum*	S.of E.Siberia	Endemic species. Noted for high content of ascorbic acid	"
11. *A microbulbum*	Chita Reg., Valley of Shilka River, near Nerchinsk town	Large fruited species. Noted for high vitamin content	"
12. *A. victorialis*	Throughout the region	Noted for high content of ascorbic acid. Recommended for introduction into cultivation	"

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
13. *A. schoenoprasua*	Throughout E.Siberia	Grows on the hills. Promising for introduction into cultivation in the North. Population is decreasing	"
14. *Corylus heterophylla*	S.of East Siberia (single findings)	Winter hardy, non demanding to surrounding conditions. Fruit quality is lower than that of *C. avellana*	"
15. *Humulus lupulus*	Throughout E.Siberia	Contains lupuline, an essentialsubstance for beer brewing	
16. *Grossularia andacicularis*	"	Winter hardy, draught and disease resistant. Promising for the use as rootstock	
17. *Ribes altissimum*	S.of E.Siberia	Highly frost resistant. Resistant to diseases and pests	
18. *Amygdalus pedunculata*	S.of E.Siberia (single findings)	The most cold tolerant species in the genus. Promising for cultivation, produces high yields	Requires protection
19. *Armeniaca sibirica*	Dauriya Reg.	Polymorphous species, crosses withothers well. Frost and draught *resistant*	
20. *Crataegus maximoviczii*	Trans Baikal Reg.	Produces good tasting fruits with high vitamin content	
21. *Rubus idaeus*	S.of Trans Baikal Reg. (E.border of the area of distribution)	Peripheral forms are of interest for breeding	Requires protection
22. *R. komarovii*	Dauriya Reg. (single findings)	Plants are lower and leaves are smaller than those of R.sachalinensis	"
23. *R. sibiricus*	Throughout the region	Less thorny, and produces berries larger than those of R.sachalinen sis.	"
24. *Sorbus sibirica*	Throughout the region	Contains ascorbic acid; used for producing tinctures, vinegar. Recommended for use in breeding for frost resistance	

3.4 EUROPEAN PART OF RUSSIA

It unites several natural regions, each of which is characterized by a specific set of valuable species.

a) The zone of Tundra and Forest Tundra

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
FRUIT AND SMALL FRUIT PLANTS			
1 *Rubus chamaemorus*	N. of Russia, on sphagnum bogs	A widely spread species. Eagerly used by the local people. Populations in the vicinity of large inhabited areas tend to decrease	
2 *R. saxatilis*	"	"	
3.*R. arcticus*	"	"	
4.*Oxycoccus palustris*	"	"	
5 *O. microcarpus*	"	"	
6.*Vaccinium vitisidaeus*	"	"	
7 *V. myrtillus*	"	"	
8.*V. uliginosus*	"	"	

b) The zone of Taiga

FRUIT PLANTS			
9. *Ribes nigrum*	N.of Russia	Occurs in taiga underwood and on elevated marshlands	
10. *R. spicatum*	"	Progenitor of cultivated varieties of red currant. Occurs in taiga underwood and on elevated marshlands	
11. *R. alpinum*	"	Occurs in taiga underwood and on elevated marshlands	
12. *R. lucidum*	"	"	
13. *Rubus idaeus*	"	"	
14. *R. caesius*	"	"	
15. *R. nessensis*	"	"	
16. *Padus avia*	"	Occurs along rivers	
17. *Corylus avellana*	N W and Central Regs	"	

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
18. *Fragaria moscata*	"	Occurs on meadows and forest borders	
19. *F. vesca*	"	"	
20. *F. viridis*	"	"	

c) The zone of Broad Leaved Forests

FRUIT PLANTS			
21 *Malus sylvestris*	Throughout the zone	Noted for a wide range of forms which may be used in breeding	
22 *Pyrus communis*	"	"	
23 *P. rostica*	"	"	
24 *Sorbus aucuparia*	"	"	
25 *Crataegus volgensis*	Kuibyshev and Saratov Regs	Area of distribution is decreasing due to lands reclamation	Requires protec-tion
26 *C. ucrainica*	Bryansk Reg	"	"

d) The zone of Forest Steppes and Steppes

FORAGES			
27. *Vicia pisiformis*	Throughout the zone	A member of grasses and mixed herb steppe communities	
28. *V.dumeforum*	"	"	
29. *Lathyrus hirsutus*	"	"	
30. *Dactylis glomerata*	"	Some local ecotypes are promising for cultivation	
31. *Phleum pratense*	"	First introduced into cultivation in the Russian North. Some forms are endemics of the North	
SPICY AND ESSENTIAL OILBEARING PLANTS			
32. *Thymus spp.*	Belgorod, Kursk, Voronezh Regs	Specific diversity is concentrated on limestone outcrops and chalk deposits. Destruction of habitats endangeres existence of species and forms	
33. *Hyssopus*	"	"	

cretaceus			

3.5 NORTHERN CAUCASUS

In the ancient times, regions of the Caucasus had been woody; on Southern mountain slopes there had been areas of mountainous steppes and semi deserts. Many plant complexes have survived to our days. European elements dominate in the North Caucasian flora, while in the South some Mediterranean plants occur.

Latin name	Distribution	Morpho economic description, status of the population	Notes, proposals
FRUIT PLANTS			
1. *Pyrus communis*	Throughout the region	Shows wide polymorphism	Fruits are edible and harvested by the local people
2. *P. caucasica*	"	"	
3. *P. salicifolia*	"	"	
4. *P. vsevolodii*	"	"	
5.*Malus orientalis*	"	"	
6. *Prunus spinosa*	"	"	
7. *P. cerasifera*	"	"	
8.*Cydonia oblonga*	"	"	
9.*Berberis spp.*	"	Harvested by the local people. Have breeding value	
10. *Corylus iberica*	"	"	
11. *Pistacia mutica*	"	Area of distribution is decreasing	Requires protection
FORAGE PLANTS			
12. *Avena pilosa*	Throughout the Caucasus	Possesses breeding value as a relative of the cultivated oat	
13. *Hordeum asperum*	"	Possesses breeding value as a relative of the cultivated barley	
14. *H.orinitum*	"	"	
15. *Secale silvestre*	"	Possesses breeding value as a relative of cultivated rye	
16. *S.dighoricum*	"	"	
17. *Trigonella* spp.	"	Foci of species and type diversity are located in the Caucasus and represent a certain	

		interest for breeding	
Latin name	**Distribution**	**Morpho economic description, status of the population**	**Notes, pro-posals**
18. *Medicago* spp.	"	"	
19. *Vicia* spp.	"	"	
20. *Camelina sativa*	"	A promising forage plant	
21. *Vavilovia formosa*	"	A very rare species	Requires protection
22. *Pisum elatius*	"	A comparatively rare species, relative of the cultivated pea	"
INDUSTRIAL PLANTS			
23. *Linum* spp.	Throughout N.Caucasus	Had been used as sources of fibre. Some local forms are of value for breeding	
24. *Papaver* spp.	"	Show wide polymorphism	
SPICY PLANTS			
25. *Alliaceae* spp.	"	Local forms have breeding value	
26. *Apiaceae* spp.	"	"	
27. *Lamiaceae* spp.	"	"	

ANNEX 4
Gene Pool of Forest Woody Species

Natural dendroflora of Russia and contiguous states is represented by almost 70 plant families wich include over 200 genera and over 1,500 species and varieties. Angiosperms predominate over gymnosperms. The number of their species is 366 507. The number of gymnosperms is 48 61. The highest percentage of endemic and relict species is characteristic for the regilns, which were not covered with ice and were not exposed sea transgression: the Far East 339 species, the Caucasus 463. Characteristic feature of plant cover of the most regions is prevailing in their content of a small number of coniferous species. For instance, deciduous forests (which consist mainly of *Larix sibirica, Larix gmelenii, L.kajanderi*) occupy 40.5% of forest area, *Pinus sylvestris* forests 17%, *Pinus sibirica* forests 5.9%, *Picea abies, P.obovata, P.ajnensis, P.orientalis* forests 11%, *Abis sibirica*, *A.nordmaniana, A.Sachalinensis* forests 2.1% and *Pinus pumila* brushwood 3.6%. As for decidious forests, Betula pendula, *B.pubescens*, *B.tortuosa* forests make 12.7%, *Populus tremula* forests 2.8%, *Quercus robur, Q.petraea, Q.pubescens, Q.mongolica 1.5%. Pinus sylvestris* occupies the most areal within plains of boreal region.

Succesful growing of these species in contrast physical and geographic and ecological conditions depends on considerable differenciation of its gene pool. It was the basis for *P.sylvestris* subdivision into numerous subspecies, varieties, geographic races, climatic and edaphic ecotypes. In contact zone of areals of species in genera *Larix, Picea, Betula, Quercus* there are hybrid populations of different sizes. There were revealed regions with increased frequency of introgressive hybridization for many plants species (the Caucasus, the Urals, the regions of Baikal Lake, the Lower Amur). Agregates of hybriodous population are often considered as species, for instance *Picea fennica* (*Picea medioxima*), *Larix* Czekanowskii, *Larix maritima, Larix Lubarskii. Pinus sibirica* growing in quite simlar ecological conditions (with heightened air and soil humidity) is characterized by comparatively low interpopulation variability. Progeny tests of different origin show difference in the indices of their growth only between populations of quite contrast regions: low mountain and high mountain; south taiga and north taiga zon respectively. The study of intraspecific variability of Larix sibirica enabled to isolate Altai, Verchneenisei (Saiani), Verchnelena, Pribaikal and suarctic geographical races. In different times they were considered as varieties, climatic (geographical) ecotypes or subspecies. Significant polymorphism of *L.sibirica* was confirmed by the results of the detailed study of its gene pool in geographical cultures. *Quercus robur, Q.petraea, Q.pubescens, Betula Pendula, B.pubescens, B.tortulsa, B.nana, B.rotundifolia* are also characterized by significant differetiation. In particular,

population structure of *Quercus robur* is represented by the system of ecological geographical races. *Q.petraea* and *Q.pubescens*, in spite of their high intra and interpopulation variability, do not form such a complex population structure as in *Q.robur*. Both of the species phylogenetically are very close and are a united complex of vicarious races. In Russia there are important precondinations for intensification of work in the field of forest genetics breeding and seed improvment. They include elaboration and partial realization in the 1980's of the General scheme of the development of seed improvement of the main forest forming species on selection basis, Forest and seed regioning of main forest forming species, the Regulations on conservation of woody species gene pool, the main regulations on forest seed improvement, the programme of establishing the net of plus trees trial cultures and clone archives, the programme of establishment of new net of geographic cultutes of the main forest forming species introduction, the scheme of distribution on country's regions of breeding seed centers and scientific bases for foundation for Federal genetic bank of forestseeds. State leading bodies both on federal and on regional levels more and more inderstand the significance of genetic variability of forests and forest breeding in increase of productivity, quality and resistance of natural and cultivated forests maximum use of scientific potential of research and production enterprises will be possible at stable financing of works, which as a rule are of long term character.

4.1 THE RESULTS OF POPULATION AND GENETIC RESEARCHES OF WOODY SPECIES

When studying intraspecific variability of the main forest forming species both traditional phenetic methods and modern methods of biochemical genetics are used. In particular population and genetic research of *Pinus sylvestris, Picea abies, Pinus sibirica* and others were carried out by the methods of isoenzymatic analysis with the help of electrophoretic protein division and by the methods of monoterpene content analysis. But poor equipment of the most institutes and experimental stations, limitedpossibilities in purchase of pure reagents prevent wide use of these methods, potentialities in decision of such theoretical questions and applied problems as: introspecific differenciation, population structure, genetic certification of plus and elite trees, forest seed orchards, voluatle natural and cultivated forms and populations and other breeding objects; definition of clone fertility in plantations; analysis of the efficiency of controlled crossing and artificial additional pollination of forest seed orchards; genetic certification of seeds.

4.2 THE STATE OF THE WORKS ON GENETIC FOREST FUND CONSERVATION

In spite of high percentage of areas covered with forests in Russia impoverishment of genetic potential takes place. In a number of regions it has irreversible character and causes to approve urgent measures on protection of woody species gene pool in the conditions of market economics.

Some measures on conservation of the most valuable forest stands of oak, pine, spruce and larch have been undertaken in Russia in the XVIII century, but the United States politics in the field of the forest gene pool conservation has been formulated in 1982 as "The regulation on isolation and conservation of woody species gene pool".

The regulation determined the works trends on conservation of "*in situ*" and "*ex situ*" gene pool, including isolation of forest genetic reserves, plus and elite stands and trees, formation of genetic banks (collection cultures and clone archives, reproductive plantations) and gene seed banks, polen grains and meristems. In view of insufficiently elaborated intraspecific systematics of species of forest woody plants, forest seed region boundaries were taken as conditional boundaries of extraspecific taxons. The forest seed region boundaries have been determined by "Forest seed regioning of the main forest forming species of the ISSR". Forest genetic reserve (FGR) has been determined as a forest plot which is typical for the given natural and climate region by its phytocenotique, sylvicultural and forest growing characteristics.

First of all it is recommended to isolate FGR in a zone of optimum growing of species and in regions with threat of disturbance fore valuable gene pool or its loss owing to man economic activities or unfaourable changes of natural conditions. The size of genetic reserves is conditioned by the necessity of isolation of forest plot, which gives quite a full reflection of genetic content of given population part and allows to preserve its state for a long time.

According to these criteria there were determined the following maximum FGR sizes for all species *of Picea genus and Pinus sylvestris* 500 1,000 ha; for all srecies of Betula genus, Pinus sibirica, P.korainensis, p.pumila 200 500 ha; for all species of *Quercus genus and Fagus, Larix, Abies, Populus* and Tilia cordata 100 200 ha. Rare and in danger species with their distribution on the area over 1,500 ha are recommended to include in FGR. To assure FGR resistence they are surrounded by special buffer zones.

Within FGR economic activities, threatening its conservation and the conservation of genotypic content, disturbing natural development of natural populations is not allowed. FGR isolation was initiated by branch and academic research institutions which carry out genetic and breeding investigations in each concrete region. Local region leading bodies are responsible for legal official registration and protection of FGR.

4.3 THE SYSTEM OF RESEARCH ORGANIZATION

Research work on conservation and study of genetic forest fund varietal plant breeding and foundation of objects of constant forest seed basis on genetic breeding base are carrying out. Academic and branch enterprises, educational institutions, forest experimental and seed stations, breeding seed centers take part in these works. Up to 1992 priority works were fulfilled within complex programm "Forest".

Financing was from state budjet. This programme united a number of enterprises: Research Institute of Forest Genetics and Selection (Russia, Voronezh), Forest Institute of Siberian Department of Russian Academy of Science (Russia, Krasnoyarsk), the Ural Institute of Forest Department of R.A.S.(Russia, Ekaterinburg), The Forest Institute of the Carel Research Center of R.A.S. (Russia, Petrozavodsk), The Institute of the Biology of the Scientific Center of Komi Republic of R.A.S. (Siktivkar), Forest Institute of the R.A.S. (Moscow), Genetic Institute of R.A.S. (Moscow), The Main Botanic Garden of R.A.S. (Moscow), Research Production Amalgamation "Funduk" (Russia, Moscow region, Ivanteevka), The Caucasus Branch (Russia, Sotchi) and Forest experimental sections of the All Union Research Institute of Forest and Forest Mechanization (Russia, Moscow region, Pushkino), Archangelsk Institute of Forest and Forest Chemistry (Russia, Archangelsk), Sankt Peterdurg Institute of Forest Development (Russia, Sankt Peterburg), Far East Research Institute of Forest (Russia, Khabarovsk). Since 1991 in Russia International Forest Institute has begun to function. It is a structural sub division of the International Center of Scientific Culture World Laboratory. Since 1993 in the Russian Federation There was begun realization of state scientific technical programme "Russian Forest".

One of its main trend is a research work on conservation study and rational utilization of biological variability of the country forests. It should be pointed out, that the Programme takes into consideration the necessity of fulfilling by Russian obligations resulting signing concluding documents of UNO Conference on Enviroment and Development (Rio de Janeiro, 1992). This State Programme provides for improving the system of ensuring research works in the field of forestry, in particular development of experimental stations, breeding and biotechnological centers with modern equipment and skilled staff (in the regions without permanent examinations).

4.4 REGIONAL AND INTERNATIONAL COOPERATION

Till 1992 the following research institutes of CIS countries took active part in study, preservation and use of genetic resources of the main major forest forming species: Research Production Amalgamation "LES" (The Ukrain, Kharkov), Forest Institute of Byelorussia Academy of Science (Byelorussia, Gomel), Research Institute of Forest and Agromelioration of Kazakhstan (Kazakhstan, Kokthetav region, Schutcinsk), Forest Reseach Institute of Latvia (Latvia, Salaspils). Lithuania Forest Institute (Lithuania, Girionis), Research Institute of Mountain Forest Institute (Georgia, Tbilisi), Middle Asia Research Institute of Forest Breeding (Uzbekistan, Tashkent) and others.

With the states of Eastern Europe (Bulgaria, Hungary, Roumania, GDR, Czechoslovakia, Poland), and with Cuba, Finland and Sweden cooperation was realied by direct agreements, which provided exchange of seed samples and breeding material for parallel test in the corresponding countries.

International cooperation with the states of Western Europe in the field of study, preservation, evaluation and use of genetic resources of a number of forest species was realized by Research Institute of Forest Genetics and Breeding (NIILGiS, Voronezh) in *1990 1992* within the limits of 2 issues (envisaged by Resolution 2 and 5) of the Programme, taken at the Conference of Ministers of European Countries (Strasbourg, 1990). Eurosilva (Cooperation in Forest Tree Physiology); Euforgen (European Forest Genetic Resources Programma).

In *1989 1992* NIILGiS cooperated with USA (Forest service USDA) according to the following theme: "Reveal intra and inter population variability of *Pinus sylvestris* to stress and develop rapid methods of stress indentification and methods for early diagnois of Pinus sylvestris resistance to stress". Since 1993 performance of the corresponding issues of the themes with NIILGIS was suspended because of quite limited budgetary financing.

Distribution of forest area (thousands of ha) according to the major forest forming species of Russian Federation

Species	Overall	Including	
		European Ural part	Asiatic part
Pinus sylvestris	114,326	40,121	74,205
Pinus sibirica; P. koraiensis	39,797	721	39,076
Picea abies; P. obovata P. ajnensis et al	75,866	46,604	29,262
Abies sibirica, A.sachalinensis et al Larix sibirica; L. gmelenii	14,370	605	13,765
L. kajnderii;L. sukaczewii et al	263,348	369	262,979
Pinus pumila	27,222		27,222
Betula pendula, B. pubescens; B. tortuosa	87,733	31,642	56,091
Populus tremula	18,908	7,275	11,633
Alnus glutinosa	963	622	341
Quercus robur	7,006	4,017	2,989
Acer platanoides	298	270	28
Fagus orientalis	667	667	

Rare and disappearing species of forest woody plants of Russia

Species	Region of growing
Pinus funebris Kom.	Primorski Territory
Pinus brutia Ten.subsp.*pityusa* (Stev.) Nab.	Krasnodar Territory
Pinus sylvestris L.. var. *cretacea* Kalenicz.	Belgorod, Voronezh regions
Larix olgensis A. Henry	Primorski Territory
Larix lubarskii Sukacz.	Primorski Territory
Abies holophylla Maxim.	Primorski Territory
Picea glehnii (Fr.Schmidt) Mast.	Sakhalin, the Kuril Islands
Picea obovata var. *coerulea* Malysch.	The Altai, the Buryatia,irkutsk region
Taxus cuspidata Siebold et.Zucc.ex Endl.	Sakhalin, Primorski Territory
Taxus baccata L..	Krasnodar Territory
Tilia cordata Mill.subsp.*sibirica*	Kemerovo, Omsk regions
(Fisch.ex Buger) K.Kam.	Krasnoyarsk Territory
Magnolia obovata Thunb.	The Kunashir Island
Populus balsamifera L..	Chukot Peninsula
Betula maximowieziana Regel.	The Kunashir Island
Betula schmidtii Regel.	Primorski Territory
Jiniperus rigida Siebold et Zucc.	Primorski Territory
Microbiota decussata Kom.	Primorski Territory
Juglans ailanthifolia Carr.	Sakhalin

The list of especially protected nature territories of Russia (to a considerable extent, protecting genetic resources of forest woody plants)

Category	Number	Total area thousands of ha
in situ		
1. Reserve	89	24,623
2. National Parks	27	6,447
3. Nature sanctuary (forest)	685	167
4. Forest reserve (dendrologic)	158	182
5. Especially valuable forest tracts	430	4,339
6. Forest of scientific and hystorical importance	203	186
7. Forest protected plots	92	64
8. Forest genetic reserves	165	74
9. Plus stands		14.1
10. Permanant forest seed plots		74.7
11. Plus trees (59 species) including:	35,334	
Pinus sylvestris	16,582	
Picea abies	6,420	
Picea obovata	1,162	
Larix sibirica	1,609	
Larix Sukaczewii	781	
Pinus sibirica	2,180	
Pinus koraiensis	879	
Quercus robur	1,778	

The list of especially protected nature territories of Russia (to a considerable extent, protecting genetic resoureses of forest woody plants) (continued)

	ha
ex situ	
1. Forest seed plantations including:	7,324
Pinus sylvestris	3,650
Picea	1,860
Larix	863
Pinus sibirica	422
Quercus	262
2. Clone archives including:	400
Pinus sylvestris	153
Picea	28
Larix	15
Pinus sibirica	16
3. Long term storage of the seeds of coniferous Oterelievski forest fruit growing nursery (Moscow region)	

ANNEX 5

Composition of the Plant Germplasm Collections updated for 1 January St 1995

No.	Crop name	Number of accessions
	Department of Wheat	
1	Bread wheat	31,467
2	Durum wheat	6,965
3	Rare wheat species	3,385
4	*Aegilops*	6,557
5	Triticale	4,593
SUBTOTAL		**53,485**
	Department of Rye, Barley and Oats	
6	Rye	3,131
7	Barley	24,785
8	Oat	13,463
SUBTOTAL		**41,379**
	Department of Small Grains	
9	Maize	18,265
10	Rice	6,780
11	Buckwheat	2,307
12	Sorghum	12,603
13	Millet	8,852
14	Millet related crops	6,232
SUBTOTAL		**55,039**
	Department of Forage Crops	
15	Alfalfa	4,204
16	Clover	7,167
17	Dakota vetch	495
18	Sainfoin	953
19	Melilot	999
20	Timothy grass	1,680
21	Canary grass	416
22	Meadow fescue	1,175
23	Reed fescue	417
24	Cock's foot	1,362
25	Brome grass	1,280

No.	Crop name	Number of accessions
26	Foxtail	410
27	Kentucky bluegrass	1,725
28	Rye grass	1,335
29	Bentgrass	707
30	Creeping fescue	658
31	Arid grasses	1,684
32	Other and rare forage plants	1,082
SUBTOTAL		**27,833**
Department of Leguminous Crops		
33	Pea	7,983
34	Soybean	7,586
35	Vetch	3,138
36	Lupin	2,970
37	*Phaseolus* beans	10,500
38	Chickpea	2,631
39	Faba beans	1,707
40	Peavine	1,195
41	Lentil	3,288
42	Cowpea	1,951
43	New grain legumes	328
SUBTOTAL		**43,222**
Department of Industrial Crops		
44	Cotton	6,300
45	Sunflower	3,055
46	Flax	5,637
47	Fibre crops	1,638
48	Castor bean plant	1,178
49	Groundnut, sesame & safflower	3,685
50	Rapeseed & colza	1,101
51	Mustard	1,371
52	Other *Cruciferae*	396
53	Poppy	1,881
54	Rubber producing plants (kok saghyz)	128
55	Jojoba, stevia, etc.	53
56	Subtropical industrial crops	617
SUBTOTAL		**27,040**

No.	Crop name	Number of accessions
	Department of Tuber Crops	
57	Potato: breeding cultivars	2,069
	S. andigenum	2,620
	indigenous varietes of Chile	120
	primitive species	728
	wild species	3,568
	dihaploids	110
	hybrids	430
	tuber bearing forms	8
58	Jerusalem artichoke	324
SUBTOTAL		**9,977**
	Department of Vegetables	
59	Cabbage	3,947
60	Tomato	7,246
61	Cucumber	3,788
62	Onion & garlic	3,613
63	Pepper, eggplant & ground cherry	3,784
64	Carrot, radish, etc.	6,591
65	Beet	2,880
66	Swede & turnip	666
67	Lettuce, dill, spinach, etc.	2,821
68	Watermelon	3,007
69	Rare melon related species	735
70	Melon	4,579
71	Pumpkin & marrow squash	2,889
72	Other rare vegetables	4,240
SUBTOTAL		**47,965**
	Department of Fruits, Berries, Subtropical Plants and Grapes	
73	Fruit trees	14,524
74	Berry plants	4,466
75	Ornamental plants	3,437
76	Grapes	300
SUBTOTAL		**22,787**
TOTAL		**333,727**

ANNEX 6
Experiment Stations

Moscow Division was opened in 1957 in the town of Mikhnevo near Moscow.
It has been working with cereals, legumes, forages, vegetables, potato and hop. The research on the effect of ionizing radiation and chemical supermutagens on the heredity of agricultural and horticultural crops is concentrated here. It also studies mutants and the prospects of their utilization in plant breeding, resistance of plants to diseases and pests, and physiology of environmental stress resistance.

Astrakhan Experiment Station was opened in 1966 and is situated 14 km from Astrakhan. At this station the collections of rice, watermelon, melon, pumpkin, tomato, alfalfa, forage grasses and ornamental plants are studied.

In particular, the station performs biochemical assessment of accessions and analyses tomato physiology under saline soil conditions.

Volgograd Experiment Station, established in 1932, is located in flood lands of Volga. It is comprised of the departments of vegetables, fruit plants, vegetable and potato seed production, and laboratories of biochemistry and technology, physiology and immunology. Plant genetic resources collections are studied under intensive irrigation conditions. This station possesses a huge experimental farm and supplies scientific institutions with breeding materials.

Daghestan Experiment Station was organised in 1969 on the Caspian Sea shore, 10 km from Derbent, and has been studying the collections of wheat and its wild relatives, barley, oat, vegetables, fruit plants and valuable local forms of grapevine. The climate provides a natural background infested by virulent races of brown, stem and yellow rust, which helps to make precise evaluation of accessions by their rust resistance. This station performs genetic analysis of wheat accessions in order to identify donors of male sterility and fertility restoring lines.

Far East Experiment Station (20 km from Vladivostok) has existed since 1929 and studies field crops, vegetables, fruits and berries, grapes, *actinidia,* aboriginal forms of plum, apricot, magnolia vine, honeysuckle and Amur grape. More attention is allocated to soybean, genetics proper of this crop and its resistance to fungi. The station breeds potato cultivars and introduces wild forage grasses into cultivation.

Zeya Experiment Station was established in 1985. This station collects old landraces and forms of cultivated plants and their wild relatives in the Far East and East Siberia. It provides complex study of the collected samples and those from the Institute's collection in order to identify the most promising accessions of cereals, vegetables industrial crops, small fruit plants and potato. It is also renders scientific assistance to the local farms.

Yekaterinino Experiment Station was organised in 1958 in Tambov Province (25 km from Michurinsk). It identifies sources of fungus resistance in leguminous crops, initial materials for breeding of nematode resistant potato with high content of starch. The station maintains duplicate collections of pea, lentil, vetch, small grains and perennial grasses.

Krymsk Experiment Breeding Station was included in the Institute's network in 1935. It is situated in the town of Krymsk, Krasnodar Region, and studies the collections of green pea, sugar maize, tomato, pepper, eggplant, cucumber, apple, plum, peach, pear, apricot, cherry, strawberry and some other crops. It is involved in vegetable and sugar maize breeding programmes.

Kuban Experiment Station was established in 1924 in the steppe zone of Krasnodar Region. It performs studies of maize, sorghum, sunflower and castor oil plant, immunological research on wheat, barley, chickpea and sunflower, and on flax resistance to *Fusarium* wilt. The National Seed Store is situated in the territory of this station. It houses the base collection of the Institute preserved at +4°C.

Maikop Experiment Station was established in 1930. It has been studying the collections of cultivated and wild grasses, maize, Jerusalem artichoke, potato, winter rapeseed, and southern varieties of apple, pear, plum, sweet cherry and filbert. There is a quarantine nursery at this station. The station specializes in research on onion, pepper, eggplant, cucumber, cabbage, garlic, carrot and red beet. Heterosis hybrids of cucumber and tomato are bred at the station.

Pavlovsk Experiment Station was organised in 1926 near St.Petersburg. Being one of the major stations of VIR, it studies perennial grasses and cruciferous tubers cultivated in the Non Black Soil area. There are over 3,000 accessions of fruit and berry plants maintained in vivo in its gardens. More than 40 of these fruit samples have been commercialized. This station operates an experiment farm, a quarantine nursery and greenhouses.

Polar Experiment Station was opened in 1923 near the town of Kirovsk beyond the Polar Circle. It is a kind of natural laboratory for studying crop variability and their physiological characters under the growing conditions of the

Far North. Cereals, vegetables, forage crops, berries and potato are studied here. The station is involved in biochemical, physiological, immunological and chemical weed control research. (Annex 7).

Accumulation of diversity of cultivated plants and their wild relatives, as well as its study remain the tasks of national importance, as attaining of such goals as a significant increase in yielding ability, improvement of commercially valuable characters in varieties and development resistance in the latter to biotic and abiotic factors, etc. is possible only through the use of initial materials preserved in the collections. Improvement of the existing varieties and creation of new ones will be the major tool of agriculture intensification, but success will depend not only on the application of the improved breeding methods, but to a great extent on the efficient utilization of the global varietal and specific diversity of cultivated plants and their wild relatives. In this respect, the activities on accumulating and studying appropriate genepools acquire outstanding importance. Yet special acuteness of the problem stems nowadays from the fact of the increased rate of genetic erosion and plant species extinction. That is why collecting of plant diversity should be intensified.

Germplasm collecting in the centers of origin and diversity still remains the most important goal of VIR. To this end, collecting teams had been despatched by the Institute to explore and collect plant diversity both in the USSR and abroad. Annually, 5 to 6 teams used to travel abroad, and 30 more were involved in permanent explorations in this country. Thanks to their activities, VIR's collections have been replenished with numerous accessions of wild grasses, wild species of rye, oats, barley, many landraces of fruit crops, and a wide range of leguminous, industrial and vegetable crops.

From abroad, dwarf wheat varieties of intensive type have been delivered along with draught resistant productive barleys, protein and lysine rich maize forms, wilt resistant cotton, disease resistant species and varieties of sunflower, as well as new triticale varieties, large seeded dwarf ryes, etc. Some materials preserved in the VIR's collections can no longer be found in the nature.

However, due to a sharp decrease in financing determined by the complicated economic condition of the country, experts from VIR are unable to continue with collecting missions and explorations, and the main source of collections replenishment is the intensified materials exchange with national programs of other countries and breeding institutions of Russia. There is a necessity to re establish the practice of obligatory supplying VIR with samples of newly developed varieties and place responsibility for this with the originators of varieties. Besides, it is very important to revive activities of the permanent collecting

teams which would continue collecting plant diversity in the nature, as for instance, the North Caucasus, Far East and Siberia haven't been investigated completely.

Another way of obtaining new materials is by ordering them from various institutions abroad. (Annex 8). Major part of these materials are modern commercial varieties.

All germplasm coming to VIR arrives at the Department of Introduction where each sample is given a catalogue number. Also, name of the sample, the country of origin, description or name of the place the sample has been received from, as well as other initial information are registered there.

Germplasm quarantine is carried out at special nurseries at specific regional stations. Seed samples are first checked visually for seed borne diseases by the State Quarantine laboratory which is located at VIR in St.Petersburg. The samples are then forwarded to the appropriate quarantine nursery together with a certificate stating the diseases present, if any, and treatments used. Non seed samples are sent directly by the Department of Introduction to the appropriate quarantine nursery.

Before disintegration of the USSR, VIR's network included 7 quarantine nurseries, but now only 3 remained:

1. at the Pavlovsk Experiment Station (for temperate plants);
2. at the Maikop Experiment Station (for Southern vegetable and field crops);
3. at the Kuban Experiment Station (for Southern cereal crops).

Before, from 6 to 8 thousand samples had been undergoing inspection annually; at present the number tends to decrease as the flow of incoming samples also decreases. At the same time, the load on each of the remaining nurseries has increased due to the loss of other 4.

At the quarantine nurseries, the plants are grown for inspection. The number of plants grown out is few and can be as low as 4 even for a landrace or wild species. There are national lists for each crop of the pests and diseases with quarantine status. If the plants show symptoms of a quarantine or nonlocal disease, they are discarded. No attempts are made to identify the diseases and pests; the objective being to reveal them. If it is necessary to identify the pathogen, then the plant sample is sent to a local phytopathology laboratory or back to headquarters at VIR.

Field quarantine testing is carried out by a local branch of the State Quarantine Inspection which issues a Quarantine Certificate. Afterwards, seeds of healthy plants are returned back to the VIR's Department of Introduction together with the Quarantine Certificate.

Quarantine inspection is combined with the preliminary morphological characterization of an accession, as well as with checking its resistance to diseases and pests. Each accession is supplied with a brief (ca. 50 words) description which is further published along with other ones in catalogues compiled by the Department of Introduction.

Under present social and economic conditions, as well as due to the development of private farming and agribusiness, a stream of foreign seed materials rushed into the country, quite often without appropriate quarantine testing. Such an uncontrolled introduction of foreign plant materials brings about a threat of severe epiphytoties and appearance of new quarantine objects in Russia. Scientists of VIR have approached the responsible governmental bodies with a warning stressing the necessity of restoring the previous system of strict control over the plant materials imported into the country.

Though the global collection of VIR is regarded as one of the most rich in terms of botanical families, genera and species represented in it, experts of the Institute insist that not all diversity of cultivated plants and their wild relatives has been accumulated in the collections, so far. Before, 5 to 6 collecting teams, including from 2 to 3 experts of different specialization each, explored different foreign countries annually. The collecting missions were complex by nature and pursued the objective of collecting the widest range of germplasm, including that preserved in national genebanks, at experiment stations, as well as that available at markets and in the wild nature. At the same time, from 20 to 30 permanent crop based collecting missions (5 to 7 VIR's and local experts in each) were operating in the USSR.

The voluminous materials accumulated in VIR's collections over 100 years include those possessing important genes of potential breeding value, and therefore few accessions are discarded in course of annual thorough inventories.

A genebank was constructed at the Kuban Experiment Station in 1976. A two storey building houses offices, research laboratories and 24 cold chambers 50 cub.m each cooled down to +4°C.

On receipt at Kuban, a visual examination of the seeds is carried out. Samples are received untreated unless unavoidable. Sample viability is tested using standard paper and sand laboratory germination methods using 100 seeds in 2 replications. Only the most recent regeneration batch is stored, unless it is of unacceptably low viability. Depending on the species, initial viabilities of

70% or less are accepted. At Kuban, samples are dried to 5% to 8% seed moisture content, depending.

The sample size for the base collection is set at 5,000 seeds, but for some species smaller quantities are accepted, for example for species with large seeds such as maize and beans. The dried seeds are packed in glass bottles which have a silicon plug and an aluminium cap. Each accession is divided into 2 subsamples; one for storage only and the other for periodic viability monitoring.

Information on the accessions stored is recorded in an inventory book. The following descriptors are listed: Kuban entry No., VIR Catalogue No., country of origin, species, variety, place of regeneration (VIR's experiment station), year of regeneration, donor of sample, month and year of storage, location of sample in store chamber, moisture content at storage and % germination at storage. Furthermore, no monitoring data is recorded for viability and seed stock available, although germination testing of random samples is carried out every 5 years and occasionally it is necessary to provide samples to restock
the active collection.

A start has been made to computerize the inventory data using Dbase software in Russian.

The Seed Store has a staff of 5 scientists, 12 technicians and 2 engineers. The staff are trained in the Seed Testing Laboratory at VIR Headquarters.

Since the completion of a technical inspection of the Seed Store in 1994, thanks to the USAID and IPGRI funding 4 drying chambers have been purchased and installed at 4 locations at VIR headquarters (St.Petersburg), at Kuban, Volgograd Experiment Station and at the Moscow Branch. Besides, foil pouches and thermal sealing equipment have been received to start the gradual replacement of glass bottles for seed storage with foil pouches. In 1995, 4 more drying chambers are planned to be installed at the Maikop Experiment Station, Daghestan Station, Yekaterinino Station, and Pavlovsk Station. Currently, a Project is being considered by the World Bank which envisages construction and equipping of a genebank for long term storage of the VIR's global collection at temperatures from 4°C to 18°C. The Kuban Seed Store will be then used as a medium term storage.

By present, the Kuban Seed Store has been filled up for 80%. The balance volume can be filled with about 150,000 accessions from the working collection sealed in foil pouches. The Kuban Seed Store contains a number of collections from other research institutes of Russia, for instance, of the Rice Research Institute, the Institute of Tobacco and Rustic Tobacco, the Institute of Sugarbeet, as well as a small collection of rice from Cuba and a few wheat accessions from Italy.

The total number of accessions put for storage in the Kuban Seed Store makes 177,680 (as of 1 January 1995).

The active germplasm collection is held at VIR Headquarters in St.Petersburg.

The seed store occupies the rear part of 2 floors of the main VIR building.

There is no special insulation on the store rooms, but the building is very old with thick walls and so keeps cool. There is a refrigeration system and the temperature is regulated to about +7°C. There is no humidity control and relative humidity varies from 60% in summer to 45% in winter.

Curating of the working collections is the responsibility of individual Crop Departments. The samples are stored in paper envelopes and packed inside non hermetic tin boxes. Some samples are packed in small (30 to 50ml) sealed glass bottles. The sample containers are labelled with the VIR catalogue number and other passport descriptors. Vegetable crops, many of which store poorly, have 9 to 14% moisture contents and longevities of 2 to 10 years, depending on the species. Wheat and barley are stored from 10 to 15 years before needing regeneration.

Viability testing prior to storage and viability monitoring during storage of the working collections is undertaken by the Seed Science Laboratory in the St.Petersburg main building, but only at the request of the Crop Department. Test samples of 200 seeds are prepared by the individual Departments and passed to the Laboratory. Both % germination and speed of germination are tested. The threshold for regeneration is 50% of initial viability.The documentation on the accessions in storage held by the Seed Laboratory is in the same format and uses the same descriptors as at the Kuban. New regenerations of an accession are stored separately and identified by their place and date of regeneration. The information on different regenerations of the same accession are recorded separately.

Recently, 12 horizontal freezing chambers (6,00 l capacity each, with 10°C storage temperature) have been purchased at the USAID expense via IPGRI and put into operation at VIR Headquarters for storing working collections of the Crop Departments.

Vegetatively propagating crops are maintained and studied at the VIR's experiment stations. The stone fruit and quince collections at Krymsk Station are the largest and most important in Russia and the former USSR. Of the 9,000 accessions of Prunus, about 5,000 to 6,000 are wild species and forms, 500 to 1,000 local varieties, and 2,000 to 3,000 cultivars and breeding materials.

The collection is rich in wild species and spontaneous hybrids from the Caucasus (where the natural habitats are now under threat from war) and the Far East, assembled mainly through collecting expeditions. The collection is judged to be more or less complete for material from the territory of the former USSR.

Maikop holds the major apple and pear collections in the VIR system, including unique wild Malus and Pyrus. The wild apple collection comprises 136 accessions of about 20 species from the American, Caucasian and Chinese centers of diversity, and the wild pear, 140 samples of about 32 species from the Caucasus, Syria, Turkey, the Mediterranean, Japan and China. The cultivar collections at Maikop include 2,400 apples and 1,127 pears, but the most comprehensive varietal collections are at the former VIR station of the Crimea. Maikop also holds an important collection of hazelnut, as well as some Prunus material.

The Volgograd Station has cultivar collections of apple, pear, plum, apricot and other fruits of the Volga region. The Pavlovsk Station near St.Petersburg is the principal quarantine station for fruit germplasm in the system, and it also maintains collections of apples, pears, Prunus, strawberry and raspberry.

A number of other stations in the VIR system hold collections of local fruits, for example the Zeya Station for Siberian berries, raspberries and strawberries, the Polar Station for arctic berries, and the Far East station near Vladivostok for Chinese gooseberry, grapes and fruits of the east.

The local varieties, wild species and spontaneous forms in the VIR fruit and nut collections have been acquired primarily through exploration.

Preservation of fruit and nut tree germplasm is in the form of fruiting orchards with each accession represented by 3 to 5 trees. Maintenance in this manner is labour intensive and costly. The orchards both at Krymsk and Maikop were

established 30 years ago and consequently, a number of the trees are aged and in need of repropagation. Furthermore, the wild and landrace material is not conserved in duplicate within the system elsewhere.

The need to rejuvenate the collections and duplicate them has fallen at a time of severe cuts in funding and staff. The curators of the collections were concerned that they would not be able to guarantee the preservation of the collections to the same standards as in the past, without additional funding.

At Krymsk Station, a start has been made to repropagate the trees and establish them in non fruiting dense plantations. This type of plantation has lower maintenance requirements, reduced land needs an provides a constant supply of good sized cuttings for sale to offset maintenance costs. However, without financial assistance, the station cannot complete the transfer of aged material into low maintenance plantations. Maikop and Volgograd face these same economic problems with maintaining and rejuvenating their collections. However, at Maikop dense planting is not so favoured because of problems experienced with grafting onto dwarfing rootstocks on the Maikop soils. The station would prefer to develop in vitro conservation.

Other crops held as living collections, but at former stations of VIR, are cotton at the Central Asian Station, Uzbekistan, and groundnuts at the Turkmenian station at Kara Kala (Garrygala), Turkmenistan. The cotton varieties that are adapted to Russian conditions have been duplicated at the stations of Daghestan and Astrakhan, but the majority of the industrial varieties remain in Uzbekistan. About half of the total VIR cotton collection is held in seed form in the base collection at the Kuban Seed Store. The groundnut collection has been partly duplicated in Daghestan and Krasnodar, but 70% remains unduplicated in Turkmenistan because it cannot be grown in Russian environments.

6.1 DOCUMENTATION

As for the rate of computerized databases development at VIR, the picture is as follows:

- Passport data: until now, 150,000 of 340,000 accessions are documented in a computerized form. Until the end of 1995, the main task is to computerize all available passport data.
- Characterization data are not yet computerized.
- Evaluation data are not yet available in a computerized form.
- Management data (germinability, stock, etc.) are not stored/not available in computerized form. Information about storage is not stored in computers.

- Other data: auxiliary data such as code tables and lists of addresses are available although not in a well structured and consistent way.

All characterization and evaluation data is traditionally published in catalogues and books; catalogues are usually prepared by typewriters, on card files or other manual forms.

Information is generally exchanged in printed form (catalogues, etc.).

Sometimes, information is exchanged in electronic files.

Creation of international databases was started in the mid 1970's within the framework of the regional international programme of the COMECON countries. As a result, a unified system of the "International COMECON Lists of Descriptors" has been developed. These lists were devised for individual crops and included passport data and descriptive part, the latter containing information about morphological characters, biological properties, resistance to diseases and pests, yielding ability, chemical composition, technological quality of the main product, etc. All in all, from 1974 till 1991 such lists have been published for 42 crops. Later this work was stopped due to the termination of existence of COMECON.

At present, there are several European project of technical support to VIR that are related to documentation and information of plant genetic resources; (1) the German project "Technical support to VIR in the field of documentation and information of plant genetic resources" which is coordinated by ZADI, Bonn (*1994 1996*) and (2) the Dutch project "Technical support to eastern European genebanks to improve access of privatized plant breeding to germplasm collections" which is coordinated by CGN, Wageningen (*1994 1996*).

Besides, VIR collaborates with USDA ARS, Beltsville, USA, ECP/GR, and the University of Aachen, Germany, in related fields.

6.2 REGENERATION

Which accessions to regenerate and when is decided by the individual Crop Departments. All regeneration is carried out on samples taken from the working collection in St.Petersburg. The subsamples for regeneration are prepared and despatched by departments themselves.

The sample batches for regeneration are distinct from those sent out for study. There is no periodic regeneration of the working collection from the base collection. Accessions for storage in the base collection at Kuban are regenerated especially.

The primary criteria used in deciding when to regenerate an accession are whether enough seed is available for distribution, the year of its last regeneration and the known life span of the species in storage.

The viability of samples in the working collection is tested, but only at the request of the Crop Department. There is no routine, consistent and comprehensive monitoring of samples in storage.

All 12 regional stations carry part of the regeneration load. The station at which an accession is regenerated depends largely on its zone of agroecological adaptation, but also on the station's specialization. The number of samples that a station is required to regenerate is laid down in an agreement that is drawn up every year between the station and VIR headquarters. With the loss of stations from the system, there has been a need to redistribute the regeneration workload. Some of the existing stations have now to handle more accessions and regenerate crops outside their original specialization. However, some former VIR stations have agreed to continue to regenerate VIR collections and deposit the seed in St.Petersburg even though they receive no funds from VIR. The stations return the regenerated seed to the relevant Crop Department. Samples harvested in August are received the following November to February.They are sent by post, train or hand delivered.

Linked to the regeneration process is a procedure for checking the integrity of the regenerated sample. The checking is carried out at those stations with special responsibility and expertise for certain crops. The sample batches are distinct from those for regeneration and study. The plants are grown out over one year and their morphology checked against the initial description of the sample made at the time of quarantine. The results are transmitted to the Crop Department and if the regeneration does not correspond with the original sample, it is discarded and the original resent for regeneration. This checking process is aimed at identifying regenerations where there has been marked phenotypic shift due to physical mixing or crossing during reproduction.

The number of plants used to regenerate an accession varies between crops and stations. For wheat and barley, sample size is 50 or 100 and for maize, from 10 to 20. In the case of outcrossing vegetable species, the number of plants ranges from 10 to 40. The quantity of seed required was stated as a principal factor in setting sample size. Much of the workload is on homogenous advanced cultivars. Heterogenous samples such as landraces, have gener-

ally been subdivided. At the time of regeneration there may also be some selection for example in biennial crops such as onion and cabbage where the best plants are retained for the second year.

The regeneration plots are harvested by hand and in the case of vegetables, as the fruits ripen. Seed harvested from the regeneration plots is dried conventionally in the sun and when judged to be dry, threshed, cleaned, and packed in paper for return to the relevant Crop Department in St.Petersburg. Seed moisture content is not measured. Lack of equipment and labour is jeopardising seed conservation and regeneration standards and as a consequence, the genetic integrity of the collections. Every cycle of regeneration increases risks to the genetic integrity of the material and the costs involved, thus the frequency should be kept to a minimum.

As a result of the poor financial situation staff losses have been increasing, particularly in the technical and field assistants grades.

ANNEX 7

Experiment stations of the institute and collections maintained by them

Name of the Exp.Station	Main depart-ments	Main areas of research	Seed accessions reproduced	Vegetatively propagated accessions maintained
Polar Station	Laboratories of potato Vegetables Forages Small Fruits	Preservation of Potato and small fruit collections assessment of plant productivity under low positive temperatures and long daylight chemical composition winter hardiness	Potato 2,549 vegetables 22 forages 46 cereals 2	Berries 191 perennial ve-getables 14
			TOTAL:2,619	**TOTAL: 205**
Pavlovsk Station	Laboratories of Fruit and Ornamental Plants; Forage Crops	Collection maintenance in viable conditions; ecological study; analysis of resistance to biotic and abiotic environmental factors and chemical composition	Forages 600 ornamentals 128	Fruits and berries 4,043
			TOTAL: 728	**TOTAL:4,043**
Moscow Division	Laboratories of Wheat; Fodder Cereals and Legumes; Potato; Forages; Vegetables; Biochemistry;. Genetics & Physiology; Immunology	Germplasm maintenance in viable conditions; ecological study; studying of wheat frost resistance genetics; research on plant immunity and chemical composition	Cereals 2,000 legumes 654 potato 850 forages 370 vegetables 1,204	Actinidia and magnolia vine 178
			TOTAL: 5,078	**TOTAL: 178**

Name of the Exp. Station	Main depart-ments	Main areas of research	Seed acces-sions repro-duced	Vegetatively propagated accessions maintained
Ekaterinino Station	Laboratories of Leguminous Forage and Industrial Crops	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study	Cereals 1,700 Small grains 220 Legumes 1,550 Industrial 300 Forages 660	
			TOTAL:4,430	
Volgograd Station	Laboratories of Vegetables; Fruits, Cereals and Forage Crops	Collecting of local plant forms; germplasm maintenance in viable conditions ecological study analysis of heat resistance and chemical composition under irrigation	Cereals 1,800 Maize 300 Vegetables and melons 1,516	Fruits; berries and grapes 3,508
			TOTAL:3,741	**TOTAL: 3,508**
Astrakhan Station	Laboratories of Melon Crops; Vegetables; Small Grains; Forages	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study; analysis of heat resistance and chemical composition	Small grains 1,200 Forages 69 Legumes 610 Industrial 15 Vegetables 508	
			TOTAL:2,402	
Krymsk Station	Laboratories of Solanum spp Legumes Cucumber and; Vegetable Maize ; Fruits; Immunology; Biotechnology; Biochemistry	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study ; studying of plant immunity; *in vitro* propagation of fruit and berry plants; breeding of cultivars and hybrids	Vegetables 1,225	Fruits and berries 9,177
			TOTAL: 1,225	**TOTAL: 9,177**

Name of the Exp. Station	Main departments	Main areas of research	Seed accessions reproduced	Vegetatively propagated accessions maintained
Kuban Station	National Seed Store. Dept. of Plant Resources (industrial wheat, forage grasses, leguminous, barley oat); Depts of Maize; Sorghum; Sunflower; Melon Crops	Collecting of local plant forms; long term germplasm storage; collection maintenance in viable conditions; ecological research; biochemical research; genetics of valuable characters; heterosis breeding of maize and sorghum cultivars	Cereals 2,100 Legumes 4,020 Maize and sorghum 3,300 Industrial 1,660 Forages 600 Melons 350	
			TOTAL: 12,840	
Maikop Station	Laboratories of Vegetables Fruits; Field; Crops; Biochemistry; Immunology	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study; biochemical research; disease resistance studies	Cereals 639 Tubers 1,025 Forages 70 Vegetables 4,034 Industrial Cruciferae 130	Fruits and berries 6,165
			TOTAL: 5,898	**TOTAL: 6,165**
Daghestan Station	Laboratories of Wheat, Triticale, Barley and Oat; Genetics; Vegetables; Fruits and Grapes	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study wheat and triticale genetics studies; obtaining of new plant forms by means of remote hybridization	Cereals 5,834 Vegetables 258	Grapes 463 Fruits 44
			TOTAL: 6,092	**TOTAL: 507**

Name of the Exp.Station	Main depart-ments	Main areas of research	Seed acces-sions repro-duced	Vegetatively propagated ac-cessions main-tained
Zeya Station	Laboratory of Plant Resources (cereals, forages, berries, vegetables; potato)	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study; analysis of chemical composition	Cereals 356 Legumes 94 Forages 51 Potato 16	Forages 99 Fruits and berries 626
			TOTAL: 517	**TOTAL: 725**
Far East Station	Laboratories of vegetables; and grapes field crops (wheat,barley, foragegrasses)	Collecting of local plant forms; germplasm maintenance in viable conditions; ecological study; analysis of chemical composition	Legumes 1,407 Industrial 74 Vegetables 120	Fruits, Berries Fruits, berries and grapes 1,872
			TOTAL: 1,601	**TOTAL: 1,872**

ANNEX 8

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994

No	Countries	Cereals	Small grains	Grain legumes	Vegetables	Melons	Total
1	Algeria	2					2
2	Argentina	30			1		31
3	Australia	62	5	100	2		169
4	Austria	34	1				35
5	Bangladesh		2				2
6	Belgium	5	1	9	17		32
7	Brazil	4	1	2	23		30
8	Bulgaria	11	16	19		1	47
9	Byelarus	8		13			21
10	Canada	76	2	18	51	35	182
11	Chile	28		4	9		41
12	China	3	23	5	12	6	49
13	Costa Rica		4	122	116	41	283
14	Cyprus						
15	Czechia	194	3	15	1		213
16	Denmark	13		2	7		22
17	Ecuador		99	9			108
18	Egypt	1,500	83	75	51	9	1718
19	Finland	2		2	4		8
20	France	462	9	134	62	12	679
21	Germany	577	28	1	28		634
22	Ghana						
23	Guinea			3			3
24	Hungary	12	5	124	38		179
25	India	16	781	146	2	4	949
26	Indonesia			6			6
27	Ireland						
28	Iran	1					1
29	Israel	55			5	6	66
30	Italy	11	12	5	16		44

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Cereals	Small grains	Grain legumes	Vegetables	Melons	Total
31	Japan	123	4	4	185	148	464
32	Kazakhstan	1					1
33	Kenya		39				39
34	Korea (South)	14	7	1	49	18	89
35	Lithuania						
36	Madagascar			9			9
37	Mexico	1,784	118	152	8	2	2,064
38	Moldova			36			36
39	Monaco						
40	Mozambique			6			6
41	Netherlands	57		4	265	33	359
42	New Zealand	35			1		36
43	Nigeria		1				1
44	Norway	2		4	30		36
45	Peru		31	39			70
46	Philippines		60				60
47	Poland	72	2	128	40		242
48	Portugal	52	64	435	99	18	668
49	Rumania	18		3			21
50	Saudi Arabia						
51	Senegal		4				4
52	Singapore			9			9
53	South Africa						
54	Spain	41					41
55	Sudan		2				2
56	Sweden	266	1				267
57	Switzerland	13	1	1	8	3	26
58	Syria	1,460		211			1,671
59	Taiwan			2	49	28	79
60	Tunisia			30	3		33
61	Turkey	146		3	6		155
62	Ukraine	107		46	2		155

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Cereals	Small grains	Grain legumes	Vegetables	Melons	Total
63	United Kingdom	83	3	24	106		216
64	U.S.A.	764	347	749	358	99	2,317
65	Uzbekistan	3			3		6
66	Vietnam	141	204	441	134	61	981
67	Yemen		3		3		6
68	Yugoslavia	8		10			18
69	Zimbabwe		27				27
	TOTAL	**8,296**	**1,993**	**3,161**	**1,794**	**524**	**15,768**

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Tuber crops	Forage crops	Subtropi calcrops	Fruit crops	Indust rial crops	Total
1	Algeria						
2	Argentina						
3	Australia	2	38	1	13	1	55
4	Austria	3	1			21	24
5	Bangladesh						
6	Belgium		6		3	18	27
7	Brazil	4		2	1	31	38
8	Bulgaria						
9	Byelarus		1			1	2
10	Canada	4	16		9	4	33
11	Chile						
12	China						
13	Costa Rica	32	3	14	8	28	85
14	Cyprus	1					1
15	Czechia	4	38			4	46
16	Denmark					4	4
17	Ecuador						
18	Egypt			5	4	20	29
19	Finland		6		26	6	38
20	France	8	177	1	41	25	252
21	Germany	114	84	1	5	73	277
22	Ghana					2	2
23	Guinea						
24	Hungary		2		5	11	18
25	India					12	12
26	Indonesia						
27	Ireland					3	3
28	Iran						
29	Israel					1	1
30	Italy		5	6	4	17	32
31	Japan	1	4	1	15	23	44

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Tuber crops	Forage crops	Subtro pical crops	Fruit crops	Industrial crops	Total
32	Kazakhstan						
33	Kenya						
34	Korea (South)				2		2
35	Lithuania						
36	Madagascar					4	4
37	Mexico	1	1	3	1	1	7
38	Moldova						
39	Monaco					1	1
40	Mozambique						
41	Netherlands	28	26			4	58
42	New Zealand		1				1
43	Nigeria						
44	Norway				22	9	31
45	Peru	8				7	15
46	Philippines						
47	Poland	2			2	7	11
48	Portugal	2	46	8	9	29	94
49	Rumania					24	24
50	Saudi Arabia						
51	Senegal						
52	Singapore						
53	South Africa		1			1	2
54	Spain	3				2	5
55	Sudan						
56	Sweden						
57	Switzerland	5	15		6	14	40
58	Syria						
59	Taiwan			2			2
60	Tunisia		18				18
61	Turkey						
62	Ukraine		2				2

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Tuber crops	Forage crops	Subtropical crops	Fruit crops	Industrial crops	Total
63	United Kingdom		62		70	19	151
64	U.S.A.	114	76	15	609	107	921
65	Uzbekistan		1				1
66	Vietnam	13		1	3	31	48
67	Yemen					1	1
68	Yugoslavia						
69	Zimbabwe						
	TOTAL	**349**	**629**	**60**	**858**	**566**	**2,462**

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992-1994 (continued)

No	Countries	Oil crops	Ornamental	Other	Total
1	Algeria				
2	Argentina				
3	Australia		3		3
4	Austria				
5	Bangladesh				
6	Belgium		2	3	5
7	Brazil				
8	Bulgaria	6			6
9	Byelarus		1		1
10	Canada		81		81
11	Chile				
12	China				
13	Costa Rica	1	14	13	28
14	Cyprus				
15	Czechia	3			3
16	Denmark				
17	Ecuador				
18	Egypt		1		1
19	Finland	8			8
20	France	97	3	8	108
21	Germany	22	42	23	87
22	Ghana				
23	Guinea				
24	Hungary		2	2	4
25	India	7			7
26	Indonesia				
27	Ireland				
28	Iran				
29	Israel				
30	Italy	1	1		2
31	Japan		2	8	10

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992 -1994 (continued)

No	Countries	Oil crops	Ornamental	Other	Total
32	Kazakhstan				
33	Kenya				
34	Korea (South)				
35	Lithuania	45			45
36	Madagascar				
37	Mexico			1	1
38	Moldova				
39	Monaco				
40	Mozambique				
41	Netherlands		10		10
42	New Zealand				
43	Nigeria				
44	Norway		6	2	8
45	Peru				
46	Philippines				
47	Poland			2	2
48	Portugal	2	19	9	30
49	Rumania				
50	Saudi Arabia			2	2
51	Senegal				
52	Singapore				
53	South Africa	6			6
54	Spain	3			3
55	Sudan				
56	Sweden				
57	Switzerland	2			2
58	Syria				
59	Taiwan				
60	Tunisia			7	7
61	Turkey				
62	Ukraine				

Data on the number of seed and planting samples received by VIR from foreign countries and C.I.S. republics in 1992 -1994 (continued)

No	Countries	Oil crops	Ornamental	Other	Total
63	United Kingdom		38	20	58
64	U.S.A.	10	14	7	31
65	Uzbekistan				
66	Vietnam	11		4	15
67	Yemen				
68	Yugoslavia				
69	Zimbabwe				
	TOTAL	**224**	**239**	**111**	**574**

ANNEX 9

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Cereals	Small grains	Grain legumes	Vegeta bles	Melons	Total
1	Argentina		19	17	6		42
2	Australia	32		16	5	2	55
3	Austria		2				2
4	Azerbaijan			35			35
5	Belgium	23	18	21			62
6	Bulgaria		2				2
7	Byelarus	6	31	20			57
8	Canada	13	2				15
9	China	57	17		80	110	264
10	Costa Rica	5	16	68	77	59	225
11	Cote d'Ivoire		4				4
12	Czechia	117	43		3	2	165
13	Egypt	13	5		6		24
14	Estonia	34					34
15	Finland						
16	France	17	16		1		34
17	Germany	47	54	21	52	1	175
18	Greece		2				2
19	Hungary	38	2				40
20	India		8	7	69	1	85
21	Iran				9		9
22	Israel			2		11	13
23	Italy	70	4	32		1	107
24	Japan	19	12	50	99	56	236
25	Kazakhstan						
26	Korea (North)						
27	Korea (South)	34	13	20	9	20	96
28	Latvia						
29	Lithuania						
30	Mexico		889		95		984

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Cereals	Small grains	Grain legumes	Vegetables	Melons	Total
31	Moldova			210			210
32	Mongolia	17					17
33	Netherlands	1	3		101		105
34	New Zealand				6		6
35	Poland	22	13	106			141
36	Portugal	28	2	12			42
37	Rumania	6	2				8
38	Spain	8	17		22	14	61
39	Sweden	1					1
40	Syria	55					55
41	Tunisia				8	7	15
42	Turkey						
43	Turkmenistan	480					480
44	Ukraine		8				8
45	United Kingdom			35			35
46	U.S.A.	404	73	26	44	26	573
47	Uruguay	12					12
48	Uzbekistan	560	278	416	2	126	1,382
49	Vietnam				104		104
50	Yugoslavia	33	2		31		66
	TOTAL	**2,152**	**1,557**	**1,114**	**829**	**436**	**6,088**

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Tuber	Forage crops	Subtro-pical crops	Fruit crops	Industrl crops	Total
1	Argentina					11	11
2	Australia						
3	Austria						
4	Azerbaijan						
5	Belgium						
6	Bulgaria						
7	Byelarus						
8	Canada		5				5
9	China					16	16
10	Costa Rica	10	11			40	61
11	Cote d'Ivoire						
12	Czechia	39	2		10		51
13	Egypt						
14	Estonia	9					9
15	Finland		51		11		62
16	France				6		6
17	Germany		36			23	59
18	Greece						
19	Hungary		5				5
20	India						
21	Iran						
22	Israel						
23	Italy					44	44
24	Japan		234		200	2	436
25	Kazakhstan	100	242				342
26	Korea (North)	31					31
27	Korea (South)	6			12		18
28	Latvia					16	16
29	Lithuania						
30	Mexico						

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Tuber	Forage crops	Subtro-pical crops	Fruit crops	Industrl crops	Total
31	Moldova						
32	Mongolia						
33	Netherlands					18	18
34	New Zealand		6			5	11
35	Poland					6	6
36	Portugal						
37	Rumania					85	85
38	Spain		11		6	4	21
39	Sweden		13				13
40	Syria						
41	Tunisia						
42	Turkey					21	21
43	Turkmenistan				29	31	60
44	Ukraine					42	42
45	United Kingdom	3	80		10		93
46	U.S.A.		423		85	44	552
47	Uruguay						
48	Uzbekistan					65	65
49	Vietnam						
50	Yugoslavia		3				3
	TOTAL	**198**	**1,122**		**369**	**473**	**2,162**

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Oil crops	Ornamental	Other	Total
1	Argentina	18			18
2	Australia				
3	Austria				
4	Azerbaijan				
5	Belgium	62			62
6	Bulgaria				
7	Byelarus	8			8
8	Canada				
9	China				
10	Costa Rica				
11	Cote d'Ivoire				
12	Czechia	3			3
13	Egypt				
14	Estonia				
15	Finland				
16	France				
17	Germany				
18	Greece				
19	Hungary				
20	India	16			16
21	Iran				
22	Israel				
23	Italy	4			4
24	Japan	3			3
25	Kazakhstan				
26	Korea (North)				
27	Korea (South)				
28	Latvia				
29	Lithuania	6			6
30	Mexico				

Data on the number of seed and planting semples sent by VIR to foreign countries and C.I.S. replics in 1992-1994

No	Countries	Oil crops	Ornamental	Other	Total
31	Moldova				
32	Mongolia				
33	Netherlands	31			31
34	New Zealand				
35	Poland				
36	Portugal				
37	Rumania				
38	Spain				
39	Sweden				
40	Syria				
41	Tunisia				
42	Turkey				
43	Turkmenistan				
44	Ukraine				
45	United Kingdom	5			5
46	U.S.A.	55	1	5	61
47	Uruguay				
48	Uzbekistan	13			13
49	Vietnam				
50	Yugoslavia				
	TOTAL	**224**	**1**	**5**	**230**

ANNEX 10

Joint international collecting missions, performed by Vir in 1990-1994

	Year	Participant countries	Crops collected	Regions explored
1	1990	Czechoslovakia Bulgaria Poland	Forage crops	Kazakhstan
2	1990	Netherlands	Wild Beta spp.	Armenia Daghestan
3	1990	USA	Fruit plants	Uzbekistan Turkmenia Kazakhstan Tadjikistan
4	1990	Great Britain Israel	Wild legumes	Turkmenia Tadjikistan Uzbekistan Kirghizia
5	1991	Great Britain USA	Grain legumes	Tadjikistan Uzbekistan Kirghizia
6	1991	Netherlands	Wild Beta spp.	Georgia Daghestan
7	1991	Syria	*Aegilops* spp.	Uzbekistan Turkmenia
8	1991	Japan	Forage crops	Far East Sakhalin
9	1992	Japan	Forage crops	N.Caucasus Lower Volga
10	1992	Japan	Fruit plants	Uzbekistan Kirghizia Kazakhstan
11	1992	USA	Forage crops	Kazakhstan Altai
12	1992	Finland	Small fruits	Leningrad Reg.

	Year	Participant countries	Crops collected	Regions explored
13	1993	Japan	Cereals	Turkmenia Uzbekistan
14	1993	Japan	Vegetables	Uzbekistan Kazakhstan Kirghizia
15	1993	Japan	Leguminous crops	Uzbekistan Kirghizia
16	1994	Japan	Leguminous crops	N.Caucasus Krasnodar Reg.
17	1994	Japan	Ornamental plants	Uzbekistan Kazakhstan

ANNEX 11

International scientific and technical cooperation of the Vavilov Institute

No.	Country	Topic of cooperation	Foreign partner	Term	Level of cooperation
1	Belgium	Introduction, studying and oreservation of Fragaria L. and Prunus genetic resources in Western Europe and Russia	Station de Cultures Fruitieres et Maraicheres, Gembloux	1994 1997	Institutional
2	Great Britain	Introduction, studying and preservation of pome gruit germplasm (apple, pear) in Great Britain and Russia	Wye College, University of London	1993 1996	Institutional
3	Hungary	Studying of vegetable crops and their further utilization in breeding practice	VETOMAG, Szentes	1993 1995	Governmental
4	Germany	(1) Collecting and utilization of leguminous crops	Institute of Crop Science (FAL), Braunschweig	1989 1995	Governmental
		(2) Utilization of PGR for stress resistance and quality of cereals and potato	Institute of Crop Breeding, Gross Luezewitz	same	same
		(3) Molecular genome analysis of barley and rye for identification of new resistance sources	Institute of Plant Genetic Resistance, Gruenbach	same	same
		(4) Morphogenetical assessment of cereals	IPK, Gatersleben	same	same
		(5) Documentation and information	ZADI, Bonn	same	same
5	India	Joint projects in the sphere of PGR within the framework of the Swaminathan Foundation	Swaminathan Research Foundation	1991 n/a	Institutional

No.	Country	Topic of cooperation	Foreign partner	Term	Level of cooperation
6	China	Introduction, studying and utilization of East Asiatic Prunus spp. in China and wild spp. in Russia	University of Sichuan Province	1992 1995	Governmental
7	Republic of Korea	Studying of plant genetic resources	Rural Development Centre (National Genebank), Suweon	1992 1997	Institutional
8	Netherlands	(1) Studying and utilization of PGR of vegetable crops	CGN, Wageningen	1989 1995	Governmental
		(2) Establishment of joint databases	CGN, Wageningen	1995	Governmental
		(3) Studying of vegetable crops	"Royal Sluis", Enkhuizen	1993	
9	Poland	(1) Cooperation in the sphere of exchanging information on the stock of genetic collections of Linum *spp.*	Institute of Natural Fibres, Poznan	1993 1995	Institutional
		(2) Agreement on joint activities on grain legumes	Institute of Plant Genetics, Poznan	1990 1995	Institutional
10	USA	Special Agreement of cooperation between VIR and USDA/ARS	USDA/ARS	1992 1995	Institutional
11	Finland	(1) Introduction, studying and preservation of fruit and small fruit plants in Finland and Russia	Institute of Fruit Growing, Pikkio	1992 1995	Institutional
		(2) Introduction and domestication of rare small fruit plants	Agricultural Centre, Lapperanta	1993 1995	Institutional

No.	Country	Topic of cooperation	Foreign partner	Term	Level of cooperation
12	Sweden	(1) Introduction, studying and preservation of fruit, small fruit and ornamental plants in Sweden and Russia	Dept. of Horticultural Crop Breeding, Swedish University of Agr.Sci., Kristianstand	1994 1998	Governmental
		(2) Wide hybridization of cereal crops. Molecular research on plant genetic diversity	Swedish Royal Academy of Agricultural Sciences	1993	Governmental
13	Japan	(1) Exchange and mutual replenishment of national PGR collections	NIAR, Tsukuba	1990 1995	Institutional
		(2) Joint agriecological trials of vegetable crops	TAKII Company	1993 1995	Governmental
		(3) Creation of cold hardy breeding materials	Hokkado Experiment Station	1994 1997	

There are also several agreements on various spheres of PGR research with the countries of the former Soviet Union:

1. Moldova (Moldavia)
2. Turkmenistan
3. Uzbekistan
4. Ukraine
5. Lithuania
6. Kazakhstan
7. Estonia