TURKMENISTAN:

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

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Note by FAO

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CHAPTER 1
Introduction: Characteristics of the Country and its Agricultural Sector

Turkmenistan is situated in the western part of Central Asia between 35°08' and 42°48' North and 52°27' and 66°41' East. The country occupies the area of 488.1 thousand sq. km. Its population according to the latest data (1995) amounts to 4.5 mln.

The territory of Turkmenistan stretches from West to East spanning 1,100 km and makes 650 km from North to South.

Turkmenistan borders on Kazakhstan in the North, Uzbekistan in the East and North-East, Iran in the South and Afghanistan in the South-East. The shores of the Caspian Sea make the western border of the country. The northern and central areas of Turkmenistan are occupied by sandy deserts of Turan Lowland: Central, Zaunguz, and South-Eastern Kara Kum (about 80% of the country's total territory). These sandy deserts approach hillside areas and Kopet Dagh foothills in the south and Paropamisus foothills (Badkhyz and Kara Bil highlands) in the south-east.

The climate of Turkmenistan has specific features associated with the particularities of its geographic situation, surface relief and atmosphere circulation. Typical for Turkmenistan are continental subtropical climate conditions: summers are very hot, dry and cloudless; and winters are humid and rather cold.

Annual duration of sunshine exceeds 3,000 hours. The absolute minimum of air temperature is 46°-47°C with the lower limit of 50°C (Repetek). Absolute maxima on the soil surface in most areas exceed +70°C.

The greater part of the country's territory has a yearly mean value of rainfall of approximately 100 mm.

The most humid places are in the Alpine zone of Kopet Dagh with the rainfall level of about 400 mm.

Greater part of the population are concentrated in the areas of irrigated lands in the southern and northern parts of the country.

The utilized area of irrigated lands in Turkmenistan is about 1.5 mln ha. For the most part these lands are meadow and takyr soils or light sierozem (the areas are as follows: grey-brown soils - 6.1 mln ha; takyr-like soils - 2.6 mln ha; sandy desert soils - 10.0 mln ha; residually meadow soils - 75,000 ha; meadow-takyr 24,000 ha; meadow soils - 64,000 ha; marshy soils - 25,000 ha; solonchaks - 2.3 mln ha; dark sierozems - 430,000 ha; cinnamon-coloured mountainous soils - 300,000 ha; meadow sierozems - 120,000 ha; weakly fixed and shifting sands - 3.7 mln ha; steep precipices and ledges - 200,000 ha).

In the areas of promising irrigation improvement there are about 5.5 mln ha of virgin lands suitable for ploughing.

The basis of agriculture is irrigated crop production. The population is also skilled in original techniques of non-irrigated farming but its portion in the total agricultural production is at present insignificant. Table 1 presents basic data of agricultural crop production.

Crop or a group of crops	Cultivation areas (ha)	Annual of crops harvest (t)
Cotton	600,000	1,300,000
Cereals (wheat, barley, maize, rice, sorghum)	600,000	1,000,000
Fruit and small-fruit plants (plum, apple, pear, apricot, Persian walnut, cherry, almond, peach, grapes, dewberry, pistachio, pomegranate)	60,000	120,000
Vegetables (onion, cabbage, potato, beet, tomato, cucumber, melon, watermelon, eggplant, carrot)	24,708 (1992)	273,000 (1992)
Melon crops	26,069 (1992)	

Up to the present moment cotton production has been aimed at exporting raw materials (mainly cotton fibre). Now tremendous efforts are being undertaken to process cotton products within the country.

The remaining part of crop production is earmarked for national demands. Products of horticulture, viticulture and melon production are exported only on a small scale.

Forests in Turkmenistan are few. Major types of forests are mountainous, desert, riparian woodlands and shelterbelt afforestation.

1.1 MOUNTAINOUS FORESTS

They occupy 5 mln ha or 10% of the total territory of the country. There are forests on Kopet Dagh, Kugitang and partly on the Balkhans. Basically they grow in the upper parts of these mountainous regions and occupy the total area of 497,000 ha, including 102,200 ha directly covered with forest trees. An average stock of wood at the forest-covered areas is estimated 17.5 cubic m per hectare.

The following plants are typical for mountainous forests: Central Asian juniper, pistachio, ash, maple, oleaster, Jerusalem thorn, almond, walnut, elm of different kinds and other trees. Juniper groves cover 73,300 ha, while pistachio groves occupy 81,620 ha.

1.2 DESERT FORESTS

The most valuable massifs of desert forests are under forest management in the total area of 14,221,000 ha. Woodlands occupy 12,506,000 ha (88%), including forest-covered lands of 4,535,000 ha and thin forest areas of 6,406,000 ha.

White saxaul is dominating in desert forests both in the area covered and in stock. Saxaul covers 3,655,000 ha with the total stock of wood of 1,776,000 cubic m. Cherkez and kandym trees occupy 41,000 and 4,000 ha respectively.

Black saxaul has the highest average stock per 1 hectare of the forest- covered area (2.43 cubic m); next is white saxaul (2.03 cubic m); kandym (1.3 cubic m); and Richter cherkez (0.9 cubic m).

1.3 RIPARIAN FORESTS

The total area of riparian woods amounts to 50,000 ha. In Amu Darya floodlands they are formed by two types of local poplars, as well as of oleaster and tamarisk.

By their habitat, composition and herbage riparian forests are divided in the following types: juncaceous riparian woodlands, licorice woodlands, dogbane woodlands, liana-bindweed woodlands, wheat-grass woodlands and tamarisk woodlands.

1.4 SHELTERBELT AFFORESTATION ON IRRIGATED LANDS

Artificial forest massifs and field-sheltering forestation belts on irrigated lands began to be established comparatively not very long ago. They were set up simultaneously with constructing large irrigation canals and water reservoirs and reclaiming new lands. In the ravines of Chuli and Firyuza there is an artificial oak-grove. The tendency towards increasing their acreage is developing: during the last two years the acreage under artificial forests was significantly expanded. The increase of acreage is first of all associated with the construction of the Kara Kum Canal.

The agricultural sector in Turkmenistan is mainly represented by collective farms, state farms and peasantry (daikhan) associations, with arable areas of 1,000 ha and even larger ones (up to several thousands of hectares) and animal breeding (sheep, cattle, poultry, etc.).

At present the private sector is being developed in the form of individual farms.

For supplying the state with seeds by official requests several farms specialize in seed production. Quality and varietal composition of seed materials is under control of state authorities.

The basic tendency in crop production, like in the whole national economy of Turkmenistan, is all-round privatization and development of private property in agriculture, individual farms and stock companies with an aim of reviving the market economy.

In recent years cotton industry, horticulture and melon crop production have been severely attacked by whitefly. In the plantings of late cabbage, cucumber and melons the losses in yield exceed 50%.

Tomato plantings are reported to show high incidence of tobacco mosaic viruses of various forms.

CHAPTER 2
Indigenous Plant Genetic Resources

Forest genetic resources important from social and economic viewpoints grow mainly in the mountains of Kopet Dagh and in river floodiands. In the ravines of Western Kopet Dagh (subtropical zone) quite numerous are groves of aboriginal wild fruit- and nut-bearing plants. They reproduce themselves by natural propagation, while some of them, such as pistachio, almond and Persian walnut, are reproduced artificially by sowing and grow up into highland forests on mountain slopes. Wild relatives of fruit crops are valuable genetic resources. A number of wild fruit species related to cultivated fruit- and nut-bearing crops, are now under a threat of vanishing and are protected in national reserves. For example, Syunt- Khasardagh natural reserve has been established in Western Kopet Dagh. All wild relatives of cultivated fruit plants and subtropical crops are now preserved in its territory (30,000 hectares).

2.1 WILD SPECIES AND WILD CROP RELATIVES

Of 2,500 species of angiospermous plants growing in Turkmenistan 1,700-1,800 *spp.* are focused in the Turkmenian part of Kopet Dagh where the country's major diversity of valuable plants (729 *spp.*) and wild crop relatives (106 *spp.*) is concentrated. According to our estimates the following useful species are available (including wild relatives):

fruit plants	41
vegetables, tuber plants, etc.	14
oil-bearing plants	5
essential oil-bearing plants	131
ornamental plants	142
medicinal plants, etc.	311

Many of these species are under the threat of complete vanishing and need protection. "The Red Book" of Turkmenistan includes 10 fruit *spp.*, 9 ornamental *spp.*, 2 forage *spp.* and 2 medicinal *spp.*

A lot of plant species are within the protected limits of national reserves and protected zones. Vanishing or decreasing of the number of species (genetic erosion) is unfortunately a reality already and has been connected with the increasing anthropogenic process. In the present political circumstances one should not expect quick improvement of the current situation and any external aid in healing the state of *in situ* conservation would be much appreciated.

Unfortunately in the last decade there appeared a tendency to cut down the areas of natural reserves and change the regime of national reserves into the one of local protected zones.

Even worse threat to mountainous ecosystems is associated with increasing the number of domestic livestock capita and progressing overgrazing. Transformation of Western Kopet Dagh into a national park, regulation of the number of cattle and restoration of the regime of pasturing in accordance with the ancient traditions of the Turkmenian people may in future stop the process of digression and genetic erosion.

In Western Kopet Dagh there is the eastern border of the area of Vitis sylvestris. The diversity of grape forms is the greatest in the ravines of Western Kopet Dagh where a rather variegated population have been developed from natural hybridization of *V. vinifera* and *V. sylvestris*. During the past 20 years most of the grape groves were examined and several thousands of specimens were described.

About 200 forms of theoretical and practical interest were reproduced and preserved at the Station. Many cases of intersexuality were discovered which may serve as a proof of the fact that grape forms with bisexual flower type had been developed from male plants.

While studying wild grapes it became possible to trace the origin of seedlessness through reducing seeds to their rudiments. Two seedless forms have been preserved at the Station.

The area of wild grapes in Kopet Dagh is now dwindling due to decreasing water yield of wellsprings, destruction of arboreal plants, grazing of livestock and fires. It may be possible to decelerate reduction of the number of vines by introducing a national reservation regime.

Especially large is the genetic diversity of wild fruit plants still existing in the ravines of Western Kopet Dagh. Their polymorphism is extremely great (in vegetative and generative organs, physiological traits, etc.).

In the plant diversity of Western Kopet Dagh-there are a lot of species exceptionally valuable as local sources of plant products (fruits, onion, spinach, etc.). The Turkmenian Experiment Station of Plant Genetic Resources (TES) maintains

316 useful plant species that makes 43.9% of their total number in Western Kopet Dagh (Table 2). Over 30,000 samples of valuable cultivated and wild plants are preserved in the country's plant genetic resources collections (Table 3).

2.1.1 Old local varieties and landraces

Collecting missions that explored the whole of Turkmenistan in 1962 and 1975 and Western Kopet Dagh in 1964-1994 showed that in the country's household orchards there are numerous local fruit varieties which have been fairly quickly vanishing being replaced by widely popular commercialized cultivars.

In Garrygala area local landraces of fig and pomegranate have been kept (many of them are of Iranian origin) as well as rather numerous domesticated forms taken from mountain ravines.

Local population value the local fruit genetic diversity and in general strive to preserve the foci of its concentration. Other wild relatives more often vanish due to overgrazing of domestic animals, fires, felling of trees in disordered forests, deterioration of the soil layer and resulting changes in the hydrological regime.

The local range of grape varieties amounts to 50 varieties stored and securely protected in the collections of TES.

In production plantings local varieties Terbash and Kara Uzyum Ashkhabadsky are dominating; they occupy over 60% of viticulture areas. These varieties became widely distributed due to their relative resistance to water deficiency, high temperatures, pests and diseases.

The Government of Turkmenistan encourages the use of these varieties because of their regular and high fruit bearing. All brands of Turkmenian wine are received from the harvest of these varieties.

A number of varieties have local distribution in the regions where they have performed better (Kaakhka, Nukhur, Geokcha, etc.).

Natural genetic diversity of wild fruit races in Western Kopet Dagh (the territory of Syunt-Khasardagh National reserve).

Studying genetic diversity of wild fruit forms in Western Kopet Dagh is of great practical and theoretical importance.

Special attention from the viewpoint of horticultural and botanical value should be paid to ecological monitoring of wild fruit plants.

The state of natural environments in Syunt-Khasardagh National reserve presently differs from other areas of the same region. Not only the landscape, but also the surface ecosystem and bio/geocoenotic cover of mountains and ravines undergo changes.

With this in view, development of ecological monitoring of wild fruit plants as one of the main bases for ecological forecasts is considered an vital scientific and practical task of the present time.

Ecological monitoring of wild fruit races in Western Kopet Dagh is regarded as fundamental scientific research.

Ecology of the distribution of wild fruit plants in Western Kopet Dagh is determined mainly by the particularities of water and temperature regimes in a certain habitat. In this aspect it is possible to identify two general ecological types of territories:

1. The bottom of ravines where lower winter temperatures and better moisturing conditions are typical (pear, apple, quince, grape, myrobalan plum, Persian walnut, etc.).
2. Ravine slopes with lower minima of winter temperatures and deficiency of water during the plant vegetation period (almond, pistachio, etc.).

Approximately 80 species of trees and shrubs grow in Western Kopet Dagh. 41 species of them (over 50%) are wild fruit races.

In the ravines of Western Kopet Dagh there are wild fruit, nut and grape species represented by diverse valuable forms (myrobalan plum, pear, plum, little cherry, apple, pomegranate, fig, jujube, hawthorn, almond, pistachio, Persian walnut, dewberry, grapes, etc.).

Implementation of ecological monitoring of the natural wild fruit diversity in Western Kopet Dagh preserved in the National reserve will provide for a possibility to obtain new, diverse and rich materials for the development of horticulture in Western Turkmenistan.

TABLE 2 Useful plants of Western Kopet Dagh maintained at the Turkmenian Experiment Station of Plant Genetic Resources (TES)

No.	Utilization groups	Number of *spp.*
1	Vegetables	5
2	Tuber crops	6
3	Textile fibre plants	3
4	Glue-producing plants	2
5	Resin and gum-producing plants	5
6	Pigment-producing plants	12
7	Tanning plants	5
8	Fat and oil-bearing plants	3
9	Insecticide and repellent plants	3
10	Plants used for wattling mats, etc.	1
11	Volatile oil-producing plants	7
12	Forage crops	12
13	Ornamental:	
	(a) trees and shrubs	8
	(b) grasses	70
14	Medicinal plants	172
TOTAL		***315***

TABLE 3 Composition of the plant genetic resources collections in Turkmenistan

Crop sections	Crop groups	Number of samples in TES*				Number of samples in other institutions		
			cultivated	wild	total IAgr*	IHVA*	CRBG*	total
I. Field crops	1. Cereals	551		551	1047			1598
	2. Industrial	831	34	865				865
	3. Vegetables & melons	206	11	217	102			319
	4. Forage	13	12	25				25
	5. Volatile oil and spicy	9	7	16				16
	6. Medicinal	11	172	183				183
	SUBTOTAL	**1621**	**236**	**1857**	**1149**			**3006**
II. Fruit crops	1. Fruits and nuts	1431		1431		467		1898
	2. Subtropical fruits	1760		1760				1760
	3. Berries	39		39				39
	4. Grapes	988		988		186		1174
	SUBTOTAL:	**4218**		**4218**		**653**		**4871**
III. Ornamental plants	1. Trees	137	8	145			1750	1895
	2. Succulents	564		564			95	659
	3. Flowers	12	70	82			208	290
	SUBTOTAL:	**713**	**78**	**791**			**2053**	**2844**
	TOTAL:	**6552**	**314**	**6866**	**1149**	**653**	**2053**	**10721**

*TES - Turkmenian Experiment Station of Plant Genetic Resources; **IAgr** - Institute of Agriculture; **IHVA** - Institute of Horticulture, Viticulture and Agrosilviculture; **CRBG** Central Republican Botanical Garden of the Academy of Sciences.

CHAPTER 3
National Conservation Activities

3.1 *IN SITU* CONSERVATION ACTIVITIES

Flora of Turkmenistan numbers over 2,500 species of wild plants. Seven natural reserves and 12 forbid territories are involved in protecting the local flora and fauna.

The overall protected territory in natural reserves amounts to 1,082 thousand ha, i.e., 2.2% of the total territory of the country. The share of protected areas is insignificant and does not ensure PGR preservation in the nature.

A special programme of PGR preservation does not exist, to say nothing of a programme concerning landraces and traditional varieties, a considerable part of which has already been lost.

Natural reserves are state organizations; control over territories is effected by technical workers of the reserves.

3.2 *EX SITU* COLLECTIONS

National PGR collections are concentrated at the Turkmenian PGR Experiment Station (TES) in Garrygala (former station in the VIR's network). Currently TES is within the network of the Academy of Agricultural Sciences of Turkmenistan.

This genebank was set up in 1930 at the proposal of Acad. N.I.Vavilov, and until 1992 when it became the property of Turkmenistan, it had been a specialized genebank that held collections of fruit, subtropical crops, and grapes. The question of creating collections of all agricultural crops and their wild relatives has been discussed for 2 years; eventually, an appropriate agreement has been concluded with VIR, and PGR collecting missions are being planned.

At present, collections at TES number 4,832 accessions including the following plants:

fruit	1,188 accessions
nut bearing	240 accessions
subtropical	1,711 accessions
grapes	988 accessions
industrial	705 accessions

Besides, TES maintains the largest in Central Asia collection of succulent plants numbering over 700 species belonging to 160 genera of 18 families.

Collections of fruit crops and grapes include local, introduced and bred varieties, as well as wild relatives. Most collections are regional by their composition; only the collection of pomegranate species and forms numbering 1,117 accessions can be regarded as a global one. Duplicate collections of fruits and grapes are maintained in the VIR's network and other CIS countries. Collections of the above crops are the major ones at TES; those maintained at the Turkmenian Research Institute of Horticulture, Viticulture and Agrosilviculture duplicate less than 20% of accessions from TES (467 for fruit crops and 186 for grapes).

Concerning annual crops, the accessions available in Turkmenistan can just conventionally be called genepools. For practical purposes, VIR has been supplying research institutions of the country with genetic resources. After using them as initial materials in breeding programmes, these PGR have never been reproduced and it has been nobody's responsibility to maintain them.

The lack of basic conditions for storing materials caused rapid loss of germinating ability by them. Besides, passport data for these accessions are far from being complete.

The Institute of Experimental Biology and Plant Protection possesses a collection of commercial varieties of fine-staple cotton which is maintained by the institute's researchers. Most accessions have been produced employing experimental mutagenesis.

The Institute of Agriculture (in the network of the Turkmenian Acad. of Agr. Sci.) preserves a range of breeding seed materials amounting to 776 varietal samples of different cereals, namely 467 of wheat, 230 of barley, 79 of triticale, 217 of sorghum, 54 self- pollinated lines of maize, as well as 68 of tomato, 17 of carrot, and 17 varieties of melon crops. VIR has supplied the largest part of these materials, while the rest has been received from Iran, Turkey, Yugoslavia, Hungary, Mexico, Argentina, the USA, and China.

In 1992, the work on restoring local cereals was launched. A collection of aboriginal wheat varieties has been gathered. It features such varieties as Ak Bugdai, Turcicum-57, Turkmenka, Due-Dash, Karashyk, Gouzlyuk, Kyzyl Bugdai, and Kyzyldzha. Two aboriginal, varieties, namely Ak Bugdai from Khalach and Ak Bugdai from Artyk, have been chosen for multiplication, for they have been noted for high yielding ability and high gluten content (no less than 34%).

The widest diversity of Turkmenian aboriginal wheat and barley forms is concentrated in the VIR's genebank in St. Petersburg. In 1983, a part of this diversity (10 wheat varieties) was brought to TES and, upon reproduction, handed over to the Institute of Agriculture.

Melon production in Turkmenistan is based mainly on old aboriginal varieties improved through selection. Of high demand are such old local melon varieties as Ak Gulyabi 803, Ameri 696, Vakharman 499, Gok Gulyabi 694, Sary Gulyabi 497, Zaami 672, Karry Gyz 700, Kyzyl Gulyabi 498.

The current rate of utilization of the existing collections of fruit crops and grapes is not high, as no breeding programmes on these crops have been devised in the country. About 90% of commercial varieties of fruit, subtropical crops and grapes are a result of selection from the TES collections and consequent State Variety Trials.

Before 1992, besides Turkmenistan, the major users of fruit genetic resources have been Russia, Ukraine, Moldavia, Uzbekistan, Tadjikistan, Georgia, Armenia, Azerbaijan, China, the USA, Hungary, Bulgaria, etc.

At present, practically no replenishment of the collections is taking place. Before, the main inflow of fruit crop materials was from abroad, from research institutions in CIS countries, and from collecting missions in Central Asian countries and Transcaucasus.

As a rule, collecting missions are preceded by route devising (accumulation of literature data, herbarium studies, analysis of reports by previous missions, etc.). Usually, missions explore household plots, plantations of perennial plants in collective and state farms, as well as mountainous canyons where wild relatives of fruit crops and grapes occur.

A considerable part of accessions comes from research institutions. During over 60 years of the TES existence, researchers have explored all places where aboriginal fruit and grape varieties grow in Turkmenistan, while in search for subtropical and some fruit crops, the Central Asian and Transcaucasian countries have been investigated. Much attention has been paid to exploring and collecting wild forms of fruit plants and grapes in Kopet Dagh.

All collected materials are maintained in collections, as their potential value may be revealed by a much later research. The procedures of exchange and storage of accessions in other countries on the condition of retaining ownership rights (free access to the materials) could positively influence the process of PGR preservation and utilization.

Speaking about annual crops (i.e. cereals, vegetables, potato, industrial crops, etc.), import of genetic resources from abroad is several times larger than export of them. As for fruit crops and grapes, import and export of PGR have been balanced over a long period of time.

As a rule, collecting missions in Turkmenistan target on 1 or 2 crops, while those carried abroad are of complex nature and collect a wide range of various crops. The method of random collecting at the markets, along the roads and from distant locations is also employed.

3.3 STORAGE FACILITIES

Genetic resources of annual plants are stored either in paper, or calico bags in bookcases placed in researchers' studies and store rooms. The lack of appropriate conditions for maintaining constant temperature and for performing thermal sterilization or fumigation considerably reduce the term of accessions safekeeping, cause their damage and death. The existing storage conditions are far from the international standards.

At the first stage, the country needs assistance in either purchasing freezing equipment, or construction of special facilities for PGR storage Turkmenistan has no special PGR storage, and therefore no long-term PGR storage is carried out.

Collections of fruit crops and grapes are maintained in live condition in the orchards. It is a very space, labour, and money- consuming method. A method of the inbred seeds cryoconservation has been devised for pomegranate, and a small number of accessions are stored in the cryobank at the Biological Center of the Russian Academy of Sciences in Pushchino.

With acquiring independence, Turkmenistan faces an urgent need in creating a genebank for storing 100 thousand accessions. It is planned to set it up at Garrygala after transforming TES into the Institute of PGR with laboratories dealing with all crops. The question of storing collections of Turkmenistan somewhere has never been discussed with either other countries, or with CGIAR.

In 1929, a Botanical Gardens was set up in Turkmenistan and since then its major activities have been plant introduction and acclimatization, enrichment of the cultivated flora with valuable plant resources from the local flora of Turkmenistan and from various regions of the world.

The Gardens maintains live plant collections numbering over 5,000 species, forms and varieties. Among them are over 1,200 introduced tree and shrub accessions. Over 450 plant species from the flora of Turkmenistan are concentrated in the Gardens. Over 300 species have been selected by the Gardens and proposed for the purposes of landscaping.

3.4 DOCUMENTATION

A computerized database is absent in Turkmenistan. For annual crops, catalogues published by VIR (St. Petersburg) have been used. For fruit crops and grapes, catalogues have been published for a limited number of crops. Available are a card-catalogue and crop-based lists of accessions. The card-catalogue contains all research data on the collections (e.g., on plant phenology, resistance to diseases and pests, technological properties, yielding ability, biological composition, etc.).

Evaluation data are used when writing reports, compiling catalogues and preparing publications. Accessions are supplied with passport data, and partially with descriptions including agronomic data. Full documentation has been prepared for an insignificant part of the collection. There is a direct relation between the quality of documentation and utilization of accessions.

At TES, users are supplied with information in course of workshops, and when they familiarize themselves with reports. To those in other cities, information is sent by mail. TES is not switched to any database exchange network.

The status and quality of documentation on the PGR collections leaves much to be desired. Skills of researchers and technical assistants are insufficiently high, and it makes one of the most serious problems.

Check up of the names of accessions is carried out using the published catalogues and descriptions, more rarely authenticity of accessions is established in the places of initial growth.

In the end of each year, a thorough inventory of collection orchards is carried out and the number of plants and their condition are recorded. Results of the inventory are published in detail in annual reports.

Duplicate information on the fruit crops and grapes is stored at VIR (St. Petersburg).

3.5 EVALUATION AND CHARACTERIZATION

Information on PGR accessions includes passport data and botanical description and evaluation (complex study). Botanical description is made once, while the complex study of accessions lasts from 3 to 10 years.

As recommended by VIR, the most valuable accessions undergo description and evaluation in the firs place using descriptors worked out by VIR.

Description and evaluation are made by researchers and technical assistants. The work is very labour-consuming, and a group of 3 people (1 researcher plus 2 technical assistants) can handle from 350 to 400 accessions.

Private farming is in the state of formation in the country, and therefore farmers do not participate in describing the collections.

International Lists of Descriptors are not used for describing the collections.

Evaluation of fruit crops and grapes is performed at Garrygala where the collections are maintained. Evaluation includes such parameters as biochemical properties and resistance to diseases and pests. Physiology and nutritional value are not studied.

The data of evaluation and description have been published just partially, and it makes another problem in the work.

Our opinion is that all financial expenses, irrespective of their magnitude, related to the maintenance and study of PGR collections will be justified if not immediately, then in the future.

Cooperation at all levels, i.e. at the international, regional, or that involving separate crops, will undoubtedly help to achieve better results in PGR studies and utilization.

In the future, all accessions will undergo complete evaluation and description and the international scientific community will have free access to the results obtained.

3.6 REGENERATION

Until recently, research institutions in Turkmenistan did not regenerate accessions of annual crops, as VIR supplied them with fresh materials when requested. After disintegration of the USSR, Turkmenistan has to take care of crop regeneration itself. In this respect, it would be reasonable to use the experience accumulated by VIR over many years in the sphere of storage and periodical regeneration of accessions of various crops depending on their biological properties.

Maintenance of commercial varieties of vegetable and melon crops is ensured by the system of seed production which includes the State Committee for Seed Control, research breeding institutions, state organizations for seed purveyance ("Turkmentokhum"), and seed-growing farms.

Regeneration of fruit crops and grapes at TES is carried out at intervals approximating those of the optimum term of a crop utilization. Associated problems are as follows: irrigating water deficiency, low soil fertility, and low rate of mechanization. Over the period of TES existence, re-establishment of collections has been carried out from 3 to 5 times.

Genetic integrity of initial accessions is maintained at quite a satisfactory level. This responsibility is placed with the unit heads and crop experts.

A method of preserving the studied fruit crop accessions in dense plantations with a shorter regeneration cycle has been repeatedly discussed within the VIR's network.

The Department of Seed Science at VIR has developed methodological guides for preserving seeds of annual crops and determined the minimum quantity of an accession necessary to ensure its genetic integrity. These guidelines have been adopted by all CIS countries.

When regenerating collections of fruit crops and grapes, the old collections are preserved until the new ones reach the fruiting stage and undergo approbation. Then the old collections are stubbed out. The year of planting is recorded in the collection lists, and a user may get precise information concerning the history of reproduction for each accession.

For a series of crops, the number of accessions is reducing with each regeneration, security of which is ensured in other places.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

For all crops without exception there exists a common pattern of PGR utilization:

- PGR collecting;
- a complex study aimed at selecting promising accessions; State Trials of the selected accessions performed by research institutions;
- commercialization proceeding from the results of State Trials, commercial multiplication in order to meet demand in the country.

Prior to commercialization, all bred varieties have to undergo the above stages.

It is difficult to imagine development of any branch of plant industry in Turkmenistan without introduction of PGR. Out of 239 commercial varieties, 82.8% are introduced ones, whereas aboriginal and varieties bred in Turkmenistan make only 17.2%. These figures show that the level of breeding work is very low in the country.

Considerable success has been reached in breeding cotton, melons, onion and sorghum, and bred varieties dominate over the introduced ones.

Below is a brief description of PGR utilization of separate crops.

4.1 COTTON

Cotton growing is the main branch of Turkmenian agriculture; each year cotton occupies from 55% to 60% of irrigated lands, annual yield amounts to 1.3 mln tons of raw cotton. Over 90% of cotton is exported.

Before the break up of the Soviet Union, VIR has been completely providing genetic resources of cotton. Practically all valuable genetic resources of cotton populations in the Transcaucasus and Central Asia have been collected by Acad. N.I.Vavilov and his associates. The major varietal samples which enriched the

genepool of fine-staple cotton were the variety Maarad, Peruvian perennial cottons (01326, 0876, T-48, 01277), a series of varieties with a common name Gyza, Egyptian long-staple Sea-island cottons, logora, Janovitch, Rahura, Ashmuni.

In the former USSR, Turkmenistan was regarded as the motherland of fine-staple cotton. The breeders have developed 14 cotton varieties using materials from the VIR's genebank to this or that extent. Varieties of Uzbek and Tadjik breeding are predominantly derivatives from the major varieties bred in Turkmenistan.

In the early 1950's, fusarium wilt, a dangerous disease, started spreading in the fine-staple cotton. There are no means of fighting this disease except for breeding new varieties. This difficult problem has been solved through remote hybridization of annual and perennial forms, namely 4844-I, 8981-I, 4848-I, 8173-I, and 8322-I.

4.2 CEREAL CROPS

Grain production in Turkmenistan is instable from year to year. It has always been dependent on cotton monoculture production and been oriented to meet the demands in forages. Bread grain has been imported from Russia, Kazakhstan and Ukraine.

In order to make the country self-sufficient in grain, the State programme "Grain" was adopted in 1992 envisaging an increased annual grain production of 1.5 min tons.

In 1994, production covered one third of the general demand in grain; in 1995, it is expected to cover 60% of the demand.

At present, grain production is based on the following introduced varieties: of wheat - Bezostaya 1, Krasnovodopadnaya 25, Skifyanka; of barley - Altyn-Dam, Unumli-Arpa, Sholpan, Cyklon; of maize - Gibrid VIR 156TV, Gibrid Krasnovodsky 5TV, Dnepropetrovskaya 200, Gibrid Chuisky 466, Gibrid Dnepropetrovsky 125TV, Gibrid Chuisky 62TV, Kremenistaya UzROS; of sorghum - Alty-Ailik, Katta-Bash, Oranzhevoye 160.

New cereal varieties of Turkmenian breeding which are currently being introduced into cultivation are wheat varieties Gyaurs 1 and Tedzhenskaya 62, and sorghum variety Turkmenskoye 1. As it was mentioned in the previous chapter, a local wheat variety Ak Bugdai is being actively revived.

4.3 VEGETABLE CROPS

Vegetable production is a comparatively young branch of Turkmenian agriculture; in 1925 these crops occupied only 1,000 ha. In the 1980's these areas reached 17-18 thousand ha, and production grew up to 300 thousand tons a year.

At present, the country is experiencing great difficulties in potato supplies, for until 1992 this commodity has been supplied in abundance from the republics of the USSR.

Turkmenistan carries out practically no research and breeding work on potato. Introduction of planting materials from other countries without due regard to local climatic conditions and preceded by no variety testing does not yield positive results. For instance, planting of Iranian potato on a series of Turkmenian farms resulted in very low yields in 1994. Below, please, find some information on the use of PGR of vegetable crops.

Cabbage

Two local varieties, namely Bagirskaya and Ashgabatskaya, both late ones, are cultivated in the country. Early and medium varieties (e.g., No.1 Gribovsky 147, Slava 1305, Apsheronskaya Ozimaya, lyunskaya) have been introduced from Russia and Azerbaijan.

Cucumber

The whole range of varieties, namely Gybrid Syurpriz-66, Gybrid Mayul, Gybrid Marafon, Gybrid Sentyabrsky, Margelansky Mestny, Konkurent, Sintez have been introduced from Russia and Uzbekistan.

Tomato

Production of tomatoes is based on the use of Russian and Uzbek varieties Volgogradsky 5/95, Volgogradsky Skorospely, Maikopsky Urozhainy 2090, Podarok, Vnukovsky, Vostok-36, Yermak, Uzbekistan. Two varieties, Kopetdag and Gok-Yaila, have been bred in Turkmenistan recently.

Tomatoes are heavily susceptible to mild mosaic on tomato. The problem may be solved though the use in practical breeding of sources of resistance to the virus.

The varieties of eggplant, radish, garlic, carrot, beet, pepper, and watermelon which are currently cultivated in the country have been initially supplied from the VIR's genebank.

As it has been mentioned above, among melon and onion varieties the local ones improved by selections are prevailing.

4.4 FRUIT CROPS

Formation of fruit growing as a branch of agriculture started in the 1930's. While in 1913 fruit crops have been cultivated on only 0.6 thousand ha, these days the areas make over 25 thousand ha. A peculiar feature of fruit growing in Turkmenistan is a possibility to produce high-quality fresh fruits both somewhat earlier and later than in the neighbouring countries. With an appropriate set of varieties, the period of fresh fruits consumption may be extended up to 6 months, and with proper storage - up to 10-12 months.

Twenty-one variety of seed-bearing fruit crops has been commercialized in Turkmenistan; all of them are of foreign origin - from the USA, France, Russia, Uzbekistan. The situation with stone-fruits is the same, as all 47 commercial varieties have been brought to Turkmenistan from Uzbekistan, Ukraine and the USA.

Local Turkmen varieties of such subtropical crops as pomegranate, fig, olive, unabi, persimmon are nearly absent in commercial plantations in which varieties developed in Uzbekistan, Azerbaijan and Ukraine are prevailing.

Another drawback of Turkmenian fruit growing is the absence of small-fruit crops.

National programmes on fruit crops and grapes have not been devised yet. Some breeding on a small scale is carried out at TES. A series of promising varieties of almond, pomegranate, persimmon, myrobalan plum have been created and put for State Trials.

In contrast with fruit crops, among commercial varieties of grapes 5 local ones occupy 74% of all lands under the crop. The general drawbacks of viticulture in the country is the low share of seedless grape (just 4-5%) and a nearly complete absence of early varieties. In the 1980's, 10 varieties of table grapes have been bred and currently undergo State Trials.

Along with being a source of varieties for direct introduction into commercial production, PGR collections at TES have been used for composing the working collections of other research institutions, and as a source of breeding materials.

Free access is ensured to all collections at TES; workshops devoted to various aspects of fruit growing and viticulture are organized there periodically for the interested specialists.

Agronomists, farmers, etc. do not participate in evaluating genetic resources of fruit crops and grapes.

International exchange with genetic resources is beneficial for all the parties involved, as this process promotes the enrichment and improvement of crop varieties in the participating countries.

4.5 CROP IMPROVEMENT PROGRAMMES

4.5.1 Seed Distribution

Breeders of Turkmenistan work on the improvement of local varieties and adaptation of the introduced ones. The final goal of these works is the increased productivity and higher quality of agricultural commodities. Seed and planting materials for the needs of agriculture are produced by seed growing farms and fruit crop nurseries. Unfortunately, quality of these materials sometimes is not up to the demands of the users.

During the last 30 years, the number of accessions introduced as a result of exchange, received through mail orders and from collecting missions has significantly increased at TES. Break-up of the USSR brought about disruption of links with other countries and cessation of exchange with accessions.

Restoration of direct relations with genebanks in other countries and organization of activities by TES in compliance with the modern standards will require significant financial inputs.

Cultivated lands can be expanded on a limited scale, while demand in foodstuffs is growing from year to year along with the increase of the population. Consequently, the value of plant genetic resources is constantly increasing. Leaders of any country shall perceive the idea that the value of PGR is by no means less than that of the country's golden stock.

CHAPTER 5
National Goals, Policies Programmes and Legislation

National goals are not defined clearly; special legislation concerning plant genetic resources is absent.

There is no special National Programme that would unite separate projects which are government-funded through the Turkmenian Academy of Agricultural Sciences in a volume of 70% to 75%.

The Quarantine Service of Turkmenistan is a major obstacle in PGR exchange, especially in their imports. This Service is an administrative organ and does not employ any methods of virus detection, or growing virus-free plants.

Since 1991, TES has been maintaining exchange with grape varieties with research institutions in the USA. However, outcome of it is negligible, as the prolonged delivery (60 to 70 days and over) kills the scionwood.

The Customs is another governmental body that blocks to some extent import and export of seeds and scionwood.

Training of the personnel is one of the weakest points. Much efforts are required to attain a certain level of training, to change people's mentality and raise the general cultural level. Obviously, the major part of experts shall be trained abroad.

CHAPTER 6
International Cooperation

Not a single country possesses a complete global PGR diversity of all crops, and therefore cooperation in the sphere of PGR utilization is of vital importance.

Turkmenistan is poorly involved in the international cooperation. Scientists from the country very rarely participate in international congresses and symposia; subscription to scientific periodical literature is problematic due to financial constraints; there's a general lack of detailed information on the availability of genetic resources in other countries.

The International Vine and Wine Office (IVWO) has been existing for over 70 years. Currently, it numbers 31 member-country, but Turkmenistan is not among them. Therefore, viticulturists from Turkmenistan are deprived a possibility to participate in congresses, symposia and competitions held by this Organization. IVWO possesses quite a global diversity of genetic resources of grape which are concentrated in the member-countries, and IPGRI has to find ways to utilize these genepools.

We deem it necessary for IPGRI to organize publishing of useful periodical reviews (quarterlies or yearlies) devoted to each crop and reflecting national PGR activities in all countries.

CHAPTER 7
National Needs and Opportunities

The needs of Turkmenistan in the sphere of viticulture are in the increase of grapes production both as raw material for wine-making, and for drying.

The availability of the global genetic diversity of seedless grape varieties for research is a problem for Turkmenistan, and a better access to them might result in an increased raisins production.

The expansion of the Turkmenian genebank on the basis of the collections preserved at TES shall be carried out with the aim of making it able to provide initial breeding materials for the existing and to-be-launched breeding programmes involving all agricultural crops which are used in Turkmenistan currently, or may be introduced into cultivation in the future (e.g., halophytes, rubber-bearing plants, tropical fruit plants for cultivation in the protected ground, etc.).

CHAPTER 8
Proposals for a Global Plan of Action

The Government of Turkmenistan is sharing the anxiety of the world community concerning abrupt acceleration of the process of vanishing of the genetic diversity resulting from civilizing activities of the mankind and offers to establish a plant genetic resources collection in non-irrigated area of Garrygala, Turkmenistan, where the Turkmenian Experiment Station is situated.

Ecological environments of the Station are suitable for maintenance of plant genetic resources in the field in order to supply breeders with valuable initial breeding materials and to carry out joint complex studies of PGR in both non-irrigated and irrigated conditions with the purpose of obtaining new varieties and hybrids with complex resistance and developing new water-saving technologies of plant growing for enrichment and preservation of natural genetic diversity.

Recognizing the importance of the problem of plant biodiversity preservation we would like to offer the following measures:

- to include in the Global Plan of Action the establishment of an International PGR Collection of Non-irrigated Area based on the Turkmenian Experiment Station on Garrygala, Turkmenistan;
- to recognize that plant genetic resources represent national and international heritage of the mankind and future generations and play a major role in supplying the world's population with food and medicaments;
- whereas preservation, studying and evaluation of plant genetic resources is an international problem, to organize on the basis of the Turkmenian Experiment Station (Garrygala) joint studying of the genetic diversity of medicinal plants available in Turkmenistan with the purpose of further utilization of this diversity for treating people for cancer, AIDS and other diseases on an international level;
- to attribute the status of a working language to the Russian language which has been and shall be the means of intergovernmental communication between the countries of C.I.S.