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on Plant Genetic Resources

CONSERVATION AND SUSTAINABLE UTILIZATION OF PLANT GENETIC RESOURCES IN WEST ASIA

Sub-Regional Synthesis Report

Annex 2 of the Report of the
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West and Central Asia
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Table of Contents

I. INTRODUCTION

The Sub-Region of Central Asia and its Agricultural Sector

The sub-region of Central Asian being considered in this document includes six countries: Azerbaijan, Kazakhstan, Kyrgyzstan, Turkmenistan and Uzbekistan. Unfortunately no country report was produced for Kyrgyzstan and Tajikistan. The territory covered by these six countries encompassed some 4.1 million square kilometers. Their combined population is ca 60 million according to the most recent census. Kazakhstan is the biggest of these six states.

Large tracts of Central Asia are not conducive to human settlement in the central and western areas (excluding Azerbaijan)where barren desert and semidesert extend. In the south-east, there is the jagged mountain range of Kopet-Dagh, Tien Shan and in the west of the Caucasus. The very north part of the region is dominated by steppe. Azerbaijan is separated from other countries by the Caspian sea and geographically is considered to be a part of the Caucasus region.

Most of the arable land of the region requires irrigation. Some crops however are cultivated in unirrigated areas. The principal crops are cereals(wheat, barley, maize, rice), cotton, sugar beet, fruits and vegetables.

In Kazakhstan, approximately 1/2 of the land under cultivation is devoted to wheat but several other cereals are mainly cultivated in the south. Cotton, sugar beet and tobacco are less significant in terms of volume than grain. Kazakhstan used to be an important exporter of many agricultural products (mostly to former SU territories).

In Uzbekistan, agriculture is dominated by cotton. The country used to be world's fourth largest producer and the third largest exporter of cotton. It maintains a high production of fruits and vegetables.
In Turkmenistan, only 2% of land is arable of which 50% was devoted to cotton. Also fruit and vegetable production is significant for the country's economy.

In Azerbaijan, principal crops are cereal, grapes, tobacco but fruits and vegetables are also important agricultural products.

In Kyrgyzstan, mountainous livestock rearing is a principal agriculture sector as only 7% of the land is arable. The main crops are cotton, hemp, tobacco, vegetables and fruit.

Animal husbandry is an important agricultural sector in all those countries as pastures extend on considerable areas. The principal livestock are cattle but particularly in the mountain areas sheep and goats are maintained.

After the dissolution of USSR all six countries declared independence and in 1991 joined the Commonwealth of Independent States (CIS).

Despite the political transformation they remain politically and economically very much dependent on Russia and the former SU countries. In all five countries agriculture sector accounts for the overwhelming majority of economic activities. However, none of them is self sufficient in agricultural production. In the last few years, Governments have taken steps to restructure the agricultural sector and to diversify production. These measures should provide greater reliance of the economy on internal agricultural production. Efforts have been made to introduce market economy and to privatize part of the arable land.

Unlike other countries, Tajikistan is a member of FAO, however, other countries plan to join this organization.

Plant Genetic Resources of the Sub-Region

Following Zhukovsky's delimitation of regions of crop diversity, Kazakhstan, Kyrgyzstan, Turkmenistan and Uzbekistan are situated in Central Asian region, whereas Azerbaijan belongs to Near East region.

To the most important species which have their center of origin/diversity in these two areas are:

Allium cepa
A. sativum
Beta vulgnris
Spinacia oleracen
Cucumis melo
Daucus carota
Elnengnus angustifolia
Secale cereale
Tricicum aestivum
Triticum turgidum

Zea mays luglnns regin
Cicer arietinum
Lathynus satires
Medicago sativa
Pisum sntivom
Vicin satin Linnum usitatissimum
Gossypium barbadense
Gossypium herbaceum
Fagopynum exculentum
Carthamus tinctorius
Brassica oleracea
Camelina saliva
Castanea saliva
Corylus avellana
Monus nigra
Amygndlus communis
Amygdalus Persian
Armeniaca vulgaris
Males sylvestris
Cydonia oblongs
Pnxnus ssp
Pynus spp
Vitis vinifera
Coffea arabica.

Indigenous flora of all aforementioned countries still holds large number of species which are the progenitors and relatives of crop plants. Kazakhstan lists over 200, Azerbaijan over 250, Turkmenistan 106 such species. The sub-region is particularly rich in wild species of cereal, fruit trees, shrubs and herbaceous plants, vegetables, fodder, aromatic, industrial, medicinal and ornamental plants. Aboriginal forest genetic resources of eastern part of the sub-region consist of three main genra *Fagus, Quercus, Carpinus,* however species of several other genera are also present in smaller quantity. Central and eastern part of the sub-region is abundant in groves formed by *Fraxinus, Acer, Juniperus, Ulmus, Oleaster, Juglnns, Males, Pyres, Prunes, Pistacia, Paliurus, Amygdalus* and other less important genera. Over the years the native genetic diversity has been eroded especially due to increased overgrazing, deforestation, industrialization and melioration of the land. Particularly this latter factor adversely affected the ecosystem of the region as it has increased salinity of arable land.

In most countries of the region many valuable landraces and old native cultivars of wheat, barley, maize, sugar beet, sorghum, cabbage, cucumber

aubergine, *allium,* bean, potato, apple, peach, quince, cherry, plum, walnut, fig, pomegranate persimmon and others are in part preserved in home gardens and on small farms. There seem to provide the most sustainable mean of conservation in the region. However, in countries such as Azerbaijan, Kazakhstan and Turkmenistan many landraces and local cultivars of cereal, vegetables and fruits (especially grape) are still being used for commercial production. Their importance varies from country to country and from crop to crop. In Turkmenistan, for example, local cultivars of grape accounts for all wine production whereas in Azerbaijan and Kazakhstan old varieties and landraces only contribute for a small part to the overall production of the crops. Over the years gradual replacement of this valuable source of variation with current commercial cultivars is being observed especially with regard to field crops.

II. ASSESSMENT OF PGR PROGRAMS AND ACTIVITIES

National Programs, Policies and Legislation

National PGR activities are not organized into national Programs in any of the countries. Several institutions in each country subordinated to various administrative agencies (Academy of Science, Academy of Agricultural Sciences or Ministry of Agriculture, State Committee for Science and Technology, State Committee on Environmental Protection) are involved in germplasm maintenance have either a research or breeding profile and they do not assign a high priority to PGR activities. Only Turkmenistan and Uzbekistan have established institutional bodies which are entirely devoted to PGR activities. There are the Experimental Station for Plant Genetic Resources in Garrygala, Turkmenistan and the Plant Industry Institute in Tashhent, Uzbekistan. Both were former stations of the Vavilov Institute at St. Petersburg.

None of the countries, except for Uzbekistan, provide mechanisms for coordination of PGR activities. All countries recognize the need of PGR Programs to be established but there has not yet been a real commitment on the governmental level to pursue this issue. Also a dear conception (understanding) of the structure of the program to be established and the organizational, institutional, legal and technical aspects to be addressed have not yet been well determined. Additional constraints in the development of the program is a lack of funding for PGR activities resulting from the political transformation of the countries and abrupt change of economical situation. Most national efforts are devoted to maintaining a satisfactory level of activities in the sectors most important to economy thereby neglecting remaining ones including scientific research and areas attached to plant breeding.

Despite all these drawbacks, it is noteworthy that in all countries institutional and technical basis exist for developing PGR activities into integrated national programs which is especially realistic when the strong intention to carry out this task expressed at an institutional level is considered. Countries also expressed intention of collaboration in the area of plant genetic resources with other states in the region, especially among the five central Asian countries.

Political transformation has also entailed the need for new legislative acts to be developed and implemented in all five countries. This concerns areas such as the status of national PGR programs to be launched, variety release legislation and seed certification. To date, some counties have only introduced legislative acts on the protection of reserves, national parks but other genetic resources conservation activities have not been addressed.

Existing legislation is being reviewed for its possible adjustment to the new political and economical situation.

Sub-regional Programs Networks and International Collaboration

All five countries gained their independence in 1992 following dissolution of USSR. Until then all collaborative links were mostly maintained with other republics of the Soviet Union. There was no need to act independently as all plant genetic resources activities were centrally planned and managed by the Vavilov Institute for Plant Genetic Resources (VIR) in Leningrad. Under the new political circumstances the links with VIR have rapidly become very loose and countries been forced to search for new collaborative links and to try to restore old ones in order to secure germplasm material for their national breeding programs. To date, all countries managed to establish to some extent collaboration with several international institutions around the world but it is mostly limited to germplasm exchange.

All the countries expressed intention to embark on a new mode of collaboration which would include all aspects of genetic resources activities. They would like to establish a regional program for PGR, which would be centrally coordinated under the auspices of an international organization.

Conservation Activities

Conservation activities in the sub-region are in the initial stage of development. In situ conservation has only been carried out in reserves, protected areas and in national parks which have been mainly established with the aim of protecting forest genetic resources of sites covered by wild growing fruit trees and shrubs. Turkmenistan has 7 such reserves and 12 protected areas which cover over 1,000 ha., Azerbaijan 15 parks of a total of 6,501 ha, in Kyrgyzstan 680 ha of fruit trees in under protection. No measures for protecting native fruit tree stands in Uzbekistan has been taken.

Ex situ conservation is performed in fruit orchards and in seed collections. Both field and seed collections have status of working collections with the exception of those maintained in Uzbekistan in the Plant Industry Institute and in the Experimental Station in Garrygala in Turkmenistan.

Seed and field collections are characterized and evaluated following VIR descriptor lists modified to meet national needs. In Kazakhstan evaluation

includes biochemical, physiological and phytopathological data while in Uzbekistan germplasm collections are also accompanied with information on genetic markers, cytology, karyology, genetic analysis, anatomy and data obtained from the breeders. In most cases characterization is not considered to be a separate procedure and is included in evaluation. Evaluation is performed in the location of the collections. In Turkmenistan, the process of evaluation lasts 3 to 10 years depending on the plant material. In general, no special assessment of diversity is performed. Usually the task of characterization and evaluation is the responsibilities of plant breeders or qualified personnel. Data obtained from the literature are often included in documentation of accessions.

None of the countries has computerized databases, Data are documented mainly in card indexes or in inventory books. A small percentage of accessions is fully documented which varies from country to country and depends on the crop collection. In Uzbekistan only 15% of accessions have been completely documented. In Turkmenistan this percentage is also low. In Azerbaijan, Kazakhstan and Kyrgyzstan the status of documentation has not been yet clarified. Since many accessions were obtained from the Vavilov Institute of Plant Industry (VIR) in St. Petersburg, for those at least duplicate documentation exist.

None of the countries has adequate storage facilities. Seed collections are stored in paperbags, cotton bags and envelopes at ambient temperatures. There is no tradition of maintaining duplicate collections in the countries or elsewhere. Only those accessions which were received from VIR are duplicated in this latter institute.

Regeneration is performed every few years depending on the crop. Regeneration of living collections of trees and perennial plants is carried out at intervals approximating those of the optimum term of their utilization or longevity. Only Turkmenistan has managed to arrange cryopreservation for a number of pomegranate accessions in Biological Centre of Russian Academy of Science in Pusdlino (Russia).

Collecting missions have been infrequent. Only teams from Turkmenistan and Uzbekistan have been collecting germplasm regularly. Collecting missions organized by Turkmenistan were crop oriented and employed random sampling at the markets, along roads and in distant locations. Over the last seven years, five collecting missions covering Kazakhstan, Turkmenistan and Uzbekistan have been organized with the assistance of IPGRI. They aimed at collecting fruit, nut trees, wheat and barley and their wild relatives, allium, legumes and other plants.

Uses of Plant Genetic Resources in the Subregion

Most germplasm collections maintained in all five countries are utilized for developing new cultivars. Plant breeding activities are carried out in the state sector mainly in the research institutions or experimental stations. In Turkmenistan, all germplasm of relevant crops undergo extensive evaluation prior to selection of a suitable initial material for breeding. The level of breeding in Turkmenistan is low relative to country needs. Only 17 or so of all cultivars were developed locally. Currently germplasm of melon, onion and sorghum, wheat, eggplant, radish, garlic, carrot, beet and pepper, almond, pomegranate, persimmon, myrobalan plum have been used to release new cultivars. In Uzbekistan, the most utilized collections of PGR in ongoing Programs is low. Uzbekistan carries out breeding activities in wheat, carrot, onion, garlic, pomegranate, peach, apricot, grape, melon, water-melon and persimmon. In all countries many of indigenous genetic resources which exist in nature are directly utilized as plant products, food source and for other household purposes.

Prior to the dissolution of USSR, breeding activities in each of former republic were canalized following the needs of centrally managed breeding Programs. Countries became specialized in breeding certain crops but not others. The new political situation of former Soviet Union states entailed breakdown of economic relations which also meant restructuring agricultural production and embarking on breeding Programs in a variety of crops. This has created a new opportunity for plant genetic resources to be more extensively utilized, not only as sources of genes, but also possibly as new crop plants. It relates to both genetic material assembles in ex situ collections and to that existing in nature. A great diversity of wild species especially medicinal plants has potential as a source of products to be utilized in the drug industry. This could stimulate the development of a new area of economic activities and thereby contribute to economic development. Wider use of PGR in breeding should result in the release of new, superior varieties, which should replace foreign cultivars currently grown, and thus provide a stimulus to increase and diversify agricultural production.

III. IDENTIFICATION OF NEEDS, OPPORTUNITIES AND CONSTRAINTS AND PRIORITIES FOR THE GLOBAL PLAN OF ACTION

Turkmenistan, Uzbekistan, Kazakhstan, Kyrgyzstan and Azerbaijan are in very similar positions with regard to plant genetic resources conservation status. Their PGR activities are very much dispersed and lack coordination.

In order to systematize and effectively manage PGR projects, countries need to integrate national activities into national centrally coordinated programmes. In order to develop a meaningful level of PGR activities, a scope of the endeavors, clearly defined objectives, structure, institutions to be involved, their responsibilities, mechanisms for coordination of the activities should be decided. To develop programme proposals and further facilitate their implementation, technical advice from international bodies would be required. It is imperative that the governments make the commitment to ensure adequate level of funding and secure their continuation by appropriate legislation.

In order to ensure that the programmes are effectively run and the objectives are realized the following needs have been identified:

- Necessary equipment for all stages of PGR activities has to be provided;

  A. training of personnel at a scientific and technical level in all areas of plant genetic resources should ensured;

  B. storage facilities for long and medium term preservation which meets recommended national standards for seed conservation should be secured.

The major constraint in development of PGR programmes in all five countries is their unstable political and economic situation. Lack of funding practically precludes plans of any investments in this area without outside assistance. Under those circumstances, it would be most rational that countries make collective efforts to obtain funds for construction of one storage facility to be shared by them on agreed terms. This would allow each of the countries to store seed samples at recommended standard conditions at a lower cost than those which have to be met by countries when constructing and exploiting their own facilities. Such an initiative should be especially viable when considering that the five central Asian countries already have declared an intention of cooperation in the area of plant genetic resources at regional level. Construction of common storage facilities could also provide ground for other collaborative efforts which could further reduce the cost of genetic resources

activities. Kazakhstan, Turkmenistan and Uzbekistan have already offered to act as a hot for international storage facilities.

It could also be beneficial to national projects and would provide a rational approach to PGR conservation in the region if countries could work out cooperative programme. Such pogroms would further link and increase the efficiency of activities on regional level, would help to better identify and more effectively deal with problems of the region. Training is one of those immediate priorities which should be attended to. Also in situ conservation could benefit from a regional approach. Countries may like to follow the European Cooperative Programme as a good example of well organized and run regional undertaking. For such regional programme, a coordinating body consisting of representatives of the participating countries should be set up.

Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan have the institutional and technical basis to carry out and to expand PGR activities. Turkmenistan and Uzbekistan can provide expertise in area of plant genetic resources. These two countries have offered to assume responsibilities within the framework of an international cooperative programme. Uzbekistan has a large collection of pathogenic fungi, and adequate facilities and expertise to carry out international evaluation trials to screen PGR collections for resistance to those pathogens. Turkmenistan can provide the expertise and location to establish a field collection of dryland plants.

Countries have addressed the need to take measures to evaluate and rescue existing plant genetic resources of the ecologically devastated Aral Sea region. the devastation is a result of over-exploitation of Amu-Darya waters which used to empty into the Aral Sea. As a result, desiccation of the Aral Sea and the ecological transformation of adjacent area to the sea have been occurring.