KAZAKHSTAN:

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

(Leipzig,1996)

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Almaty, April 1995

Note by FAO

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CHAPTER 1
Introductory Description of the Country and its Agricultural Sector

The territory of Kazakhstan occupies 2,725,000 square kilometers. It stretches from north to south for more than 1.6 thousands kilometers, from the moderate and humid forest steppe of the West Siberian Depression to the hot deserts of Middle Asia and the Tien Shan mountain ranges, and from west to east almost form three thousand km from the Volga River to the snowy tops of Altai. Naturally there is a large diversity of nature, landscapes and soils.

A big part of Kazakhstan is occupied by plains. Only in the southeastern and eastern parts of the countries are there the Tien Shan, Tarbagotai, Saur and Altai mountains. Latitudinally the northern parts of Kazakhstan correspond to the centre of the European part of Russia (Moscow). The southern parts correspond to such countries as Italy, Spain and Greece, characterized by a very mild Mediterranean climate.

In the Summer, hot weather is recorded all over the plains and dryer weather is found in the more southern and eastern regions, due to the influence of the hot Asian deserts surrounding Kazakhstan from the southeast (Kysylkum, Karakum, Gobi, Taklomakan). the Winter is long in the north and short in the south, with strong frosts brought over open flat territories by air streams from the Arctic Ocean and Eastern Siberia. Consequently the climate here is sterner than that found under the same latitudes of the Mediterranean Coast.

An average annual temperature ranges from 0.5°C in the north to 12°C in the south. The length of the active vegetation period varies from 125 days in the subzone of forest steppe to 710-715 days in the foot mountain desert steppe zone.

The variation in the sum of active temperatures is wide. All the territory of Kazakhstan with regard to thermal resources is conclusive to cultivation of cereals, leguminous forage and vegetable crops, and in the southern regions of rice, cotton, sugar beet, etc. The amount of annual precipitation varies within a wide range from 120 to 600/800 mm.

The flat territory of Kazakhstan occupies 235 million ha (over 86% of the total territory) and is divided into three vegetation zones:

1. Steppe zone with chernozen soils is an agricultural region devoted to grain production. It covers 258 million ha (i.e. 9.4% of the total territory of Kazakhstan).
2. Arid steppe and desert steppe zones of chestnut soils is an agricultural region of animal husbandry. It covers 20.4 million ha (i.e. 33.2% of the total of Kazakhstan).
3. Desert zone of brown, gray brown and takyr-like soils: the zone is one of animal husbandry. It covers 119.2 million ha (i.e. 43.7% of the total of Kazakhstan).

The mountain regions of Kazakhstan are divided into two groups of high altitude zones.

1. Foot hills and submountain desert steppe zone of Tien-Shan and Altai, with a predominance of sterozem and light chestnut soils. This is a zone of irrigated and dry agriculture and highly developed animal husbandry. It covers: 18.9 million ha (i.e. 6.9% of the total territory of the Republic).
2. Submountain and intermount steppe, mountain, forest steppe, meadow forest and meadow zones with a predominance of chernozems and dark chestnut, mountain forest and alpine meadow soils. In this zone of rich pasture, mainly animal husbandry developed. From the forestry point of view it is also particular important (especially in Altai). Dry agriculture is located in submount and intermount valleys in mount steppe chernozems and chestnut soil. The total area covers 18.2 million ha (i.e. 6.7% of the total of Kazakhstan).

According to zonal characteristics and to the type of agriculture, the territory of Kazakhstan is divided into the following five agricultural zones:

1. Conservation farming on dry lands, mainly cereals are grown in the northern and central regions, and Winter and Spring cereals in the western and eastern regions.
2. Conservation, farming on dry lands, Winter wheat and barley are grown on the perennial grasses in southeastern Kazakhstan.
3. Meliorative agriculture on dry, irrigated lands, cereals and forage crops are cultivated.
4. Irrigated agriculture, industrial, vegetables and forage crops are grown mainly in the southern and southeastern regions of Kazakhstan.

The zonal system of agriculture is intended to increase soil fertility by using it rationally, considering the landscape, climate, and increase of ecological adaptability of most crops. The zonal system is also used to develop new cultivars as well as the most favorable conditions for agriculture by protecting the soil form all kinds of erosions and protecting plants from insects, diseases and weeds.

According to statistical data of annual journal, the population of Kazakhstan is 17.0 million, and the area occupied by crops is 35.2 million ha, in crop production, grain an cotton-fibre have a big importance for export, but other crops for home market.

At present, the agricultural sector is in a deep crisis. The process of economic reformation is continuing in difficult conditions of disintegration of interfarm connections and a decreased standard of living of the people. The Kalhoz sovhoz system of agriculture is under disintegration.

With the purpose of extending competitive markets, new forms of properties and management are being created: small, lease and private ventures, cooperatives, small private farms and joint ventures.

The State system of seed production which existed in 1992 in Kazakhstan included scientific research institutes, experimental stations, elite seed growing farms, specialized seed growing farms, In this system primary (original) seeds were produced in SRI (Scientific Research Institutions), elite (elite seeds) in experimental farms and seed producing farms and bulk (reproductive seeds) in specialized seed growing farms and seed producing farms.

Since Kazakhstan turned to a market system, the existing system and scheme of seed production has been destroyed due to many objective and subjective reasons, namely:

absence of State support, especially in primary seed growing; insolvency of all kinds of seed producing farms; weak economic and technical base food seed growing; lack of qualified specialists; weak service of seed management in the State departments; absence of marketing, introduction of breeding and seed growing achievements into the industry.

One of the reasons restraining seed growing is the import of cultivars hybrids from foreign countries which do not surpass the local ones in productivity, quality and other characteristics, especially in corn, sugar beet, soybean, pea and cereal crops.

These actions are made mainly by commercial structures and interested persons from different organizations and joint ventures. Introduced seeds are not approved in the republic SRI (Scientific Research Institutions).

The problem of plant protection for Kazakhstan is more actual than for highly developed countries. The biggest damage in grain production is made by fungi diseases of plants (losses of yield), orange leaf rust (by 15%), dusty, hard stony brand of spring and winter crops (by 5%), blist brand of corn (by 20%), root rot of barley and spring wheat (by 10 to 18%), septoria, spot (by 15 to 20%), mealy dew of winter wheat (up to 14% on irrigated land). Losses due to stripe, stoam rust have been lower although they can reach 50%. Infestantes of generative and vegetative organs of plants have an economic importance.

In the last 10/15 years, septoria spot has become highly harmful in Kazakhstan, especially in the northern and eastern regions. It has happened in past years that the development of the disease reached an epiphytative range.

On an annual basis, 15-20 million ha area needs protection, which is very difficult to do now because of the extreme deficiency of plant protection chemicals, especially pesticides, as well as techniques and fuel.

CHAPTER 2
Aboriginal Genetic Resources of Plants

From the whole diverse flora of Kazakhstan (about 5,700 species), there are more than 210 species of wild relatives of cultivated plants, including foodstuff (cereals, vegetables, nut fruits), about 110; forage about 70; industrial plants about 20; medicinal about 10 (see table 1 below).

Table 1

Group of plants Foodstuff	Number of species	Number of genera	Main genera
cereals	15	8	*Aegilops, Avena Hordeum, Secale, Fagopyrum, Victa,*
Vegetables	36	18	*Lathyrus Rheum, Lactuca, Daucus, Sinapis, Allium* (14 species)
Nutfruits and fruitberries	55	22	Ribes (9 species), *Rubus* (4), *Amygdalus* (4), *Cerasus* (3), *Fragaria* (2), Juglans, *Pestacia, Vitis*
Forage	70	29	*Agropyron, Festuca, Elytrigia, Bromus, Poa, Medicago, Trifolium Vicia, Melilotus, Kochta*
Industrial	15	8	*Cannabis, Allochrusa, Plygonum, Rumex, Linum, Carihamus, Ilibiscus, Scorzonera*
Medicinal	13	9	*Rhaponticum, Ilumulus, Althaea, Salvia, Carum, Saponaria, Matricaria, Frysimum, Viburnum*

Besides, a group of wild relatives of decorative plants represents a special interest, including Tulipa (in Kazakhstan, 32 species, including 10 endems and subendems). Tulipa greigli (more than 200 known species) and T. Kaufmanniana (about 100 species) are most important for breeding. According to the classification of breeds, they are presented by special classes and by uacoendemics such as T. regelti, T. tarda, T. ostrovskiana, T. albertil. Numerous food, forage, industrial and medicinal plants are used by local people, including Trifllaris sowerzow, *crataegus pontica, Altium oblicuum*, A. Fedchencoviana, *megacapreaes orbiculata*, and others.

Table 2 Old local and breeds of agricultural crops used until now

N. Crop	Old local cultivars	Old cultivars	Economic importance
1. Wheat	Ak-Bidal, Bal, Bidal, Kizil Bidal, Surhaky, Teremok, Helouski, Chernoski, Zhanakizil	Spring wheat Kazakhstanskaya 126 Lyutestsens 758 Pirotriks 28 Saratovskaya 36 Saratovskaya 42 Britrospermom 841 Kazakhstanskaya 3 Kazakhstanskaya 4 Winter wheat ? Zvezda Bezostaya 1 Odesskaya 1 Mironovskaya 808 Dneprovskaya 521	High adaptability, plasticity, productivity, resistance to stress factors
2. Barley	Prikotstus 143 Medicum 89 55	Nutance 187	
3. Corn	Korelskaya Mestnaya Kromnistaya Mestnaya	Shindermeizer, Uzbeskaya zubo vidnaya, Sterding	High quality taste, productivity
4. Sugar beet		Yaltovkovskaya odnosemyanaya	High adaptability, sweetness
5. Sorgum		Sugar sorgum Ranny Yantar 161 Kinelskoye 3 Travinistoye sorgo sudanka Brodskoye 2	Fast ripeness, ability to ripen in a short vegetation period
6. Apple trees Peach trees	Aport, Swissleper, Ronet Burbardta Lantsberga Lesnaya Krasavitsa	Ivanovka, Taftyanoye, Vidubetskaya plaku chaya, Pepen chetverty, Ekonomart, Ekstermatter Lesnaya Krasavitsa	High quality taste and commercial potentialities, resistance to cold, late blooming

N. Crop	Old local cultivars	Old cultivars	Economic importance
7. Vegetables	Garlic Dunganskt Mestny Zailiski Radish Dunganski Mestny	Garlic, Iokparska, Iubilenny, Arman	High commercial potential
8. Forage crops	Agropirom Aksengerski Mestny Alfalfa Semirechenskay a Mestnaya	Stepnoy Zhitnyak, Aktubenski uzkokolocy, Aklubenski shirokokolocy, Kura balikski 202, Krasnokutski 4, Krasnokutski 306, Kostrets bezosty, Siberian SRI farm 189,58 Alfalfa - Karagandinskaya 1, Shortandinskaya 2, Koskshe, Ertishskaya, Karabalskaya 18, Pireinik Ruran; Lombkolosnik, Sitnikovy Bozoisky, shortankinski	Important forage quality Raw materials for textile, food, medicinal and industry

CHAPTER 3
Activity on Preservation of Plant Genetic Resources from a National Position

3.1 PRESERVATION OF PLANT GENETIC RESOURCES *IN SITU*

This kind of preservation mainly concerns forest genetic resources; the information on this is given in an appendix to the report.

3.2 PRESERVATION OF PLANT GENETIC RESOURCES IN COLLECTIONS *EX SITU*

Since there is no national genebank, the national collections of plant genetic resources are placed mostly in scientific research institutions, specialized in collecting and studying plant genetic resources. Botanical Gardens, in protected areas, regional research organizations which are engaged in breeding agricultural crops. The botanical gardens hold extensive collections of genetic resources.

At present in the Kazakhstan Republic (KR) six botanical gardens are active which belong to the National Academy of Science of Kazakhstan: Altaiski (Leninogorsk city), Ililsky (Bakanas), Karagandinski (Karaganda), Zheskazganski (Zheskazgan), Mangistauski (Aktay), the Main (Almaty). They have collected the most part of wild species of national collections of plant genetic resources. For example, the collection of the Main Botanical Garden (Almaty) includes more than 300 species of medicinal plants of world flora, adapted in the submount zone of Zailiski Alatay and a big collection of endemic, rare and disappearing plants. More than 1,200 taxa of living plants compose the collection of introduced trees and shrubs. Extensive collections are also in the Altai, Kraganda, Mangistau botanical gardens.

Table 3 List of the scientific research institutions which hold collections of plant genetic resources

Scientific Research Institutions	*Genus,* Species	Capacity of collection
1. Kazakh Research Institute of Agriculture, named by V.R. Williams, Almaty, Almalibak	*Triticum Z; Zea mais; Sorgum; Avena Z.; Hordejm Z; Glycine Z; Aegilops; Beta Z; pisum Z.*	10,000
2. Kazakh Research Institute of Fruit and Grape Production, Almaty	*Ribes Z; Berberis Z; Grossularia; Crataegus Z; Rubus Z; Fragaria Z; Rosa Z; Armentaca mill; Corasus Z; Hippophae Z; Malus Z; Padus Z; Pyrus Z; Vitis Z.*	6,000
3. Kazakh Research Institue of Potatoes and Vegetables, Almaty, Kainar	*Alicum Tourn; A. longicuspis; Zevisticum oll; Solanum Z; Daucus Z; Cucurbita Z.*	
4. Kazakh Reserach Institute of Forage and Pasture, Almaty	*Festuca T; Bromus Z; Agropyrom Gaaerth; Elymus Z; Medicago Z; Melilotus Z; Trifolium Z; Agropyron; Onobrychis*	
5. 2 Forest Centres of Breeding & Seed Growing, Kokchetaf, Shuchinsk, Almaty, Talgar University of Agriculture, Almaty, Faculty of Forestry	*Hippophae rhamnoides Z;p Kosacea Yuss; Pinus silvestris Z; Picea Schmukiana; Botulalin; Populus Z.*	5,000
6. Scientific Research Institute of Agriculture, Djambul	*Triticum Z; Hordeum Z; Zea mais*	10,000
7. Kazakh Research Institute of Grain Production, named by Baraev akmulah, Shorlandy	*Triticum Z; Hordeum Z; Zea mais; Avena sativa Z; Pisum sativum*	
8. Ara Experimental Station of PGR named by Vavilov	*Triticum Z; Hordeum Z; Avena sativa*	2,000

The national collections consist of both regional and international materials. Many of the samples conserved are unique, including food, forage, medicinal, industrial plants, although in many agricultural corps there are partly duplicate collections in Russia. Wild species, wild relatives, old local breeds are the most important materials in the collection. There is no possibility of making special conditions for their preservation. The main users of the collections are scientists and breeders from national institutions who use annually from 10% to 15% of the samples. Before the collapse of the Soviet Union, genetic resources collections of the All-Union Institute of Crop Production named by N.I. Vavilov in St Petersburg were a main source of genetic resources of many crops.

Import significantly used to prevail on export. Plant diversity of the country is well presented, particularly by the wild flora. Expeditions for collecting plant genetic resources were conducted mainly on the basis of planned collecting programmes, single crop trait or one-breeding objective oriented. At present due to lack of funding, the number of missions is extremely limited and this has contributed to the limits of the renewing of national collections. The material is collected directly from natural populations.

In the collections, potential precious material is kept which might be transferred for storage to a different place or exchanged for other materials under the conditions of free access to the material and the property rights will be observed.

3.3 STORAGE CONDITIONS

In the country there is no 'basis' collections due to the lack of internationally recommended storage facilities. A small number of the country's unique samples (600) are kept at the Main Botanical Garden in refrigerating rooms in glass containers with stoppers treated by paraffin under constant temperature, varying from 3.5°C to 4.5°C, with seed moisture 10-12%. Seeds of most working collections of scientific research institutes are kept at temperatures that are not controlled and moisture in cotton, elastic and foil bags.

Collections of wood and shrubs are kept in living state in the botanical gardens and national parks. The scientists of Kazakhstan who are involved in plant genetic resources activities want to create a national genebank with the purpose of preserving the existing "unique" genetic diversity and economically and socially important plants and wild relatives which are under threat of genetic erosion. However, until now, it has not been considered possible to have an agreement with another country or an international organization to

store our genetic resources material abroad. However we are considering such an option valid until national storage facilities are constructed.
The present botanical gardens, reserves and national parks are created in order to develop government programmes for preserving genetic resources and to support the development of breeding research. The government supports this method of plant genetic resources preservation.

3.4 DOCUMENTATION

Collection samples consist of recording information such as passport data, characterization, evaluation, data of breeders. However, there is no complete computerized database nor any published catalogues of duplicated information. The collection is documented mainly in the form of a card. The methodology of creating a computer bank of germplasm is now being assimilated according to information needs. The information is made available to the users through special permission. The documentation of samples of wild relatives presents no difficulty and classification specialists are available in the country.

3.5 EVALUATION CHARACTERIZATION

Evaluation and characterization of plant genetic resources are done by specialists in systematic, genetics and plant breeding. Classification is developed at the centres on collecting and studying plant genetic resources and international classifications of SEA (Soviet Economic Aid) are used for assessing and describing. There is no precise difference between assessment and description. Usually, the evaluation includes the data: biochemistry, physiology, resistance to diseases, nutrient importance, partly genetic identification. Evaluation of data is only partly published. From our point of view the expenses for sample evaluation are warranted as they promote more effective use of genetic resources. Preliminary evaluation of plant genetic resources should be made at the location of the genebank, a second evaluation is made at the place where it is used. International centres on genetic resources should lead the organization of international collaboration. an international collaboration should promote the achievement of the best results on all aspects of plant genetic resources activity. collaboration on definite crops and on a regional level is preferred.

3.6 REGENERATION

Since there is no national genebank, seed regeneration can only be done through the frequent reproduction of collections, which are very sensitive to any change in the climate, autropogenic and others.

Depending on the kind and conditions of storage, periodical regeneration is made every 1 5 years. However, sample storage in another place with the possibility of their regeneration was not discussed. The plant regenerating is controlled by qualified breeders geneticists, which allows us to avoid (bad?) mixtures and losses of important trait and to preserve genetic integrity. Aged material was usually discarded, although it is possible to keep several generations of the same sample.

CHAPTER 4
Plant Genetic Resources Use within the Country

The plant genetic resources of the country is used to preserve the genetic diversity of the flora and to study genetic breeding. Table 4 gives a list of the crops most frequently supplied over the last three years, the number of users and the number of national scientists for each crop.

Table 4 Users of genetic resources collections in Kazakhstan

Crop/plants	Number of users	Number of scientists
Wheat	50	20
Maize	10	5
Barley	20	5
Rye	10	4
Cotton	2	1
Grape	14	4
Apple	40	10
Berries	20	4
Potato	20	8
Medicinal	30-40	5

Breeding in the country is conducted only at State level. As there is no centralized genebank and database precise information about species not demanded for over the last three years is not available. Because of the absence of appropriate legislation protecting intellectual property rights, farmers have free access to genetic resources.

4.1 PROGRAMMES ON IMPROVEMENT OF CROPS AND DISTRIBUTION OF SEEDS

The main goal of the national programmes in breeding are to improve local cultivars and develop new ones with specific traits, and to increase crop productivity, high quality of grain, frost-resistance, drought-resistance, disease-resistance, etc. the major objective of the breeding programmes is to increase the production capacity and extend the genetic base of crops, thereby

decreasing their vulnerability. The breeding programmes have the objective to improve the situation on food and to increase the export capacities.

Insufficient funding, lack of high level of economic, technical base limit the ability to meet the needs of the country.

State programmes lead to the breeding cultivars for all kind of farmers (small, middle, big) are developed, that is cultivars both of high adaptability, plastic and local. At present, farmers do not participate in breeding and cultivars evaluation.

4.2 ADVANTAGE OF PLANT GENETIC RESOURCES USE

The importance of plant genetic resources in Kazakhstan lays in the potential advantage the country can get from national plant genetic resources, both directly through the use of it as crop for production (food, forage, industrial, medicinal plants) and indirectly as initial material for breeding.

Foreign plant genetic resources originating and kept in the collections can be used as initial material for breeding programmes to develop cultivars for the country. However, it is not possible to define a real advantage from their use.

The main achievements in plant genetic resources activities are: improvement of home breeding; development of the commercial crop production on the bases of improved varieties; generation of new technologies of crop growing and products of technology.

There is no centralized system for preserving plant genetic resources in the country, no centralized connections of it with breeding/seed production system.

The importance of plant genetic resources for the country will increase in the future. We will need such changes as:

1. national policy regarding PGR
2. development of a national programme on collecting and preserving plant genetic resources
3. improvement of international collaboration on all aspects of plant genetic resources activity.

The collaboration of international centres on plant genetic resources will help have a better use of plant genetic resources on mutual beneficial terms.

The assistance is required for staff training on plant genetic resources, organization and development of national genebank, access to technical information and acquire more up to date technical material for plant genetic resources evaluation.

CHAPTER 5
National Problems, Programmes, Statutes

At present there is no complex national programme on plant genetic resources activity financed by the State. There are several projects on preserving and using plant genetic resources financed by different ministries and departments. The country signed the "convention on Biodiversity" and developed a national committee to control and define the directions of plant genetic resources activities and to participate in the development of national programmes.

The collections of botanical gardens, preservations and national parks are protected by law and by governmental resolutions. However, it is necessary to change the status of the collections placed in individual research institutions with the objective of increasing their security.

5.1 TRAINING OF SPECIALISTS.

Specialists are trained at universities and research institutes of biological and agricultural type. The main problems in training specialists come from insufficient funding and a poor economic and technical base. Staff training is conducted on such fields as: systematic breeding and seed production, genetics, biochemistry, statistics, immunology and agronomy. In order to develop staff training on plant genetic resources, there is a need for outside help such as training at international plant genetic resources centres. At present the country has specialists available to organize training. Joining other countries at the "Convention on Biodiversity shows that politicians realize the importance of the plant genetic resources programme. Participation in training programmes is open to everybody regardless of gender and ethnic origins. This is a period of transition at the economic level and of financial instability for the country, it is therefore difficult to get all advantages from the investments in education.

5.2 NATIONAL LEGISLATION

Under quarantine laws, the exchange with foreign countries of *in vitro* and seed material is allowed; the quarantine laws do not influence the importation and exportation of plant genetic resources.

Extending recent collaboration on plant genetic resources exchange with information regional organizations requires stricter use and better organization of quarantine services.

The country has no legislation on intellectual property rights. Organizational measures for the protection of breeders' rights are under preparation but have no executive power. There is need for help in the legal of plant genetic resources activities.

There are no precise policies for plant genetic resources exchange. The directors of research institutions are responsible for allowing or not plant genetic resources exchange. Their decisions are affected by such factors as availability of the material, who requested the material, and informal networking.

At present, the farmers select seed material without accounting for their influence for preserving and using plant genetic resources. Since there is no market opportunities for good seed material, it is not necessary to develop new breeds and to establish control of genetic clarity of existing breeds. The specialists of plant genetic resources are mainly breeders and they take part in the development of projects for agricultural development, and environmental protection. When making laws on trade, the government does not take into consideration its possible effect on plant genetic resources activities.

CHAPTER 6
International Collaboration

In the last two/three years, the scientists of Kazakhstan have had little working experience in the field of international plant genetic resources, and informal regional organizations.

6.1 REGIONAL RESEARCH CENTERS

With regard to the exchange of genetic resources material, the country collaborates with the International Centre of Rice in the Philippines, with Japan International Centre for Plant Resources in Osaka; with CYMMIT (Iran and Turkey divisions) in Tegera, Ankar; with the Russian Institute of Crop Sciences in St Petersburg; with the International Centre of Breeding Winter Wheat in Cambridge, UK; with the Institute of Genetic Resources, China, Urmchl; with the Institute of Sunflower and Soft Wheat "Dobrudzha", Bulgaria, Tolbuhino; with the Yugoslavia Institute of Com "Zemun Pole", Belgrad; with the Bulgarian Institute of Corn, Knezhl.

6.2 WORLD SYSTEM FAO

The country is not a member of FAO. We consider that international funds should stimulate the process of entering of many developing countries into the FAO systems. The country could be an investor and consumer of an international fund. There were not any joint programmes with FAO on plant genetic resources national staff of plant genetic resources have not been trained in centres of CGIAR.

Acknowledgements

Urazaliev, Raheem
Esimbekova, Minura
The Kazakh Scientific Research Institute of Agriculture named by V.R.Williams

Madenov, Eduard
The Kazakh Institute of Fruit and Grape Production

Lahin, Evgeni
The Kazakh Institute of Potatoes and Vegetables

Alimbaev, Ilia
The Kazakh Institute of Forage and Pasture

Belgibaev, Sabir
Kabanov, Sergei
The Main Botanical Garden

Medvedev, Aleksei
The Kazakh Agricultural University