Islamic Organization for Food Security
l'Organisation Islamique pour la Sécurité Alimentaire
المنظمة الإسلامية للأمن الغذائي

ISLAMIC ORGANIZATION FOR FOOD SECURITY

CONSERVATION AND REPRODUCTION OF GENETIC RESOURCES

FOR SUSTAINABLE AGRICULTURE AND ENSURING FOOD SECURITY AT THE OIC SCALE

CONFERENCE PROCEEDINGS

NUR-SULTAN, MAY 25, 2021

ISLAMIC ORGANIZATION FOR FOOD SECURITY

CONSERVATION AND REPRODUCTION OF GENETIC RESOURCES FOR SUSTAINABLE AGRICULTURE AND ENSURING FOOD SECURITY AT THE OIC SCALE

Conference Proceedings
(Nur-Sultan, May 25, 2021)

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The Islamic Organization for Food Security organized a Conference titled "Conservation and Reproduction of Genetic Resources for Sustainable Agriculture and Ensuring Food Security at the OIC scale" on May 25, 2021, attended by 70 representatives of government authorities, research institutions, universities and scientific organizations of Kazakhstan.

This event showed the importance of agrobiodiversity development in the country, in particular the conservation and rational use of plant and animal genetic resources to ensure food security and sustainable agricultural development.

This collection of materials includes reports of the conference speakers, that presented the activities of scientific organizations of Kazakhstan in the field of conservation, reproduction and sustainable use of genetic resources; a review of national banks of genetic resources of the Organization of Islamic Cooperation (OIC) countries, and the prospects for creating an International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources (under the auspices of the OIC).

The publication is intended for the use of experts, researchers, scientists, teachers and students of higher educational institutions, as well as for a wide range of readers interested in the modern development of genetic resources and agrobiodiversity development.

The compendium is published in Russian and English. All reports have been written in the original Russian language, and translated and with the assistance of the Secretariat of the Islamic Organization for Food Security, as well as edited by its Program Manager, Mr. Bakytzhan Arystanbek.

The opinions and recommendations of the proceedings' authors within the framework of the conference belong only to the authors and do not necessarily reflect the views of the organizers of the Conference.

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CONFERENCE

CONSERVATION AND REPRODUCTION OF GENETIC RESOURCES FOR SUSTAINABLE AGRICULTURE AND ENSURING FOOD SECURITY IN THE OIC SCALE

UNDER THE PROGRAM

DEVELOPMENT OF NATIONAL GENE BANKS IN OIC COUNTRIES

NUR-SULTAN, 25 MAY 2021
ONLINE, ZOOM PLATFORM

http://bit.ly/conference-25May

INTRODUCTION

The importance of the issues of conservation and rational use of agrobiodiversity is predetermined by the current situation in food security throughout the world. In many parts of the world, crop yields tend to decline as a result of environmental degradation and increasing water and energy shortages. The constant growth of the population puts new demands on ensuring food security. Obviously, with climate change, the demand for species adapted to new environmental conditions and a wide range of pests and diseases will undoubtedly increase. This will require increased use of genetic diversity, which will increase the demand for new materials from global genebanks.

Plant and animal genetic resources are limited and vulnerable to erosion due to severe threats associated with replacing landraces / traditional varieties with modern varieties, natural disasters such as droughts, floods, fire hazards, urbanization and industrialization, and habitat loss due to irrigation projects, overgrazing, mining and climate change. In the leading countries of the world, active work is being carried out to conserve genetic resources, as well as their effective use in providing farmers with modern varieties and seeds. Unfortunately, the situation in the countries of the Organization of Islamic Cooperation (OIC) is characterized by a lack of systematic work in this direction, which jeopardizes further efforts to strengthen food security and the development of sustainable agriculture.

RELEVANCE OF ACTIVITY

On July 5-6, 2020, the Islamic Organization for Food Security (IOFS) organized an International Conference on the Development of National Gene Banks in OIC Member States under the chairmanship of the UAE with the participation of international experts. As a result of the conference, the "Dubai Declaration" was adopted, in which experts and participants emphasized the importance of intensifying the work of the OIC member states on the conservation, use and exchange of genetic resources. The experts also noted the particular importance of creating a repository of plant and animal genetic resources for the OIC member countries, which will serve as the basis for increasing yields through advanced scientific methods, such as seed improvement and genetic cloning, the purpose of which is to create resistant varieties of crops and animal breeds for access by the OIC member states.

Taking into account the recommendations of the Dubai Declaration to strengthen work on the conservation and use of genetic resources, as well as to consider the issue of creating an International Center for Plant and Animal Genetic Resources under the auspices of the OIC, the IOFS offered a platform for discussing this issue with the scientific community in the field of conservation and reproduction of genetic resources of plants and animals.

CONFERENCE

On May 25, 2021, the Conference on the "Conservation and Reproduction of Genetic Resources for Sustainable Agriculture and Food Security at the OIC Scale" held on the Zoom video conferencing platform.

The organizer of the conference was the IOFS. The event conducted in Russian. Representatives of interested government agencies, research institutions, universities and scientific organizations of Kazakhstan took part in the work of the Conference.

CONFERENCE OBJECTIVES:

Discussion of the current situation on the conservation and reproduction of plant and animal genetic resources in Kazakhstan;

Presentation of the activities of gene banks and scientific organizations in Kazakhstan;

Exchange of experience and best practices in the field of conservation and reproduction of genetic resources;

Discussion of the prospects for the creation of the International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources (under the auspices of the OIC).

CONFERENCE SESSIONS ARE:

SESSION 1: Creation of the International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources (under the auspices of the OIC) in Kazakhstan (Center)

SESSION 2: Conservation and reproduction of plant genetic resources. Activities of genetic banks and scientific organizations.

SESSION 3: Conservation and reproduction of animal genetic resources. Activities of scientific organizations.

SESSION 4: Resolutions on the establishment of the Center

Following the outcomes of the Conference, participants adopted Resolutions, which will be sent in the form of an Address to the President of the Republic of Kazakhstan H.E. Kassym-Zhomart Tokayev on behalf of the Conference participants, the scientific community of Kazakhstan. Also the IOFS Secretariat together with the speakers will develop the Conference proceedings from reports to be shared with to participants and the wider audience.

CONFERENCE AGENDA

CONSERVATION AND REPRODUCTION OF GENETIC RESOURCES FOR SUSTAINABLE AGRICULTURE AND ENSURING FOOD SECURITY IN THE OIC SCALE

13:45 – 14:00	**REGISTRATION**
14:00 - 14:30	**WELCOMING SPEECH:** ***Moderator**: Mr. Bakytzhan Arystanbek, IOFS Program Manager* **H.E. Mr. Askar Mussinov**, Assistant Secretary General for Science and Technology of the Organization of Islamic Cooperation (OIC); **H.E. Mr. Akhylbek Kurishbayev**, Member of the Senate of the Parliament of Kazakhstan; **H.E. Mrs. Gulmira Issayeva**, Chairman of the Board of the National Agrarian Science and Educational Center (NASEC); **H.E. Yerlan A. Baidaulet**, Director General of the Islamic Organization for Food Security (IOFS).
14:30–15:00	**SESSION 1: ESTABLISHMENT OF AN INTERNATIONAL CENTER FOR CONSERVATION AND REPRODUCTION OF PLANT AND ANIMAL GENETIC RESOURCES (UNDER THE AUSPICES OF OIC) IN KAZAKHSTAN (CENTER)**
	***Moderator**: Mr. Bakytzhan Arystanbek, IOFS Program Manager* **Mrs. Makpal Bulatova,** IOFS Program Manager. Topic: National genetic banks of OIC member countries. The importance of the establishment of the Center for the OIC region. **Mr. Timur Savin,** NASEC Chief Manager of the Department of Science. Topic: Concept of the International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources. **Q&A**
15:00-15:45	**SESSION 2: CONSERVATION AND REPRODUCTION OF PLANT GENETIC RESOURCES. ACTIVITIES OF GENE BANKS AND SCIENTIFIC ORGANIZATIONS.**
	***Moderator:** Mr. Timur Savin, NASEC Chief Manager of the Department of Science;* **Mrs. Minura Esimbekova**, Head of Plant Gene Pool Group "Kazakh Research Institute of Farming and Crop Production" LLP. Topic: "Biodiversity of Genetic Resources for Agriculture and Food in the Republic of Kazakhstan". **Mr. Kassym Mukanov**, Deputy Director General National Center of Biotechnology. Topic: Conservation of genetic resources and creation of a gene bank of rare and endangered species of flora and fauna of Kazakhstan.

	Mr. Muratbek Karabayev, Head of Regional Office of the International Maize and Wheat Improvement Center (CIMMYT). Topic: Opportunities and contributions of international scientific organizations and cooperation to mobilize genetic resources for food security. **Mr. Yerlan Turuspekov**, Head of Laboratory, Institute of Plant Biology and Biotechnology. Topic: Genetic diversity of agricultural plants and wild flora of Kazakhstan. **Mr. Yuriy Dolinniy**, Head of Laboratory of A.I. Barayev Research and Production Center for Grain Farming. Topic: Conservation and rational use of the gene pool of agricultural plants in Kazakhstan. **Mrs. Anar Myrzagaliyeva**, First Vice-President Astana International University. Topic: Conservation of plant genetic resources in Kazakhstan. **Mrs. Svetlana Kushnarenko**, Head of the Cryopreservation Laboratory Institute of Plant Biology and Biotechnology. Topic: Creation of a cryobank of plant germplasm in Kazakhstan: 15 years of experience. **Q&A**
15:45-16:30	**SESSION 3: CONSERVATION AND REPRODUCTION OF ANIMAL GENETIC RESOURCES. ACTIVITIES OF SCIENTIFIC ORGANIZATIONS.**
	Moderator: *Mr. Yerzhan Toishibekov, Director Institute of Experimental Biology named after F. M. Mukhamedgaliev;* **Mr. Talgat Karymsakov**, Deputy Director Kazakh Research Institute of cattle breeding and fodder production. Topic: Genetic resources of farm animals of the Republic of Kazakhstan and possible ways of preserving endangered breeds. **Mr. Bolat Seisenov**, President of “Asyl tulik” JSC of NASEC. Topic: “Republican Center for Breeding Livestock” Assyl Tulik JSC. **Mr. Roman Yashchenko**, Director General of the Institute of Zoology of the Ministry of Education and Science of Kazakhstan. Topic: State, prospects of conservation and rational use of the agrobiodiversity of wild animals' genetic resources. **Mrs. Leila Zhansugurova**, Director General Institute of Genetics and Physiology of the Ministry of Education and Science of Kazakhstan. Topic: Molecular genetic analysis of farm animal populations and other collections of the Institute of Genetics and Physiology. **Mr. Yerzhan Toishibekov**, Director of Institute of Experimental Biology named after F. M. Mukhamedgaliev. Topic: State and prospects of conservation and reproduction of animal genetic resources. Activities of scientific organizations. **Q&A**

16:30-16:50	**SESSION 4: RESOLUTIONS ON ESTABLISHMENT OF CENTER**
	Moderator: *Mr. Timur Savin, NASEC Chief Manager of the Department of Science;* ***Co-moderator:*** *Mr. Yerzhan Toishibekov, Director Institute of Experimental Biology named after F. M. Mukhamedgaliev.* Discussion of the prospects for the establishment of the Center among participants; Involvement of experts and organizations in the preparation of the Concept Note and the feasibility study for the establishment of the Center. **Q&A**
16:50-17:00	**CONCLUDING REMARKS:**
	Mr. Timur Savin, NASEC Chief Manager of the Department of Science; **Mr. Yerzhan Toishibekov,** Director Institute of Experimental Biology named after F. M. Mukhamedgaliev.
17:00	**END of CONFERENCE**

OUR CONTACTS

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CONTENT

SESSION 3: CONSERVATION AND REPRODUCTION OF ANIMAL GENETIC RESOURCES. ACTIVITIES OF SCIENTIFIC ORGANIZATIONS

SESSION 4: RESOLUTION ON THE ESTABLISHMENT OF THE CENTER

WELCOMING SPEECH
of Mr. Askar Mussinov
Assistant Secretary-General
of the Organization of Islamic Cooperation (OIC)
for Science and Technology

Bismillahir-Rahmanir-Rahim,

Dear Chairman,
Dear participants of the Conference (*from kazakh language*),
Assalamu alaikum wa rahmatullahi wa barakatuh!

First of all, I would like to express my sincere gratitude to the Islamic Organization for Food Security for organizing this conference. I think that today's event will allow us to exchange views on issues that are very important for all of us (*from kazakh language*).

Today's meeting will be held in accordance with the Dubai Declaration, which was adopted at the International Conference on the Development of National Banks of Genetic Resources of the OIC Member States, which took place on July 5, 2020. The Dubai Declaration called for the expansion of cooperation within the OIC region for the conservation of genetic resources of plants and animals, as well as the exchange between member states.

Dear participants of the Conference,

The countries of the OIC, that are located in different climatic regions, are well-supplied with natural resources, such as arable land, energy and useful fossils, and at the same time a number of them are struggling to cope with the problems and challenges, including climate change, which undermine the productive process of agricultural land, and is vitally important for food security and reduction of poverty scales.

While populations in OIC countries rely on agriculture for income and livelihoods, most of them lack the resources to grow or buy the required amount of food. Therefore, increasing investment in agricultural science and research, sharing best practices, knowledge

and innovation in new crop varieties is essential to address these new and multifaceted challenges.

In the case of OIC, some member states are highly dependent on international food supply markets, while some others are large exporters of food. It is these conditions that provide a good platform for expanding cooperation and ensuring food and agricultural security in the OIC countries. The first OIC Science and Technology Summit, which was held in Nur-Sultan in September 2017, adopted a ten-year plan called the OIC Science, Technology and Innovation Agenda 2026, which defined farm productivity and plant biodiversity as one of the main priority areas.

Particular attention was paid to increasing agricultural productivity through the use of plant biotechnology for the development of new seeds for food and commercial crops and the creation of national banks of genetic resources and seeds for the conservation and exchange of plant genetic resources between the OIC member states.

In view of this, the IOFS and the OIC Standing Committee on Science and Technology (COMSTECH), which through the UN Food and Agriculture Organizations, are initiating a number of projects to strengthen the national capacity of OIC countries to promote the use of plant genetic resources in the development of various grades and integration into the seed system.

I am sure that today's meeting will help advance food security in the Muslim world through the use of innovations and new technologies in the agricultural and food sectors. This, in exchange, will improve the socio-economic conditions of our member states.

I wish you a fruitful discussion.

Thank you for your attention!

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WELCOMING SPEECH
of Mr. Akhylbek Kurishbayev
Member of the Senate of the Parliament of the Republic of Kazakhstan

Dear Chairman,
Dear Conference Participants!

First of all, I would like to thank the Islamic Organization for Food Security for organizing this event and giving me the opportunity to speak on a very important topic, the conservation of genetic resources and their use for sustainable agriculture in our country.

The resources of the genetic banks of the country are ideal material for research in the fields of agronomy, breeding and genetics. The fact is that we have recruited the gene bank in the process of work, including in collaboration with our other country-neighbors and colleagues, as well as we have been greatly helped in the expansion of the gene bank by international scientific institutions such as CIMMYT and ICARDA.

However, there are problems with their preservation. In order to organize modern centralized conservation of genetic resources, it is necessary to create a National Bank of genetic resources of plant and animal origin in order to ensure food security and sustainable development of agriculture. Establishment of the National Bank of Genetic Resources will increase the competitiveness of domestic agricultural products by creating systems of mobilization, monitoring, conservation, restoration and rational use of genetic resources not only in the sphere of agro-industrial complex of the Republic, but also in Central Asia.

The fact is that as far as we know the situation with creation of new varieties and new hybrids of crops does not meet today's challenges both in our country and in neighboring countries. Developed countries focus on the development of breeding process, the use of modern breeding methods, including molecular biology, and lack or shortage of these initial samples for breeding development. Both our scientists and the leadership of the country are well aware of this problem.

We recently discussed with the Prime Minister of Kazakhstan the creation of a specialized genetic bank in our country. Since the country has small genetic banks localized in certain agricultural territories. Therefore, we are talking about the creation of a single conservation facility, on the basis of large agricultural institutions. The Prime Minister supports this initiative. Moreover, this initiative will be accepted within the framework of our national project.

But the essence of a gene bank is precisely the expansion and use of the diversity of genetic resources. That said, even if each country has established a genetic bank in its own country, we would not solve the problem. But it is important to create a relevant genetic resource bank within the OIC, as is being proposed by the management. This issue is long overdue and it has been talked about many times at different levels. Unfortunately, the issue is not being solved, we have proposed this idea within various organizations and have come up with this initiative. If we have such a single genetic bank for the countries of the Organization of Islamic Cooperation, then we would achieve efficiency. This option would be cheaper and, most importantly, more convenient for our breeders. The given question would unite efforts of breeders. But unfortunately, this issue has not been resolved for many years. Therefore, here we very much support the initiative of OIC and management of this organization to create the International Center on Preservation and Reproduction of Plant and Animal Genetic Resources under the auspicious of OIC. The Republic of Kazakhstan has great potential for this, therefore this entity can be created in our country, as it has appropriate climatic conditions and diversity of resources, also there is huge potential in agricultural sector. And here we will not only solve the problems of food security in our country, but also in the countries of Central Asia and the OIC.

Of course, it already makes sense to move this issue from the stage of consideration to the stage of implementation of this project.

I am sure that if we have just such a center, then the work will be faster. I recently returned from the South Kazakhstan region, and I saw how the climate is changing, both in the north and the south. Today there is a change in climate and aridity zones.

Accordingly, we must now work proactively and create new types of crops, varieties and hybrids adapted to our conditions. The creation of a genetic bank and exchange of data on genetic resources will make it easier to solve problems in our countries.

So, we support this initiative and I think from our side we will help as much as we can. The Senate of the Parliament will actively get involved in this process.

In conclusion, I would like to thank once again the organizers of this Conference for the opportunity to speak at such an important event, to thank all participants and to wish us all success, fruitful work and development of agriculture in our country.

Thank you for attention!

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ELCOMING SPEECH
of Mrs. Gulmira Issayeva
Chairman of the Board
National Agrarian Science and Educational Center

Dear Participants of the Conference!

Firstly, I would like to thank the Islamic Organization for Food Security for organizing such a relevant discussion on issues related to the conservation and reproduction of genetic resources. A huge thanks to Mr. Askar Mussinov, Assistant Secretary General of the Organization of Islamic Cooperation for the support of the development of joint scientific programs and technologies for the OIC countries. Special thanks to Mr. Akhylbek Kurishbayev, as a Member of the Senate of the Parliament of the Republic of Kazakhstan, for supporting all initiatives of the Ministry of Agriculture and the National Agrarian Science and Educational Center in the development of science in the field of conservation and reproduction of genetic resources.

As already mentioned by previous speakers, genetic resources are very important for farmers and breeders. We know that the Republic of Kazakhstan has adopted and signed a number of international documents, such as the Convention on Biological Diversity, the Global Plan of Action, the Cartagena Protocol, the Nagoya Protocol, that reflects the country's plans on these issues. The Genetic Bank, the creation of which is being discussed today, is very important for the development of agriculture. After all, through a wide exchange and free access to germplasm, breeders have the opportunity to create new high-yielding varieties with agricultural prices and traits.

Mr. Akylbek Kazhigulovich has just given you an example that in connection with climate change farmers now need traditional and new crops, but with already new properties, such as drought tolerance or, on the contrary, moisture tolerance, and this is the task of breeders.

But it is possible to fulfill these tasks promptly only by providing access to the genetic fund, which has been accumulated over the

years in our countries. In research institutions of Ministry of Agriculture of the Republic of Kazakhstan at present time 64 236 accessions of major crops are being conserved. At the same time, I would like to emphasize, including 1583 samples of wild relatives of crops.

This shows that Kazakhstan has a great reserve in the implementation of scientific programs. For 25 years we have implemented the programs of applied scientific research in the field of agro-industrial complex. Within the framework of these programs 11 national and 6 international projects are fulfilled. A huge interspecific diversity of crops was collected, studied and conserved. It is more than 100 species of cultivated and wild varieties.

As for the situation with the genetic bank, the urgency of its creation is overdue, because more than 70% of the available samples, unfortunately, at present are conserved for short periods, in insufficiently controlled conditions of temperature and humidity. And we have identified the most important priority of NASEC activity as solving the problem of creating a national genetic bank.

We see that at this time the creation of a national genetic bank, we must implement in two directions. As we discussed at the meeting with the Director General of IOFS, Mr. Yerlan Baidaulet, during the signing of the Action Plan, it is very important to ensure the implementation of two international principles, these are “availability” and “accessibility”. That is, we should, firstly, create a reserve of those genetic resources, which we have now historically inherited, and also those accumulated during the period of independent Kazakhstan genetic resources, and moreover to solve the issue of their accessibility. That is why we propose to solve the issues of development of a pomological garden within the framework of the “National Genetic Bank” project. This garden, which was established in 1937, will celebrate its jubilee next year, and we plan to further update it with 2.540 varieties of various fruit crops and grapes to enable our breeders to conduct and implement various scientific programs.

Regarding animal genetic resources, we also have a large collection of different types of farm animals, which we can further transform into collection herds, cattle and small ruminants, horses,

depending on the type of production, depending on the direction of productivity.

Therefore, we offer our colleagues, scientists from OIC countries to use this platform to discuss the possibility of creating such an International Genetic Resources Bank for our countries and to discuss what crops should be represented in this bank, under what conditions they should be conserved and what joint research programs we can implement in the long-term using this gene pool. I would like to wish success to all participants of this Conference.

Thank you, colleagues,

Thank you for attention!

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WELCOME SPEECH
of Mr. Yerlan A. Baidaulet
Director General of the
Islamic Organization for Food Security

Bismillahi r-Rahmani r-Rahim,

Dear Conference participants,
Dear colleagues!

Assalamu alaikum wa rahmatullahi wa barakatuh!

I sincerely welcome all the participants and express my gratitude to speakers, to respected Mr. Askar Akhmetovich for his constant support from the leadership of the Secretariat of the Organization of Islamic Cooperation.

Dear Mr. Akhylbek Kazhigulovich, we highly appreciate your contribution to the development of the country's agriculture, and express our gratitude for your words of support for the initiative that will be discussed today.

Dear Mrs. Gulmira Sultanbaevna, I absolutely agree with you that having recently signed the Joint Action Plan between IOFS and NASEC, we are moving towards its active implementation, moving from words to deeds. It is very important for us to use all available resources for further work.

I would like to emphasize the relevance of today's event, which aims to discuss the conservation and reproduction of genetic resources for sustainable agriculture and food security in Kazakhstan and across the OIC.

Agrobiodiversity is becoming increasingly important in terms of conservation and use of genetic resources for sustainable food systems. This is due to the current challenges in food security around the world, namely the decline in crop yields, water and energy shortages, environmental degradation and climate change, as well as the continuous growth of the world population.

In turn, this will require increased use of genetic diversity, which will increase the demand for new materials from global genetic re-

source banks. The leading countries of the world are actively working on the conservation of genetic resources, as well as their effective use in providing farmers with modern varieties and seeds. At the same time, the activity in this direction in the countries of the Organization of Islamic Cooperation (OIC) does not meet the current demand and requires a lot of efforts to strengthen food security and develop sustainable agriculture.

In this context, I would like to inform you that the Islamic Organization for Food Security as a specialized OIC institution is working on the implementation of program "Development of National Gene Banks", which aims to strengthen the capacity of OIC countries in the conservation and reproduction of plant and animal genetic resources by enhancing cooperation and sharing best practices among member countries to improve agricultural productivity and ensure sustainable food security.

Another important component of this program is the establishment of a repository of plant and animal genetic resources for their conservation and sustainable use in agriculture, which will serve as the basis for increasing crop yields through advanced scientific methods, and the formation of resistant crop varieties and animal breeds for access by all OIC member countries.

In this context, this event is in line with the Dubai Declaration adopted at the end of the International Conference on the Development of National Genebanks organized by the IOFS together with the UAE Government on July 5-6, 2020.

The Secretariat is considering the possibility of establishment of an International Center for Plant and Animal Genetic Resources and is also interested in developing a Concept Note and Feasibility Study for the establishment of such a Center under the auspices of the OIC. The IOFS Secretariat recognizes the particular importance and uniqueness of this project both for the host country and for all 56 OIC member countries.

In this regard, this Conference is organized to discuss the current situation and exchange views on the conservation and use of genetic resources in Kazakhstan. Today, we will be glad to hear the proposals for the establishment of an International Centre for Plant and Animal Genetic Resources for the OIC countries.

We are confident that despite the underdeveloped institutional framework in the issues of conservation and rational use of genetic resources, the country has a huge potential in the agricultural sector, its territory has special climatic conditions and a large variety of natural resources, in general, the scientific potential is developed, scientific and educational centers and universities for sustainable interaction with the state and business are working.

Dear Colleagues,

This event is designed to promote dialogue and exchange of views between representatives of academia, research organizations, state authorities and universities in Kazakhstan. We believe that an active and proactive local scientific community in cooperation with the state bodies of the country can intensify the work on the conservation and use of genetic resources both in Kazakhstan and in the scale of the OIC.

The conference program is quite comprehensive and covers various aspects of activities of scientific organizations of Kazakhstan in the field of genetic resources. The Secretariat will listen carefully to the papers and presentations for their use in further work, including for the publication of a small collection of conference papers and for publication in a specialized publication of the IOFS Food Security Hub.

We wish you all a fruitful discussion and productive work!

Thank you for your attention!

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SESSION 1:
ESTABLISHMENT OF AN INTERNATIONAL CENTER FOR THE CONSERVATION AND REPRODUCTION OF PLANT AND ANIMAL GENETIC RESOURCES (UNDER THE AUSPICES OF THE OIC) IN KAZAKHSTAN (CENTER)

Mrs. Makpal Bulatova
Program Manager
Islamic Organization for Food Security

National genetic banks of OIC member countries. Importance of establishing the Center for the OIC Region

Dear Participants of the Conference,

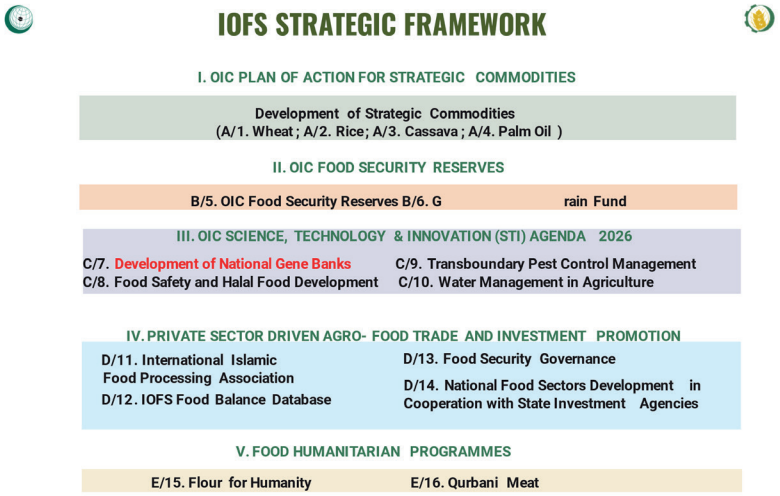
First of all, on behalf of the Islamic Organization for Food Security, we would like to express our deep appreciation to all participants of the Conference and thank them for their firm commitment to contribute to the development, conservation and efficient use of genetic resources in Kazakhstan.

The Islamic Organization for Food Security is a specialized institution of the Organization of Islamic Cooperation (OIC), which has developed 16 strategic programs on various aspects of food security, sustainable agriculture and rural development adopted by the member countries of OIC at the 3rd General Assembly of IOFS in Ankara, Turkey, December 2-3, 2020.

The mission of the Organization is to ensure sustainable food security in the OIC countries through socio-economic development, systematic promotion of targeted programs related to agriculture, science and technology, humanitarian assistance, mutual trade, including the export of food products to the IOFS/OIC countries.

We remind, that in June 2011, during the 7th World Islamic Economic Forum, the First President of the Republic of Kazakhstan – Leader of the Nation proposed the initiative of the establishment of the Organization for Food Security in the OIC region, headquartered in the Republic of Kazakhstan, the member countries of the

OIC unanimously supported the proposal. The OIC has 56 member countries, of which 36 are members of the Islamic Organization for Food Security.



There are five pillars in which the IOFS is working on the implementation of programs.

Conservation and multiplication of genetic resources in crop and livestock production for natural food production and effective agriculture, for sustainable food security.

All countries need to obtain genetic diversity from other countries and regions. Therefore, international cooperation and open exchange of genetic resources is essential for food security. In this regard, the IOFS is working on the implementation of the program “Development of National Genetic Resource Banks”, which aims to strengthen the capacity of OIC member countries to conserve and reproduce plant and animal genetic resources by developing partnerships between countries, which will help to obtain best practices and keep pace with new technologies.

Program goals:

- Promoting biodiversity and the conservation and protection of genetic resources;
- Improving the efficient use of natural resources, living standards and human well-being;
- Increasing the sustainability of the food system;
- Developing and strengthening genetic resource banks in OIC member countries;
- Mobilizing the scientific potential of genetic resource banks and research institutes of OIC member countries through the exchange of best practices;
- Improvement of agricultural productivity in OIC member countries.

According to preliminary IOFS research, there are the following national genetic resource banks in the OIC region.

OVERVIEW OF NATIONAL GENE BANKS OF OIC COUNTRIES: Asia, Africa and MENA countries

According to preliminary research within the OIC region among 56 countries, there are only 32 National Gene Banks that are currently operational.

Existing OIC Gene Banks	Number of OIC countries	Available Gene Banks	
		PGR conservation	PAGR conservation
Africa: Uganda, Burkina Faso, Mali, Nigeria, Mozambique	22	3	2 (Uganda and Nigeria)
Asian& European: Afghanistan, Azerbaijan, Bangladesh, Indonesia, Malaysia, Pakistan, Tajikistan, Turkmenistan, Uzbekistan, Turkey, Iran and Albania	15	10	2 (Bangladesh and Azerbaijan)
MENA: Jordan, Bahrain, Iraq, Oman, Yemen, UAE, Saudi Arabia, Egypt, Libya, Morocco, Tunisia, Sudan	17	9	3 (Oman, Egypt and Tunisia)
South America: Guyana and Suriname	2	-	-

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Among the 56 OIC member countries, 32 national genetic banks are fully operated. It was noted that the work on the conservation of plant genetic resources is actively carried out in the OIC countries, less dynamically developing livestock industry.

Africa

Based on country reports, data on facility conservation in Africa is less complete than in other regions. Most countries report seed and field banks of genetic resources, but only Benin, Cameroon, Mali, Nigeria, and Uganda have in vitro conservation facilities. No country has indicated that it has the ability to store germplasm cryogenically. Seed banks tend to be much more important and widespread than field genebanks on the continent.

Most national-level genetic resource banks/research centers in African countries (Somalia, Djibouti, Comoros, Ivory Coast, Gambia, Guinea, Senegal, Sierra Leone, Cameroon, Chad, etc.) are directly supported by international organizations such as AfricaRice, ICRISAT, ICARDA, CIMMYT, CORAF, IITA, IPGRI and CIRDIS.

The state and problems of genetic resource banks in African countries:

- Lack of funds;
- The capacity of existing genetic resource banks does not allow large quantities of germplasm to be conserved;
- Climate variability and population pressure;
- Continued deforestation;
- Lack of a stable energy supply;
- Poor rural infrastructure, logistics;
- Lack of coordination and synchronization processes in Africa's genetic resource banks.

Asia

Most Asian countries note that they maintain both seed and field genetic resource banks, but less than half store germplasm in vitro, and only Indonesia and Pakistan use cryopreservation. Pakistan, Turkey and Iran report compliance with international standards for germplasm conservation.

- The state of genetic resource banks and challenges in Asian countries:
- Strengthening research activities to diversify food systems;
- International cooperation on biodiversity and conservation of genetic resources among countries;

- Insufficient support at the legislative level;
- Training on various aspects of varietal development, classification and distribution in seed systems;
- Assistance in establishment and development of genetic resources centers.

MENA countries (Middle East and North Africa)

The level of development of national genetic resource banks varies greatly. For example, seven genetic resource banks have been operating for 20-30 years, and some countries such as Qatar, Kuwait, Lebanon, UAE are only planning to establish genetic resource banks.

The National Genetic Bank of Egypt is the largest genetic resources bank with a conservation capacity of 200.000 samples, as well as equipment for in vitro and by cryopreservation.

The state of genetic resource banks and problems in MENA countries:

- Hot and dry desert climate;
- Low level of international cooperation, best practices, satisfactory training system in the field of genetic resources;
- Low level of financial support;
- Assistance is required to establish and develop genetic resource banks.

Animal genetic resources bank in the OIC region:

Animal genetic resources are the main biological capital for livestock development and are vital for food security and sustainable rural development. However, the value of these resources is poorly understood and their management has not received adequate attention.

Most countries face inadequate financial and human resource base to ensure in situ/ex situ conservation and to better utilize animal genetic resources, and there are many gaps related to inefficiencies in operation. In addition, the capacity and activities of countries to address animal genetic resources are at very different stages of development.

Currently, there are only a few animal genetic resources banks in the OIC region:

- The National Center for Animal Genetic Resources and a data bank in Uganda;
- National Centre for Genetic Resources and Biotechnology in Nigeria;
- National Gene Bank of Azerbaijan;
- National Gene Bank in NIB Bangladesh;
  Animal and Plant Genetic Resources Center in Oman, etc.

Implementation of the program

The program is implemented by establishing close cooperation with OIC member countries, OIC institutions and international organizations in the field of plant and animal genetic resources conservation and by conducting joint activities.

- IOFS conference on development of national genetic resource banks in OIC member countries, organized in partnership with the UAE, on July 5-6, 2020;
- Within the framework of the signed Memorandum of Cooperation with the OIC Standing Committee on Scientific and Technical Cooperation – COMSTECH (Pakistan), a series of trainings for the OIC regions (Africa, Asia and MENA countries) on conservation of PGR is planned to be held in July, September and August 2021, and a Conference to evaluate and summarize all the conducted trainings in November 2021 with the participation of international experts.

Taking into account the recommendations of the Dubai Declaration on the importance of regional cooperation of national genetic resource banks of OIC member countries, it is proposed to consider the possibility of establishing a Single International Center for Plant and Animal Genetic Resources (PAGR Center) for the OIC region.

Creating a PAGR Center in the OIC region will help to solve the following major problems, such as:

- Lack of a unified bank of genetic resources on the territory of the OIC in accordance with international standards;

- Lack of coordination and cooperation among scientists, breeders, genetic engineers and farmers;
- Exchange of experiences and best practices in the conservation, evaluation and use of genetic resources, with special emphasis on the conservation of biodiversity and genetic resources that are important for food, agriculture;
- Providing free and assured access to genetic resources to be conserved at the Center by OIC member countries.

Thank you for your attention!

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Mr. Timur Savin
Chief Manager of the Department of Science
"National Agrarian Research and Education Center"
Non-commercial JSC

Concept of the International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources

Good day dear participants of the Conference!

Let me thank the organizers for the invitation and for the opportunity to speak on behalf of scientists!

As you know, plant and animal genetic resources are an important raw material for crop and animal breeding, a strategic capital. That is why in many countries of the world today great attention is paid to the collection, preservation and study of genetic resources.

Preserving biodiversity is of dual importance in the context of agriculture. It is, first of all, to improve the collection, study and access to national and international genetic collections, for their better use, responding to the needs of both diversification and adaptation to the new requirements of agronomy, nutrition and climate. On the other hand, it is necessary to benefit from the interaction between agriculture and the environment, reducing the negative impacts and enhancing the positive effects, for example, of biological diversification for soils and in relation to associated organisms to strengthen the resistance of perennial crops.

Genetic resources are increasingly considered in the context of geopolitical interactions between countries, namely:

1) Mobilization of the world's plant resources is not an end in itself, the most important task is to create a sustainable agriculture that depends as little as possible on the prevailing elements and randomness of the weather.

2) Until the mid-1980s, many international issues in genetic resources were in the hands of scientists, but by the early 1990s ever-growing political and economic disagreements were impeding both the mobilization of agrobiodiversity and the free exchange of germplasm.

3) The problem of agrobiodiversity conservation and free access has become a global geopolitical issue. Experts conclude that plant genetic resources are more important for national security than weapons and, according to CIA (Central Intelligence Agency) experts, conflicts over this issue will arise more frequently, especially in developing countries. The loss of these resources is put at the top of the list of global explosions of dangerous problems (Weaver, 2010).

4) No country in the world can maintain a developed and competitive agriculture based on local resources alone, cannot fully sustain itself with genetic diversity, and thus the countries of the world are interdependent on this issue.

5) In many parts of the world, as a result of environmental degradation, increasing water and energy scarcity, and lack of targeted investment in research and infrastructure, yields have begun to fall. Addressing these problems will require increased use of genetic diversity, leading to increased demand for the latest materials from global genebanks.

6) Regionally and globally, a major consequence of interdependence between countries is the need for international exchange of germplasm. Studies show that in recent years, such exchange has become more difficult in many cases. There is a danger that the reduction of international flows of PGRFA threatens not only their use, but also their preservation.

7) With climate change there will undoubtedly be an increasing demand for species adapted to new environmental conditions and a wide range of pests and diseases. In order to meet this requirement, it is essential to have access to the world's genetic diversity, assuming that the level of interdependence between countries and regions will increase in the future

8) The process of international use is only at an early stage, but in 100 to 200 years the present composition of the cultivated flora will have changed, not only in terms of the replacement of some varieties by others, but in terms of a radical modification of the genus composition. These trends are the tasks of modern plant breeding. Among them is the systematic and rational use of plant resources of the globe.

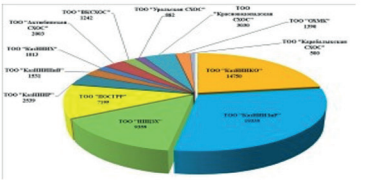
NASEC

Plant genetic resources of Kazakhstan

State of Global PGRFA (1,750 genebanks ≈ 7.0 million accessions, FAO, 2015)

Country	Volume mod., pcs
USDA Beltsweep, USA	**508 994**
CGRI , Beijing, China	**391 919**
CRRI, Cuttack, India	**366 333**
ВНИИР, St. Petersburg, Russia	**322 238**
NIAS Tsukuba, Japan	**243 463**
CIMMYT, Mexico	**173 571**
IPK , Germany	**148 128**
National Center for Plant Genetic Resources of Ukraine (NCPGRU)	**136 200**
ICARDA, Syria	**132 793**
ICRISAT, India	**118 882**
IRRI Manila, Philippines	**109 161**
Institute of Gene Pool of Plant and Animals of Academy of Sciences of Republic Uzbekistan	**93 000**
KazNARU MA RK, Kazakhstan	**64 236**
AVRDC, Taiwan	56 522
National Academy of Sciences of Belarus, Zhodino, Belarus	33 425
WARDA Monrovia, Liberia	21 527
ILRI , Ethiopia	19 000
CIP Peru, Malaysia	15 046
Institute of Genetic Resources , Azerbaijan, Baku	10 000
National Center for Genetic Resources, Tajikistan	≈ 3000-5000

Ex-situ collections of PGRFA of Kazakhstan, 64236 samples, 2018.



Ex-situ collections of the PGRFA of Kazakhstan, 64236 samples, 2018.

Crop group	Volume, pcs.
Grain	20918
Cereal Fodder	5242
Oilseeds	4537
Grain legumes	1678
Cereals	705
Feeding	9447
Technical (cotton)	1013
Vegetable and melon	14128
Potatoes	2308
Fruit & Berry	1546
Sorghum	775
Medicinal herbs	356
Wild Species	1583
Total	**64236**

As noted earlier, research institutions of the Ministry of Agriculture of the Republic of Kazakhstan currently have 64 236 samples of the most important crops in conservation.

Collections of plant germplasm of Kazakhstan are conserved with varying degrees of risk of loss. More than 70 % of available samples in collections are conserved for a short time in uncontrolled conditions of temperature and humidity. In this connection organization of optimization of plant genetic resources repository is the most important priority.

It is required to supplement and improve the quality of information on individual descriptors of passport, descriptive parts and repository of seed collections.

The collected gene pool requires special attention of researchers for its effective maintenance and conservation – planned regeneration, regular monitoring of viability and genetic integrity.

One of the most expedient steps to solve the accumulated problems in this direction is the organization of modern centralized conservation of genetic resources – **the creation of the National Bank of Genetic Resources of Plant and Animal Origin.**

The lack of a repository for plant and animal genetic resources **results in:**

1) loss of valuable genetic material;

2) genetic erosion;

3) dependence of the country on the gene pool of other countries;

4) to irrational development of breeding, and, finally, to negative influence on provision of food security of the country.

does not allow:

1) to streamline the system of using the gene pool;

2) carry out the state registration and documentation of the gene pool;

3) to take into account the possibility of duplication of researches;

4) assess the genetic value of the material on appropriate methodological level;

5) develop genetic and genomic breeding programs and enter to the world scientific community from these positions.

The conservation of plant and animal genetic resources **will allow**:

1) to develop and approve a strategy on genetic resources to identify: a) the country's needs and priorities in the field of biodiversity conservation and sustainable use, b) geopolitical partners interested in cooperation at the regional level.

2) to implement at the appropriate level the national policy on the conservation of genetic resources - to guarantee the long-term preservation of germplasm in a living state - to store valuable plant specimens under standard conditions;

3) to uphold national interests with respect to genetic resources within the framework of existing international law - to determine access for other researchers in order to avoid: a) biopiracy and repatriation of national collections, b) accusations of biopiracy;

4) to have general information about genetic resources of Kazakhstan and conduct on their basis research programs on development of plant breeding.

Why Kazakhstan is proposed as a location for the Genetic Repository Facility:

1. The convenient geographical location of Kazakhstan – in the center of Eurasia.

2. Stable political and economic situation.

3. A great variety of natural resources.

4. Kazakhstan is the center of apple and apricot domestication, the secondary Central Asian center of origin of important groups of agricultural crops – cereals, fodder crops, grains, fruits, vegetables, medicinal plants.

5. Developed scientific potential.

6. Agriculture is a priority direction of the economy.

7. Scientific and technological progress in agriculture: climate-optimized agriculture, smart greenhouses, digitalization, precision farming.

Thank you for your attention!

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SESSION 2:
CONSERVATION AND REPRODUCTION OF PLANT GENETIC RESOURCES. ACTIVITIES OF GENETIC BANKS AND SCIENTIFIC ORGANIZATIONS.

Mrs. Minura Esimbekova
Head of Plant Gene Pool Group
"Kazakh Research Institute of Farming and Crop Production" LLP

«Biodiversity of Genetic Resources for Agriculture and Food in the Republic of Kazakhstan»

After the collapse of the Soviet Union, when the breeding programs in the former republics, were left without genetic resources, which were mainly concentrated in Russia, by Mr. Rakhim Almabekovich Urazaliyev, academic put forward the idea of creating the National Genetic Bank of Kazakhstan, began implementation of state programs to preserve the gene pool. Currently, by the number of collected samples among the former republics of the Soviet Union, Kazakhstan is in the fourth place. More than 60.000 samples of food crops are concentrated in the country (Fig.1).

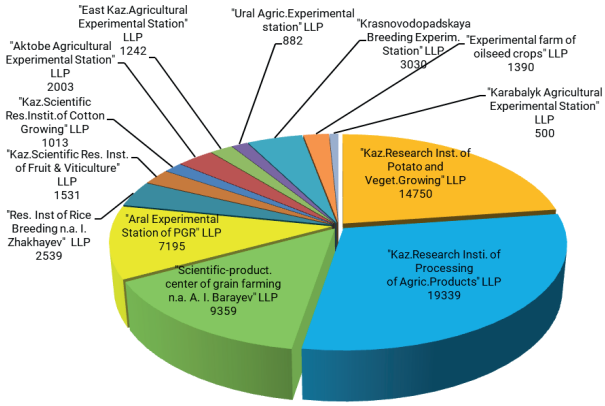

Fig.1. The ex-situ collections of the PGRFA of Kazakhstan, 64773 samples, 2018.

Large collections are concentrated in the leading institutes, such as the Kazakh Research Institute of Agriculture and Plant growing, Scientific-production center for grain farming named after A. I. Barayev, Near Aral Experimental Station of Genetic Resources named after N.I.Vavilov, Kazakh Research Institute of Fruit Growing and Viticulture. The Kazakh Research Institute of Agriculture and Plant growing has 65 species of plant collections and more than 19000 samples.

Fig.2. Field stationary of the gene pool of the "Kazakh Research Institute of Agriculture and Plant Growing" LLP

International cooperation began in 1996. Large government programs funded by the Ministry of Agriculture were initiated in 2000. Eleven programs were funded until 2010, allowing the collection of 75.000 samples. International programs under the auspices of CIMMYT with Washington State University were implemented. Expeditions were organized to collect wild, a program to improve breeding programs for resistance to yellow rust, which is the most aggressive plant disease in the region of southeastern Kazakhstan.

With the Australian Agri-Research Center, where our staff received training in documenting genetic resources, a database has

been created which is available for all of Central Asia and the Caucasus, with over 20.000 samples. Demonstration crops were organized with participation of GTZ, CIMMYT and ICARDA, where farmers participated and the potential of local varieties and varieties of foreign selection were compared. FAO project on establishment of national information exchange mechanism was implemented, which allowed us to create a database on genetic resources for Kazakhstan.

There is also cooperation with the N.I. Vavilov All-Russian Scientific Research Institute of Plant Industry, genetic banks of Belarus, Ukraine, Czech Republic and Kyrgyzstan, as well as with the Chinese Academy of Agricultural Sciences.

There are the following problems. The threat of genetic erosion of crop wild relatives and local flora species is increasing. More than 200 crop species are threatened with extinction. Famous local historical varieties are lost. Incomplete geographic coverage of taxa is occurring. There is increasing demand for species and varieties that are adapted to new environmental conditions caused by Global Warming, biotic and abiotic stresses.

Solutions. Mobilization of local and global plant resources, exchange. Expansion of international variety trials, organizing expeditions, collecting seed collections of wild flora.

Problems on documentation. Data and information management system is not standardized, both at local level and in the process of international exchange. It is necessary to unify the software, to adopt the FAO standards. It is necessary to organize data bases, collection, study, conservation, transport. It is also necessary to support the national mechanism of information exchange.

Systematic monitoring of gene pool, analysis of the overall structure of genetic diversity is necessary, it is phenotyping, genotyping, pre-selection. It is important to monitor the implementation of genetic potential of specific species under agroclimatic conditions. Here it is already necessary to move from collecting just material to creation of core trait and gene collections, which will raise the level of study of pre-gene traits.

We have a dominant type of short-term conservation of collections, due to which the viability of some collections is lowered to 30%. There is a loss of valuable material, if we now identify more

than 64.000 specimens, in 2010 it was about 75.000 specimens. What can lead to inappropriate conservation: 1) genetic erosion; 2) dependence of the country on the gene pool of other countries; 3) irrational development of breeding. It will also prevent: 1) regulate the use of the gene pool; 2) conduct state registration and documentation of the gene pool.

Fig.3. Seed conservation of field crops by the "Kazakh Research Institute of Agriculture and Plant Growing" LLP.

What are the solutions or prospects for conservation. This is the organization of long-term and medium-term conservation, i.e. the creation of the National Genebank of Kazakhstan, which will ensure: national sovereignty of the specimens and physical security of the preserved specimens. This initiative, launched at the national level in the early 2000s, has grown to the international level, and has moved to this discussion, with many countries deciding to join forces to store genetic resources.

The problems that can be solved by developing genetic resources are: environmental protection and restoration of natural resources; diversification of crop production; pre-breeding research; and transfer of outstanding forms to farmers.

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Mr. Kassym Mukanov
Deputy Director General
National Center of Biotechnology

Conservation of genetic resources and creation of a gene bank of rare and endangered species of flora and fauna of Kazakhstan

With changes in climatic and environmental conditions, agriculture needs new varieties of crops that are resistant to various diseases and abiotic biotic factors. The National Center for Biotechnology in collaboration with the Barayev Research Center created 6 varieties of spring soft wheat, resistant to "black germ" (Ak Orda), drought (Baiterek, Kazakhstan-20, Shanyrak and Darkhan-Dan), salinity (EXPO-2017) and 1 variety of potatoes "Astanalyk", resistant to dry fusarium rot.

The Scientific and Technical Program (STP) "Creation of a biobank of microorganisms, cell cultures, genomic and genetically engineered materials for biodiversity conservation and ensuring the resource base of biotechnology" was implemented, under which the following main results were obtained in 2018-2020:

- A biobank of plant growth-promoting bacterial strains was created.
- The protocols for in vitro conservation of explants of rare and endangered plant species - endemic species of onion, Rhodiola rosea, desert cistanche, Karkarala barberry, Iliya barberry, Sivers apple tree and Nedzvetsky apple tree were developed (Fig.1).
- A DNA collection of rare and endemic onion species was formed, which is represented by 16 samples (A. altaicum - 12 samples, A. ledebourianum - 3 samples, A. microdictyon - 1 sample).
- Nucleotide sequence of chloroplast gene rbcL was determined in 52 samples of apple tree Nedzvetsky, apple tree Sivers, barberry of Iliya and barberry of Karkarala.
- An electronic database of biobanks of microbial strains, cell cultures and hybrids, recombinant strains-producers of production-valuable enzymes, antigens, proteins and diagnostically

significant DNA loci, genetic constructions, rare and endangered plant species was created.

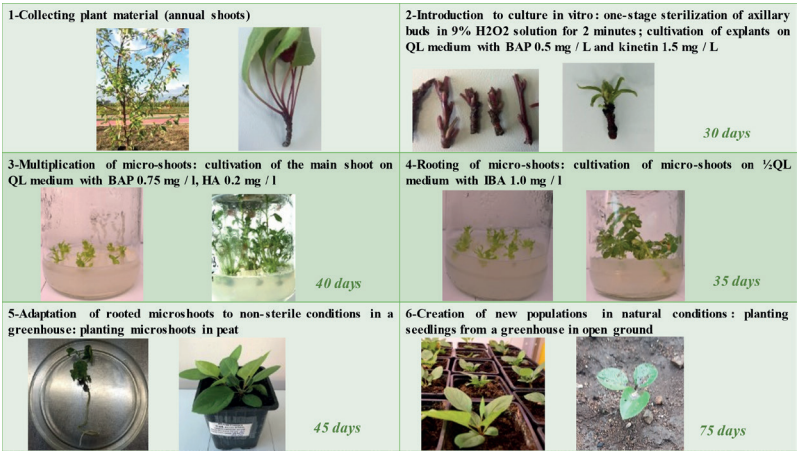

Fig. 1. Scheme of microclonal multiplication of Sivers apple tree

The problem of preserving biodiversity in the country remains acute, so the Red Book of Kazakhstan includes: Plants -387, Mammals - 40, Birds -57, Fish -18, Amphibians -3, Reptiles -10.

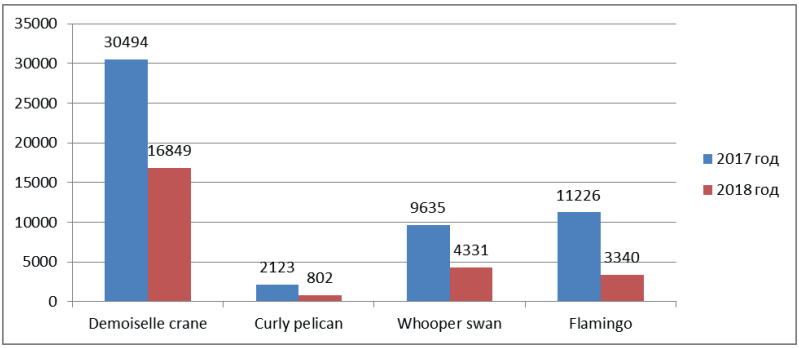

Figure 2. Reduction in the number of rare and endangered bird species

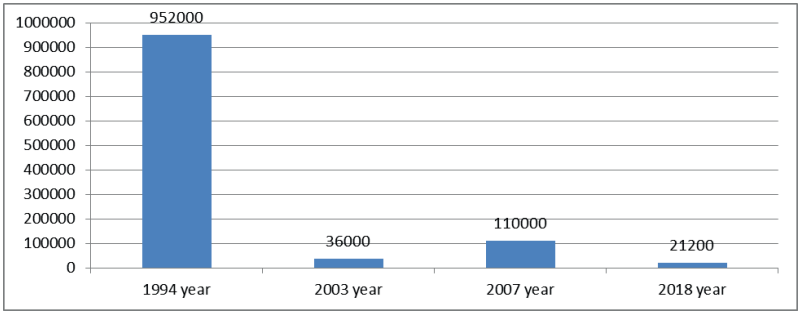

Figure 3. Saiga population decline

Currently, RTP (research and technology program) is being implemented: "Creating a biobank of rare and endangered species of flora and fauna of Kazakhstan for the conservation of biodiversity" for 2021-2022, aimed at:

- Creation of a biobank of germplasm of rare and endangered plant species in conditions of conservation and by cryopreservation at a temperature of -196 ° C.
- Creation of a biobank of DNA samples and a database of nucleotide sequences of chloroplast DNA of rare and endangered plant species.
- Species identification of rare and endangered species of flora of Kazakhstan on the basis of chloroplast DNA sequencing and the use of informative DNA markers.
- Species identification of rare and endangered species of fauna of Kazakhstan on the basis of mitochondrial DNA sequencing and protein profiling by mass spectrometry.
- Development of PCR test systems for species identification of rare and endangered species of fauna of Kazakhstan to improve the effectiveness of combating poaching.

This program is implemented according to the following block schematic diagram:

1. Creation of a biobank of DNA and germplasm samples of rare and endangered species of flora of Kazakhstan

1.1 Collection of plant explants, seeds, isolation of DNA, study of morphogenetic potential of different types of explants in culture in vitro

1.2. Species identification of plants based on chloroplast DNA sequencing and use of informative DNA-markers.

2. Development of technology for cultivation and cryopreservation of cells and tissues of rare and endangered species of flora of Kazakhstan

2.1 Development of technology for microclonal multiplication and medium-term conservation in culture in vitro of plant shoots

2.2. Development of technology for long-term conservation and creation of cryo-collection of explants of rare and endangered species of flora 2.2.

3. Creation of DNA samples biobank of rare and endangered species of fauna of Kazakhstan and biological samples

3.1 Collection of samples of biological materials from fauna species and isolation of DNA

3.2. Species identification of fauna species based on mt-DNA sequencing and mass spectrometry.

4. Development of PCR test system for species identification of rare and endangered fauna species of Kazakhstan

4.1 Selection of mitochondrial DNA genes, synthesis of probe primers for PCR test-system development

4.2 Determination of specificity, sensitivity and testing of PCR test systems

5. Creation of electronic database of biobank of DNA samples and biological materials of rare and endangered species of flora and fauna of Kazakhstan.

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Mr. Muratbek Karabayev
Head of Regional Office
International Maize and Wheat Improvement Center (CIMMYT)

Opportunities and contributions of international scientific organizations and cooperation to mobilize genetic resources for food security

Dear conference participants, colleagues!

A Regional Strategy for Plant Genetic Resources (PGR) Conservation and Use for Agriculture and Food in Central Asia and the Caucasus was developed and adopted in 2007. The objective of this strategy is to establish, through coordination and mutually beneficial cooperation, an effective system for the reliable conservation, replenishment, collection, study and rational use of plant genetic resources for improving the well-being of the population and conducting environmentally safe sustainable agriculture.

The following areas have been identified as priorities:

1. In situ/on farm conservation of plant resources.
2. Further development of robust ex situ conservation and replenishment of collections of genetic resources of cultivated plants and their wild relatives.
3. To study effectively, replenish and rationally use the genetic potential of plant diversity.
4. Technical and scientific capacity building to conserve and sustainably use plant genetic resources;

This document emphasizes the role of international cooperation as the most important mechanism for achieving the goal of the Regional Strategy. This cooperation is based on the balance of international obligations on agro-biodiversity conservation and the sovereign right of the states of the region to use their PGR. The system of international cooperation on the preservation and use of PGR includes a number of global, regional and bilateral agreements, programs and organizations. The development of international cooperation can be carried out in the following forms:

- membership in international agreements and organizations, active participation in the activities of their bodies at all levels;
- interaction with international funds and development agencies and financial organizations;
- use of opportunities and financial resources of international donors and foundations;
- cooperation and involvement in the Regional Network of international research and educational centers.

This conference on "Conservation and Reproduction of Genetic Resources for Sustainable Agriculture and Food Security in OIC", initiated and organized by the Islamic Organization for Food Security (IOFS), is fully in line with the goals and objectives of the Regional Strategy on Genetic Resources. The IOFS has once again demonstrated its active commitment to human values, such as the preservation of nature and its biodiversity, the prevention of environmental crisis and hunger, and the improvement of human well-being. The initiative of the IOFS to establish an International Center for Plant and Animal Genetic Resources under the auspices of the Organization of Islamic Cooperation (OIC) deserves special attention and respect. The importance and necessity of such a center, coordinating the activities of genebanks, collections in Kazakhstan, Central Asia, the countries of the Islamic world is long overdue, and this initiative is very timely.

It should be recognized that the establishment and development of such an International Center for Genetic Resources is associated with solving many problems and tasks of both structural and functional importance. It is very important to activate international relations in the field of agrarian and biological sciences, training and professional development of personnel, exchange of breeding and genetic material, application of advanced scientific methods, approaches, and technologies.

One of the effective partners of the center could be the Consultative Group on International Agricultural Research (CGIAR), which is a strategic alliance of countries, international and regional organizations, public and private foundations supporting 15 international agricultural research centers known as "Future Harvest Centers. The goal of this alliance is to mobilize advances in modern science and technology to eliminate hunger and poverty, improve nutrition

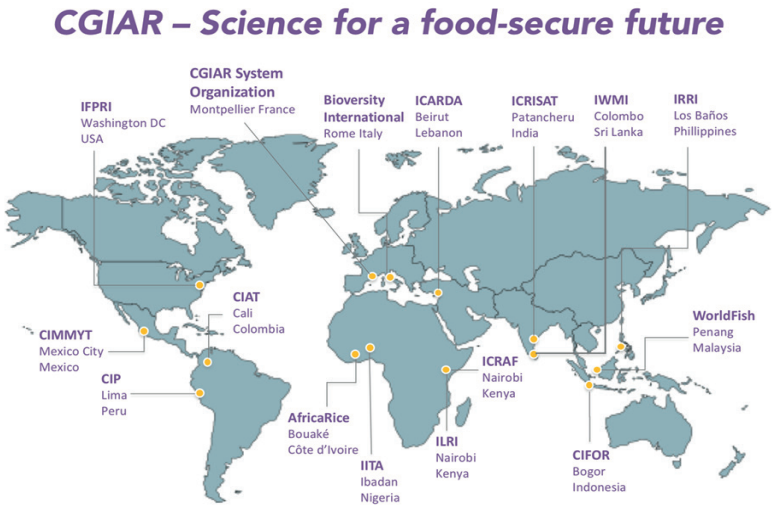
and living conditions, sustain agricultural growth, and protect the environment. "The Green Revolution in the 60's and 70's, which saved millions of people from hunger, was primarily due to the scientific centers of the Consultative Group and their active national partners in agrarian science.

The backbone of the CGIAR's success is the support of its 64 members and hundreds of partner organizations, which together form a growing alliance of the Consultative Group. The CGIAR is open to all countries and organizations that wish to join this alliance and share its noble goals and objectives. The Alliance, which in 1971 had only 12 members, now includes 64 countries and organizations, and the membership of the CGIAR is growing rapidly.

List of members of the Consuwative Group on International Agricultural Research (CGIAR)

1. Austria
2. Australia
3. Bangladesh
4. Belgium
5. Brazil
6. Great Britain
7. Germany
8. Denmark
9. Egypt
10. Israel
11. India
12. Indonesia
13. Iran
14. Ireland
15. Spain
16. Italy
17. Canada
18. Kenya
19. China
20. Colombia
21. Korea
22. Cat Di`Voir
23. Luxembourg
24. Malaysia
25. Morocco
26. Mexico
27. Netherlands
28. Nigeria
29. New Zealand
30. Norway
31. Pakistan
32. Peru
33. Portugal
34. Russia
35. Romania
36. Syria
37. USA
38. Thailand
39. Turkey
40. Uganda
41. Philippines
42. Finland
43. France
44. Switzerland
45. Sweden
46. South Africa
47. Japan
48. Asian Development Bank
49. African Development Bank
50. Arab Fund for Economic and Social Development
51. World Bank
52. Commission of the European Community
53. Food and Agriculture Organization of the United Nations (FAO)
54. United Nations Development Programme (UNDP)
55. United Nations Environment Programme (UNEP).
56. Gulf Cooperation Council (GCC)
57. Rockefeller Foundation
58. OPEC Fund for International Development (OPEC)
59. Syngenta Fund (SYNGENTA) for Sustainable Agriculture
60. Kellogg Foundation (Kellogg)
61. Ford Foundation
62. Inter-American Development Bank
63. Research Center for International development
64. International Fund for agriculture Development (IFAD)

The implementation of the goals and objectives of the Advisory Group is carried out primarily through 15 international research centers of the CGIAR, located around the world and closely cooperating with national agricultural research systems. These scientific and educational centers bring together the world's leading scientists, they are equipped with the most advanced technology and equipment, they concentrate the richest world collections and genetic banks of plants and animals, develop the most advanced technologies, methods and methodologies in the field of agricultural science, education and production.



Scientific centers of the Consultative Group on International Agricultural Research (CGIAR):

1. International Center for Wheat and Maize Improvement (CIMMYT), Mexico
2. International Rice Research Institute (IRRI), Philippines
3. International Potato Center (CIP), Peru
4. International Institute of Genetic Resources (Bioversity International), Italy.

5. International Center for Agricultural Research in Dry Areas (ICARDA), Syria
6. International Livestock Research Institute (ILRI), Kenya
7. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India
8. International Center for Tropical Agriculture (CIAT), Colombia.
9. International Forestry Research Institute (CIFOR), Indonesia
10. International Water Management Institute (IWMI), Sri Lanka
11. International Institute of Tropical Agriculture (IITA), Nigeria
12. International Food Policy Research Institute (IFPRI), USA
13. World Agroforestry Centre (ICRAF), Kenya
14. World Fish Center, Malaysia
15. African Rice Center (WARDA), Benin

A number of organizations of the CGIAR system are active in the countries of Central Asia and the Caucasus, including world-renowned centers for plant improvement, such as CIMMYT, ICARDA, Bioversity Int., CIP, ICRISAT, IRRI. These organizations can and should provide great assistance to OIC, IOFS in the creation of the International Center for Genetic Resources, effective conservation and use of genetic resources, replenishment of collections, in breeding and genetic and biotechnological research, training of personnel, etc. In order to effectively utilize the capabilities of these centers, it will be necessary to specify the general and specific tasks of each center in the development and implementation of joint programs and projects. In particular, international centers with a mandate for these species may be responsible for helping to carry out work on certain important species of agricultural plants and animals. The same specialized centers may participate in the development of international and regional projects on specific problems of genetic resources, breeding and biotechnology and participate in their joint implementation. The experience of more than 20 years of Consultative Group of International Agricultural Research in Kazakhstan, Central Asian and Transcaucasian countries demonstrates the effectiveness of cooperation with the leading world scientific centers, which actively involve the world experience, the richest world gene pool, modern methods and methodologies of improvement of agricultural plants and animals, consultations of

leading foreign scientists, and through this contribute to the fastest integration of countries and regions in the modern world scientific and technical process.

Kazakhstan pursues an active state scientific and innovation policy aimed at stimulating science and innovation activities in the country. International cooperation in the scientific sphere is actively carried out, assistance and collaboration of international institutions and forums are used in every possible way. Kazakhstan, having rich land resources, high scientific potential and developed structure of economy, has huge opportunities to increase agricultural production and to become a leading exporter of high-quality grain and other agricultural products in the world. Kazakhstan is now considered as the most important region of the world to ensure food security of the population of the Earth.

Kazakhstan as OIC member, as one of dynamically developing countries in Eurasia region and in the world, having great scientific-technical and personnel potential, could be the right place for establishment of International center for plant and animal genetic resources. In the case of a positive decision of the OIC and IOFS to establish the center in Kazakhstan, Turkestan, a spiritual and cultural center of the Turkic Islamic world, could be recommended as a place for its construction. Turkestan, built about two millennia ago, played a huge role in the Islamization of Central Asia. This is the hometown of Khoja Ahmed Yasawi - the great Islamic preacher, philosopher, and thinker.

Warm, temperate continental climate of Turkestan and availability of the main water artery of Central Asia - Syrdarya river nearby, allowing to grow a huge variety of plants (which is extremely important for reproduction and renewal of ex-situ genetic material), close location to capitals of Central Asian countries, to other Islamic states (Iran, Afghanistan, Pakistan and others) are also positive factors of Turkestan choice.

Today's active economic development of Turkestan is noteworthy; according to official data, the volume of investment in Turkestan in the last three years amounted to 3.5 billion dollars. Function International University named after Khoja Ahmed Yasawi, International University of Tourism, colleges. The International Center on Genetic Resources of Plants and Animals under the aegis of OIC

would become another important object of science, education and culture of the city, another tribute to the great preacher of Islam Khoja Ahmed Yasawi. I express my hope and confidence that the President and Government of the Republic of Kazakhstan, the administration of Turkestan and Turkestan region will support this idea and initiative and render comprehensive assistance in establishing this center.

May Allah bless you in your noble work, dear colleagues and comrades-in-arms!

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Mr. Yerlan Turuspekov
Head of Laboratory
Institute of Plant Biology and Biotechnology

Genetic diversity of agricultural plants and wild flora of Kazakhstan

At the Institute of Plant Biology and Biotechnology research is conducted on agricultural plants and wild flora in the areas - Genetic diversity of wild flora of Kazakhstan and Genetics of grain and legume crops. The research is conducted in collaboration with institutions in Kazakhstan. Diversity of wild flora and genetics of grain and legume crops are studied together with botanical gardens and national reserves and parks, the National Center of Biotechnology, universities, institutes and experimental stations of the Ministry of Agriculture of Kazakhstan (Fig.1).

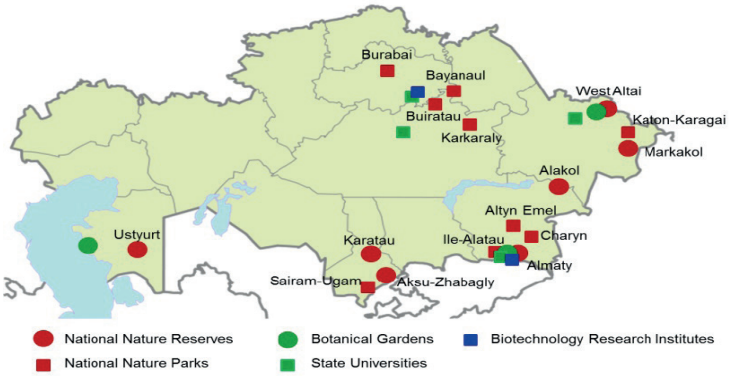

Fig.1. Collaboration of the Institute with institutions of Kazakhstan on wild flora biodiversity

Scientific research was funded by the R&D: 1. Scientific and technical program “Study of genetic diversity and conservation of genetic resources of endemic, rare and economically valuable plant species in the Republic of Kazakhstan”. (2015-2017); 2. Project “In-

formation system on molecular genetic and botanical documentation of wild flora of Kazakhstan" (2018-2020).

The following databases were formed: a) Database of botanical description of endemic, rare and endangered and economically valuable plant species in Kazakhstan (botanical passport), b) Database of molecular genetics of wild flora of Kazakhstan using genetic passports of endemics, rare and economically valuable species of wild plants based on DNA-technology.

The research work was carried out to create an information system of wild flora of Kazakhstan, the purpose of which was the botanical and genetic description, as well as the creation of an integrated database in 2015 to 2017. Currently, this database is created in 3 languages, it is constantly replenished and developed (Fig.2). At the present time, an active work in this direction, new projects on the development and study of wild flora of Kazakhstan, this database is used to describe rare and endemic endangered plant species, but also to study the genetic components, such as sequences of nucleotide markers of rare species, which are already entered in the database. Now, the database on the botanical description of endemic, rare and endangered and economically useful plant species in Kazakhstan includes 79 families, 233 genera, 444 species.

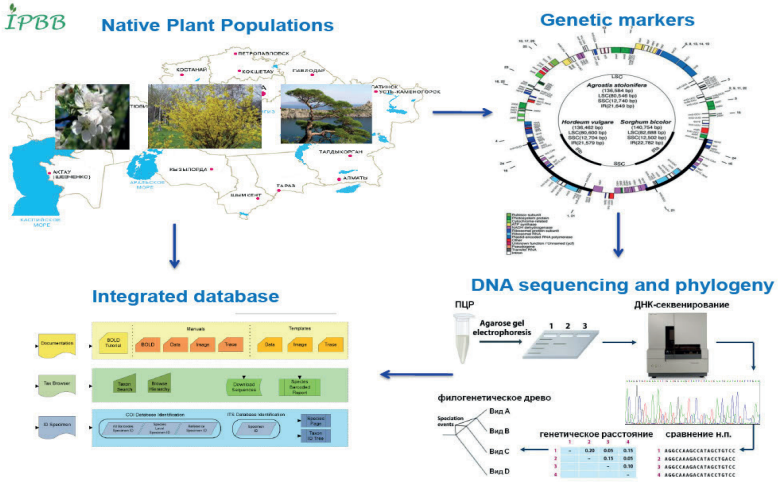

Figure 2. Research Areas on Plant Biodiversity

More than 700 populations and 200 sequences were studied together with botanists. Current status of the study: 1.706 populations of 444 species (233 genera of 79 families) collected in 2015-2020; 2. Herbarium samples were prepared for each species studied; 3. DNA was extracted for all 706 populations (at least 20 plants per population); 4. Three DNA markers of nuclear and chloroplast genomes were selected for DNA barcoding of flora species - ITS, matK and erythrocytes; 5. Current DNA sequencing status for collected samples; ITS: 23 families, 37 genera, 100 species, 149 populations matK: 19 families, 45 genera, 97 species, 161 populations erythrocyte: 8 families, 13 genera, 23 species, 33 populations; 6. Over 200 wild plant species sequences were deposited at NCBI.

In collaboration with the Research Institute of the Ministry of Agriculture (Fig. 3), a collection of genotyped accessions was established for - spring wheat: 455 varieties and lines from the world collection, 2 DHL mapping populations, 1 RILs mapping population, and 1 NAM mapping population; - winter wheat: 277 varieties and lines from Central Asia, 1 RILs mapping population; - spring barley: 814, 2 RILs mapping populations; - Durum wheat: 300 varieties and lines of the world collection; - Rice (KIR collection, Kyzylorda): 92 varieties and lines of KIR; - Oats (VIR collection, Russia): 300 varieties and lines of VIR world collection; - Soybean: 288 varieties and lines of Kazakh Research Institute of Agriculture and Plant Growing (KRIAPG) world collection.

Fig.3. Collaboration with the Research Institute of the Ministry of Agriculture of the Republic of Kazakhstan

The study of wild biodiversity is very attractive to foreign colleagues, there are a lot of publications in high-level journals. A total of 17 Articles were published with breeders in peer-reviewed foreign journals.

Figure 4. Gathering wild flora plants

Various conferences are held regularly to discuss biodiversity, and expeditions are organized to collect a collection of wild flora (Fig.4).

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Mr. Yuriy Dolinniy
Head of Laboratory
of A.I. Barayev Research and Production Center for Grain Farming

Conservation and rational use of the gene pool of agricultural plants in Kazakhstan

According to the statement of academician Mr. N.I. Vavilov, "The biological diversity of plant genetic resources is a source of creation of material values, well-being and independence of nations, the overall stability of the world community. Loss of plant genetic potential would be an irreparable loss for mankind".

The gene pool of plant resources in the republic consists of more than 60 thousand samples. Unfortunately, at present time they are conserved in unsuitable premises, works on their accounting, renewal and preservation are carried out insufficiently. Using the available gene pool in the republic, breeding work is carried out in more than 10 scientific organizations on 50 crops. Currently, gene pool replenishment and exchange is carried out between scientific organizations within the country and international centers (VIR, CIMMYT, ICARDA).

Fig.1. Cooperation with the All-Russian Research Institute of Plant Industry named after N.I. Vavilov

The main problems of conservation of genetic resources are: Lack of a single National Bank of Kazakhstan for plant genetic resources (short-term, medium-term, long-term) conservation; Undeveloped system of scientific direction with a single mechanism of financing plant genetic resources; Undeveloped system of replenishing plant genetic resources with valuable sources of economic and biological traits; Undeveloped system of training and retraining in the field of conservation and study of genetic resources; Undeveloped system of dissemination of knowledge in the field of conservation and study of plant genetic resources.

To solve these problems, it is necessary: Creation of a national bank of genetic resources of cultivated plants and their wild relatives that meet modern requirements for long-term conservation (local varieties, wild and weedy species, breeding varieties, valuable breeding lines, special genetic material); Development and implementation of a specialized program for the conservation, replenishment, study and documentation of plant genetic resources by the Ministry of Education and Science with basic funding;Development and inclusion in the plan of the Knowledge Hub of the RK of the program to preserve and study plant genetic resources that are the national patrimony of the Republic; Development of international cooperation in the field of replenishment, conservation of plant genetic resources (conclusion of contracts, carrying out expeditionary fees); Development and inclusion in the register of OP of the Ministry of Education and Science of the Republic of Kazakhstan for training highly qualified scientific personnel in the gene pool through magistracy, doctoral studies, as well as through postgraduate studies, internships in scientific centers of countries of the near and far abroad; Development and inclusion in the plan of the center for the dissemination of knowledge of the Republic of Kazakhstan a program for the conservation and study of plant genetic resources, which is the national heritage of the Republic;

The following target indicators have been identified: Replenishment, comprehensive study of genetic resources in terms of basic biological and economically valuable traits and properties, their rational use; Identification of sources and donors of biological and economically valuable traits; Providing the NRU of the Republic with

sources and donors of economically valuable traits; Formation of indicative collections; Gene pool documentation; Conservation of plant genetic resources.

For the proper preservation of the gene pool, it is necessary: an inventory of the entire gene pool available in the country and an assessment of the genetic value, the identification and isolation of donor gene sources with economically valuable traits; documentation and state registration of the gene pool; modernization of the information databank on the gene pool.

Fig. 2. Inventory of genetic resources

Rational use of the gene pool presupposes: constant maintenance of existing gene sources and donors with economically valuable traits and replenish them with new ones; comprehensive study and implementation of the introduction of new plant species; improvement of technological regimes for storing plant seeds; constant replenishment of the plant gene pool from domestic and world sources; supplementing the information databank with new information about the gene pool and periodically bringing them to the attention of consumers; to create new highly productive varieties and hybrids of agricultural crops that are resistant to biotic and abiotic environmental factors.

The gene pool of the center is represented by varieties and hybrid forms from 83 countries of the world and contains 9335 samples of cereals, grain fodder, cereals, legumes, oilseeds and perennial grasses (Table 1).

Table 1. The presence of a gene pool of cereals, grain fodder, cereals, legumes, oilseeds and perennial grasses.

Культура	The volume of samples, grades, numbers
Spring soft wheat	4390
Spring durum wheat	595
Barley	1107
Oats	409
Triticale	144
Buckwheat	50
Millet	200
Peas	210
Lentils	240
Rape	35
Soy	70
Flax	25
Awnless rump	442
Agropyron	543
Alfalfa	262
Sainfoin	200
other perennial grasses (sweet clover, grape grass, wheatgrass, clover, hedgehog, etc.)	413
All	9335

Based on the results of the study of the gene pool, 8 catalogs were published. Characteristic collections for early maturity, coarse-grain size, lodging resistance, drought, disease and high protein content have been formed. For use in breeding programs, more than 3.500 sources of productivity, early maturity, resistance to drought, lodging, diseases and pests, and a high protein content were transferred to breeders of Kazakhstan and other Research Institutes.

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Mrs. Anar Myrzagaliyeva
First Vice-President
Astana International University

Conservation of plant genetic resources in Kazakhstan

Issues discussed at today's conference are very important, plant genetic resources for food and agriculture are a common concern of the whole world, as the production of food and agriculture is very dependent on plant genetic resources. According to the indicators of biological diversity, Kazakhstan stands out for a high concentration of plant and animal species, as well as for a fairly good preservation of natural landscapes and ecosystems.

Today, there is information about the beneficial properties of medicinal plants, essential oil plants containing alkaloids, fodder and ornamental plants, which make up about 25% of all Kazakhstani species. Those that are endemic and rare, as well as those that have a limited area of distribution, are poorly studied. The disturbance of the environment, which occurred due to human activities, led to the fact that about 400 rare and endemic species were included in the second edition of the Red Book of the Republic of Kazakhstan.

We have carried out a project on the theme "Development of biotechnological methods for preserving endemic and medicinal plants in vitro", the technology of colonial micropropagation was applied to 22 species of rare and endemic plants of the flora of East Kazakhstan. Today, it is necessary to analyze the experience, conditions and clear prospects in Kazakhstan regarding the conservation and safety of rare species, with particular attention to the appropriate newest method. The creation of an international center for the conservation and reproduction of plant genetic resources in Kazakhstan is more timely than ever.

I believe that a single specialized bank for storing plant genetic resources should include both agricultural and wild representatives of flora, both rare endangered, endemic species, as well as wild relatives of agricultural plants.

Such reference samples are necessary so that the useful genetic properties of breeding plants are not lost whatever happens, be it natural disasters, man-made disasters, or subjective human factors, so that the food security of the country and the world as a whole is preserved. The issue of creating an International Center for the Conservation of Genetic Resources with a single base and common standards is being raised in a timely manner.

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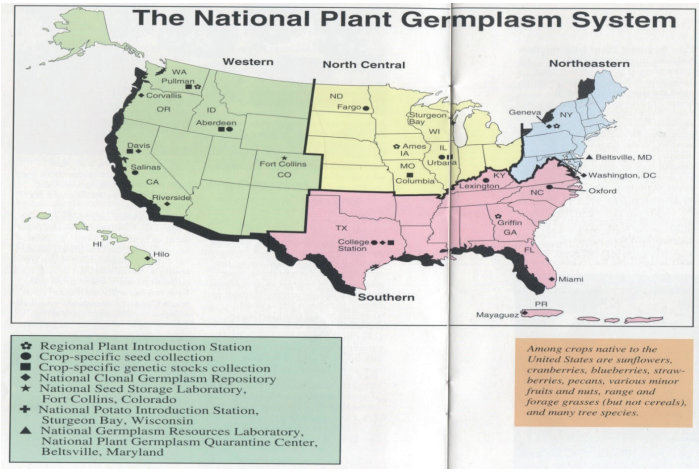
Mrs. Svetlana Kushnarenko
Head of the Cryopreservation Laboratory
Institute of Plant Biology and Biotechnology

Creation of a cryobank of plant germplasm in Kazakhstan: 15 years of experience

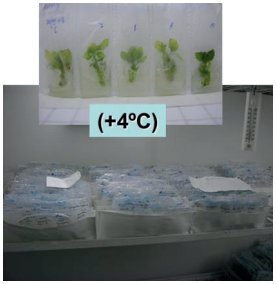
For 15 years, the Institute of Plant Biology and Biotechnology has been working on the creation of a cryobank of germplasm. Research work is carried out in cooperation with foreign partners, in particular with US specialists. Together with the US National Plant Hermoplasm System, they carried out a joint ISTC project ISTC Project - "Conservation of germplasm of fruit and berry crops and grapes in Kazakhstan", 2002-2008, had the opportunity to visit and get acquainted with the US National Plant Hermoplasm System, which was organized by over 120 years ago. More than half a million specimens of 12.000 plant species are currently preserved here, with 10.000 new specimens being added to the collection annually. In 32 repositories located in various ecological and geographical zones of the country, curators preserve certain plant species for which the conditions of this region are most favorable. 9 repositories in the context of the placed crops are united by a single information electronic system for the data of the conserved collections.



Rice. 1. USA Partners National Plant Germplasm System

In this system there are Field collections of live plants, Collections of plants in greenhouses, Medium-term conservation of In vitro collections - Plants are placed on nutrient media in plastic air-permeable bags at a temperature of + 4 ° C, illumination of 7 μmol m-2s-1 and a 10-hour photoperiod. Under these conditions, plant growth slows down, monthly transplanting is not required, plants can be conserved from 6 months to 2-3 years without passaging, Long-term conservation type - Cryobank (various organs, tissues and cells of plants: seeds, apical meristems, vegetative buds). In a cryobank, apical meristems are deposited under deep freezing conditions at -196 ° C in cryoprotectant solutions for an unlimited period of time.

In vitro collection



In vitro refrigeration

Cryoconservation

Fig. 2. Ex situ conservation techniques at the Institute of Plant Biology and Biotechnology

According to FAO, 90% of all world collections are presented in the form of seeds. More than half of all seed samples are kept in long-term conservation conditions. International standards for long-term conservation include drying seeds at 10-25 ° C to 3-7%

moisture content followed by conservation at -18-20 ° C. However, such a regime does not prevent aging processes and a decrease in seed germination of some species. In this regard, cryopreservation is recommended as a way of long-term (from several tens to several hundred years) conservation of such “short-lived” seeds.

The Institute of Plant Biology and Biotechnology has developed ex situ conservation methods, Collection in vitro, Cold conservation in vitro, Cryopreservation, created the only cryogenic bank (-196 ° C) in Kazakhstan for germplasm of fruit and berry plants, which includes 740 samples of varieties, hybrids and wild forms of apple trees, pears, raspberries, currants, barberry honeysuckle, potatoes and walnuts, methods of micropropagation and cryopreservation have been developed for many crops propagated vegetatively (Fig. 3).

Fig 4. Development of methods for cryopreservation of plant germplasm:
• Apical meristems isolated from plants in vitro
• Wintering vegetative buds
• Seeds
• Isolated germinal axes

Methods for cryopreservation of plant germplasm are being developed: Apical meristems isolated from plants in vitro; Overwintering vegetative buds; Seeds; Isolated embryonic axes (Fig. 4).

There are also protocols for recryopreservation after long-term conservation, 68% restores growth, and you can get plant regeneration after conservation in liquid nitrogen for a period of time for fruit crops.

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Mr. Muratbek Karabayev
Regional Office Manager
International Center for the Improvement of Corn and Wheat
(CIMMYT)

National Strategy for the Conservation and Use of Plant Genetic Resources for Agriculture and Food in Kazakhstan

At the turn of the 20th and 21st centuries, mankind faced a formidable problem - the decline in biodiversity. Natural ecosystems are being intensively destroyed and species of living organisms are disappearing. Thousands of plant and animal species are endangered. Further reduction of biodiversity can lead to catastrophic destabilization of the biosphere and its unsuitability for human survival.

Under the auspices of the UN, leading international organizations and communities, a number of documents and decisions were developed and adopted to overcome the threat of the global environmental crisis, to ensure food security, and to conserve and sustainably use biodiversity. The most important of them are the Convention on Biological Diversity, the Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources, and the International Treaty on Plant Genetic Resources for Food and Agriculture. These measures are of the utmost importance to unite efforts on a global scale to effectively address biodiversity reduction.

Plants play a crucial role in life on Earth. Because of the real threat of hunger and the need for food security, the conservation and use of plant genetic resources (PGR) for food and agriculture has become particularly urgent. This, too, requires joint coordinated efforts at many different levels of societal organization. This National Strategy was developed to preserve the plant diversity of Kazakhstan and Central Asia, to enrich the gene pool of plants, its effective use in agriculture and food production, to strengthen cooperation between the countries of the region and their active integration into the world system of genetic resources.

1. Features of agrobiodiversity in Kazakhstan and Central Asia and socio-economic conditions affecting it

The vast territory of Kazakhstan and Central Asia, a wide variety of natural and socio-economic conditions, many nations and peoples, cultures and traditions determine the uniqueness of the task of preserving biodiversity in the region. A significant part of the diversity of natural ecosystems of Eurasia is represented on the territory of Kazakhstan and Central Asia. The flora of the region contains over 5.000 registered plant species, many of which are endemic. The region is one of the most important centers for the domestication and evolution of crops. Most of the types of agricultural plants grown around the world originated from this region: cereals, legumes, fruits, forestry, technical, medicinal and other plants.

The natural and climatic conditions of Kazakhstan and Central Asia have led to a rich diversity of plant species growing on its territory. Among the crops growing here there are wild relatives of cereals (wheat, barley, rye), legumes (lentils, chickpeas, beans, peas), forages (Trigonella, Trifolium, Vicia, Lathyrus), vegetables (cabbage, onion, garlic, melon, carrot), fruits (almond, apricot, apple, pear, pistachios, cherries, plums, walnuts, pomegranates, quinces, hazelnuts, dogwood, grapes, figs, chestnuts and mulberries), industrial crops (safflower, flax, cotton) and many kinds of medicinal and aromatic plants (Mandragora, Achillea, Glycyrrhiza, Valeriana, Ferula etc.). These genetic resources were the basis for the creation of thousands of local varieties, well adapted to a wide range of soil and climatic conditions of the region. These varieties are characterized by a high level of quality indicators: taste, odor, appearance, conservation time, adaptability to dry conditions, quality of dried fruit, etc.

The genetic diversity of crops cultivated in the region significantly expanded in the 20th century due to the intensification of selection and genetic work, involvement in cross-breeding of a huge number of genotypes from around the world, including rich world plant collections. During the Soviet period, management and coordination of activities on collection, conservation and use of plant genetic resources were carried out by the Vavilov All-Union Institute of Plant Breeding (VIR), St. Petersburg. Seed collections were kept in the Central Seed Genebank in Kuban, Krasnodar Territory. Region-

al collections were established in Kazakhstan (forage and pasture crops), Uzbekistan (peach, apple, cherry, pear, plum), Turkmenistan (pomegranate, persimmon, fig, olive), Georgia (grape). Numerous expeditions were conducted to collect plants in Kazakhstan and Central Asia. During these expeditions not only new specimens were collected, but also new forms of cultivated species and their wild relatives were discovered between 1917 and 1990. The eco-geographic distribution of many important crops was assessed, in particular, 128 botanical varieties of soft wheat were identified in Central Asia and 43 of them were new for the region.

After the collapse of the Soviet Union, the situation in the field of conservation and use of plant genetic resources in Kazakhstan and Central Asia became sharply complicated. VIR branches located in the region became detached from the parent organization in St. Petersburg. Existing ties were broken, activities in the field of PGR in the region ceased to be coordinated. The state of agro-biodiversity has been significantly affected by environmental conditions, climate change in the region. Here is an incomplete list of the main factors determining the state of agrobiodiversity and plant genetic resources in Kazakhstan and Central Asia:

- Large heterogeneity of socio-economic conditions on the vast territory of the region, uneven distribution of population, diversity of economic types, multinational character of the region.
- High nature intensity of the economy, predominance of nature-exploiting resource-intensive industries, raw material orientation of the economy, lack of real assessment of biodiversity as a key element of the national wealth.
- The important economic role of agro-biodiversity and plant genetic resources. Agriculture is one of the main sectors of the economies of Kazakhstan and the countries of the region. However, due to the economic crisis there has been de-ecologization of public consciousness and consumer attitude to wildlife and plant genetic resources among the population of the region prevails.
- The consequences of economic crises in the region and the world. Decline in production, reduction of arable land, degradation of pasture land due to overgrazing, overgrowth of agricultural land and an increase in the number of abandoned lands.

- Insufficient attention to strategic long-term objectives, which also include the sphere of preservation of PGR, priority of tactical short-term and medium-term tasks in state planning and in the plans of commercial companies.
- An incomplete and imperfect legal framework for the use and exchange of genetic resources, ineffective enforcement of existing laws in the area of biodiversity conservation and intellectual property.
- Weakening of the system of management and coordination in the sphere of preservation and use of PGR, insufficient development of the state system of monitoring of agrobiodiversity, statistical accounting in the sphere of use of PGR.
- Training, education, propaganda, formation of public consciousness in the field of biodiversity and PGR need to be radically improved.
- Deterioration of the environmental situation in the region. There is a very high level of environmental pollution by industrial, energy, mining, agricultural enterprises, transport, military facilities, municipal farms, as well as from man-made accidents and global transfer of pollution (oil products, pesticides, chemical fertilizers, domestic sewage, etc.). Every year the area of salinized lands expands. One of the most important ecological disasters of the region is the catastrophic shrinkage of the Aral Sea water area, drying of its bottom and spreading of salt clouds over huge distances.
- In recent years, climate change has been observed in Kazakhstan and the Central Asian region, with droughts becoming more frequent and severe. Global climate change can have a strong impact on the biodiversity of the region.

Kazakhstan and Central Asia is one of the world's major centers of origin of cultivated plants. In recent decades, the region has been undergoing significant changes with respect to agro-biodiversity, many of which have negative nature and consequences. Agrobiodiversity of the region, as an integral part of the global biodiversity system, needs in active support from both the states of the region and the international community.

2. Purpose and main objectives of the National Strategy

The National Strategy, being a long-term planning document, defines principles, priorities and main directions of activities on conservation of plant genetic resources use in the country. Speaking about the National Strategy, we cannot artificially separate the problems of Kazakhstan from the countries of Central Asia, with which Kazakhstan is closely connected by water, transport, natural, ethnic and all other ties of socio-economic nature. The National Strategy defines the areas of effective conservation and use, legal, scientific, financial and human resources, management and coordination, international cooperation in the field of plant genetic resources for food and agriculture. The main object of this strategy is the most important for the country and the region collections of crops and it is through them that the effective conservation, use and exchange of PGR both in the country and the Central Asian region will be primarily implemented.

The goal of the National Strategy is to conserve plant genetic resources at a level that ensures sustainable agro-biodiversity, agricultural development and food production in the country.

To achieve the goal of the Strategy it is necessary to solve the following tasks:

- Ensure reliable and sustainable conservation of the most important crops for Kazakhstan and their relatives. Identify the main factors actually and potentially threatening their preservation in situ and ex situ.
- Identify priority collections that meet the principles and criteria for long-term support from the Foundation for Global Crop Diversity. Determine a list of priority needs and activities to improve the activities and material and technical base of these collections.
- To establish the rational preservation of plant genetic resources of Kazakhstan through distribution of responsibilities between national and international organizations. To establish effective cooperation and coordination of activities on effective conservation, use and exchange of PGR. To improve access to PGR for farmers, breeders, scientists and specialists in other branches of science.

- To improve scientific and monitoring studies of genetic diversity, identify samples with economically valuable traits/genes and promote the intensification of work on the improvement of germplasm.
- To improve the work on staff training, professional development of specialists in the field of plant genetic resources.

3. Priority collections in Kazakhstan containing plant species included in Attachment No.1 of the International Treaty on PGR

At the national and regional levels, priority should be given to plant species and varieties which are of key importance for human livelihoods and food security, national and global diversity or are in a threatened state. This Strategy is primarily focused on *ex situ* conservation of species and specimens. Therefore, collections and genetic banks of plants are the main objects of the Strategy. Plant species included in Attachment 1 of the International Treaty on PGR for Food and Agriculture are the priority species for conservation. Kazakhstan has quite a large number of collections of crops and their relatives. These collections are in research institutes, breeding stations, botanical gardens, universities, private organizations. Priorities for long-term support in the implementation of this Strategy are:

- state-owned collections;
- outstanding collections (containing objects of high economic value to the local population, wild relatives, enedemics, rare genotypes);
- collections with no copies for safe preservation;
- Endangered collections;
- collections containing specimens with specific characteristics and from specific ecological zones;
- collections that meet all the criteria for Global Fund support for crop diversity: collections that are effectively linked to users, are of high importance, have legal status, have commitments for long-term and sustainable conservation, collaborate and provide free access to specimens, and have trained staff, a well-functioning management system and appropriate facilities;

- collections with a broad ecogeographic scope of PGR, i.e. large collections;
- collections of organizations with active regional and international cooperation;
- collections with materials that are accessible and ready for exchange and that meet quarantine security requirements;
- collections with at least a minimum of passport data for the specimens to be preserved.
- Kazakhstan, recognizing the importance of conservation of plant genetic resources for sustainable agricultural development and food security, has begun to pay great attention to strengthening genetic banks and collections. They are entrusted with the main task of conservation, use and exchange of PGR both within the country and at the regional level. The effective functioning of the national PGR network will depend crucially on the capacity of such genebanks and collections. Therefore, the National Strategy stipulates priority support of the created genebanks as meeting all criteria of support by the Global Crop Diversity Fund. The task of paramount importance is to establish the National Genetic Bank in Kazakhstan - the main holder of all types and samples and coordinator of activities in the field of PGR in the country.

4. Organizations involved in the conservation of genetic resources

The national level of the document defines a wide range of subjects of the Strategy: genetic banks, collections, nurseries, botanical gardens, gene pool farms, farms, research institutes, breeding stations, higher educational institutions, international centers and organizations, etc. The implementation of the Strategy takes place through the partnership interaction of all subjects of the Strategy. It is necessary not only to expand the range of partners, but also to integrate them into targeted activities for the effective conservation and use of PGR.

The primary objective of the Strategy is to create an efficient and effective system for ex situ conservation of plant genetic resources. The most important condition for this is the willingness of the

parties involved to actively and closely cooperate, their readiness to join forces, as well as to distribute specific tasks and functions on PGR conservation among them. For example, some specific PGR services or tasks may be better performed by other organizations than by collection holders or genebanks themselves. Such tasks may be:

- conservation (e.g., the National Genebank maintains collections of all banks or multiple genebanks are responsible for the preservation of a particular gene pool(s);
- documentation (e.g., creation and distribution of shared information systems);
- specimen regeneration;
- specimen characterization and evaluation, including molecular analysis and pre-breeding work;
- assessment of germplasm health (standards and monitoring);
- duplication for conservation safety;
- exchange and distribution of germplasm;
- training and professional development;
- delivery/transfer of conservation technologies, including biotechnology.

In order to effectively preserve priority collections in the country, it is necessary to identify the main institutions/organizations responsible for the preservation of PGR, to identify other organizations responsible for the provision of specific services and communication with users. Critical prerequisites for partnership are:

a) full trust between collection holders and participating organizations in the project; b) willingness to cooperate with partners not only in the country but also outside the country; c) connection with already existing conservation structures, such as plant genetic resources networks; d) financial support for the system; and c) mutually agreed upon generally accepted standards for conservation.

The partnership envisages, in particular, that some genebanks/collections will be the lead organizations for the conservation of specific species/genepools and the creation of appropriate national databases. The selection of these organizations will be based on their comparative advantage, availability of facilities, qualification, interest and sustainability in these activities.

5. Current state of conservation of plant genetic resources

One of the first who recognized and substantiated the need to collect, preserve and study plant genetic resources was the famous scientist Mr. Nikolai Ivanovich Vavilov. The merit of Mr. N.I. Vavilov is that he was the first who created the scientific theory of plant introduction based on botanical geography, evolution of the plant world, the sequence of stages of variability in space and time, characteristic of cultivated and wild plants. Nikolai Ivanovich made a huge contribution to the world plant science. Many of his works, including those on the origin of cultural centers, remain in demand and relevant to the present day. Mr. N. Vavilov and his scientific school made a huge contribution to the study and conservation of PGR in Kazakhstan and Central Asia.

Global attention to plant genetic resources issues intensified sharply in the late 1970s. The first international discussion concerning legal and political aspects of PGR mobilization took place at the XX FAO Conference in 1979. The "International Treaty on Plant Genetic Resources" was adopted, which was signed by 113 countries of the world in 1983. The UN Conference on Environment and Development, Rio de Janeiro, adopted the "Convention on Biological Diversity", signed today by 170 countries of the world in 1992. The next factor of consolidation of the world community was the IV FAO Conference on PGR, which was held in 1996 in Leipzig. This conference adopted the "Leipzig Declaration on Conservation and Sustainable Use of PGR for Food and Agriculture", signed by 154 countries, and approved the "Global Plan of Action on Conservation and Sustainable use of PGR for Food and Agriculture". These events were a sign of recognition by the global community that conservation of agro-biodiversity is the business of all humanity, not just one or a few countries.

As noted above, during the Soviet Union, the Vavilov All-Union Institute of Plant Industry (VIR), St. Petersburg, which had branches in Kazakhstan and Central Asia, collected, preserved, and studied genetic resources. After independence, the links between the Central Asian states and VIR practically ceased. There was a real threat of loss of plant genetic resources collections in these countries. The only temperature- and humidity-controlled plant conservation facility was at the Kuban experimental station of VIR, Russia, which

became inaccessible to Kazakhstan after the collapse of the Soviet Union.

Due to economic difficulties in Kazakhstan, as well as in other Central Asian countries, almost all available plant samples were conserved in research institutes at room conditions and temperatures and had to be sown every 3-4 years to maintain germination of samples. For example, the Central Asian branch of VIR had about 52.000 crop samples alone. Due to the real threat to the collections, the challenge was to build conservation facilities with controlled temperature and humidity.

As of today, most of the institutes and experimental stations have functioning conservation facilities, although they require further improvement. Basically, these are medium-term conservation facilities with regulated temperature up to +4C degrees. To preserve the germination of seeds for 12-15 years, seed samples are dried to 5-7% before putting them into conservation, and then in plastic jars with sealed lids are put into conservation. Kazakhstan needs long-term conservation facilities, as well as the use of cryopreservation methods. Great hopes are placed on the soonest possible construction of the National Genebank. It is planned that eventually all crop collections available in Kazakhstan will be in specialized conservation facilities that meet the requirements of *ex situ* conservation. *Ex situ* and *in situ* germplasm preservation projects have been and are being implemented in the country. In situ preservation is also a priority for Kazakhstan. It is important that the methods of ex situ and *in situ* conservation complement each other harmoniously and are aimed at achieving the ultimate goal of conservation, restoration and sustainable use of PGR for food and agriculture in Kazakhstan.

Analysis of the summary data on PGR in Kazakhstan shows that about 59.56% of all samples in the gene pool of the country are wheat; 16% - fodder crops; 7% - forage crops; 6% - vegetable and melon crops; 3.9% - forest crops; 3.4% - fruit and leguminous crops; 1.5% - rice; 1.3% - potatoes; 0.8% - oil crops; 0.5% - arid, cotton, cereals; 0.04% - medicinal plants.

6. Priority activities for the conservation of genetic resources

- The most important task is the effective long-term conservation and availability of genetic material. The main activities deserving priority financial support and assistance are:
- Conservation and maintenance of genetic material in seed form, in vitro, in the field. Collection holders must ensure and demonstrate the effectiveness of the preservation methods used. All ex-situ conservation methods are considered adequate if they ensure the long-term integrity and viability of the germplasm and its availability.
- Regeneration. Necessary both to maintain viability and to increase the stock of genetic material. The regeneration procedure and methods must guarantee the genetic integrity of the samples and protection against contamination (contamination) by alien genetic material. This activity can be carried out in cooperation with other organizations.
- Characteristics. This type of work will be maintained in order to effectively manage and use the collection. Molecular characterization of specimens will be supported if it will significantly improve collection management.
- Documentation. Passporting and information management of the collection is an important activity. The development and maintenance of a computerized information and documentation system deserves all support. Necessary information about the PGR should be contained in a database and should always be available to users.
- Disease free healthy germplasm. Maintaining healthy, infection-free germplasm is also a critical component of the Strategy. Collections must have the technical capability to test germplasm for disease and provide users with information about the health status of the germplasm.
- Distribution of germplasm and communication with users. The Global Crop Diversity Trust and other Strategy partners should cover the cost of distributing genetic material and documenting distribution records. Accurately maintaining records of distributed/ disseminated material is a critical performance indicator. Collection holders must meet requests received within a reasonable period of time.

- Duplication for conservation security. All genetic materials retained under the National Strategy should have duplicates elsewhere, even outside the country, such as international genebanks and centers.
- Acquisition/replenishment of collections. This type of activity within the Strategy is especially important in cases where there is a threat of the loss of individual genetic material and urgent action is needed to address this threat.

Maintaining ex situ collections requires continued and sustained financial support. *Ex situ* and *in situ* conservation methods should complement each other to ensure ultimately sustainable and effective PGR conservation. The Government of Kazakhstan should prioritize support for a system of rational *ex situ* conservation of PGR. For this system to work effectively, it is necessary to:

- rational distribution of specific responsibilities/functions for the preservation of PGR among the participating organizations;
- full trust and willingness to cooperate, exchange information and materials for all participants in the National Strategy;
- adherence to the terms of partnership: all participants should benefit from such cooperation;
- effective communication between the relevant organizations, institutions, users and all other participants of the Strategy;
- the obligations of the participating organizations to implement the tasks of the Strategy, their contribution in the form of financial support, in the form of other resources and sources of assistance.

7. Cooperation and coordination of activities for effective conservation and use of plant genetic resources

Implementation of the National Strategy is based on effective cooperation and coordination of activities of all subjects of the Strategy, first of all, genebanks, large collections, agricultural research institutes, services, international centers and organizations.

Main areas of cooperation. Within the framework of this Strategy, the following main areas of cooperation between the partners are highlighted:

- Documentation. There is a need to know exactly what genetic material and where it is located; unique traits and characteristics of conserved specimens should be identified; there is a need for common unification of description data of conserved genotypes/samples; common information for dissemination is needed.
- Maintenance of collections. Partners should assist each other in common tasks; provide necessary services to partners in need; share methods and protocols; provide advice in specific areas such as cryopreservation, in vitro culture, molecular biological assays; and actively cooperate in areas of improved genebank management, monitoring, collection rationalization, introduction of new technologies for conservation and identification of genetic material.
- Regeneration. Partners can effectively collaborate on regeneration of plant specimens under the most optimal (adaptive) habitat conditions of the regenerated genotypes.
- Duplicates (copies) of samples to ensure conservation security. Strategy partners can easily agree to duplicate genetic materials in collections.
- Quarantine security. Partners can effectively cooperate in regulating quarantine security measures; sharing expertise, technology, and protocols for analysis of contaminated materials; specialized country institutes can evaluate germplasm for diseases and insects.
- Germoplasma distribution/dissemination. A concerted effort by partners to distribute and transfer genetic material to users in a timely and quality manner is necessary.
- Characterization of genetic material. Partners can actively collaborate on modern approaches to genotype characterization, such as molecular biological and biotechnological methods.
- Mechanisms of cooperation. Cooperation can take place through a variety of schemes and mechanisms, depending on the specific context. The most common mechanisms of cooperation may be:
- Development and signing of bi- or multilateral treaties and agreements on the conservation and use of PGR between organ-

izations within the country and in other countries (genebanks, collections, institutes, etc.).
- Ratification of the International Treaty on PGR for Food and Agriculture.
- Establishment of a national commission to coordinate the activities of collections.
- Creation of a national committee/council to guide and implement the National Strategy.
- Attracting support from politicians, key administrative structures, commercial and financial organizations.
- Development of national and regional joint projects.
- Creation of networks on certain important types of crops.
- International/regional expertise, exchange of experience, training of experts on PGR, joint evaluation and analysis of the effectiveness of cooperation.
- Training of specialists in the most important areas of PGR conservation and use, including molecular-biological methods for evaluation and characterization of genetic material; exchange of specialists, national and regional meetings and workshops, etc.
- Creation of strong inter-organizational links, sub-regional networks, effective mechanisms of germplasm exchange.
- Effective monitoring and evaluation of the implementation of the National Strategy, a flexible mechanism for adjusting tasks. A well-established system of information and analytical support of the Strategy.

Coordination at the national level. To implement the National Strategy and achieve its goals, a Critical Work Plan is formed. Formation and implementation of the Work Plan requires well-designed coordination at the national level. The strategy must be coordinated by the National PGR Coordinator through an established National PGR Coordination Network/Commission. It includes representatives of collections/genbanks. It may also include representatives of executive and legislative authorities, scientific and educational institutions, representatives of agricultural production and business, public, non-governmental organizations, etc.

The main partners and communication with users. As already stressed, a necessary condition for the implementation of the Strategy is the formation of a broad partnership system. Expansion of

the circle of partners should go through the involvement of organizations and individuals who are aware of their role in the preservation and use of agrobiodiversity and actively participate in this process. Strong and effective communication between the collections and the main users, which include farmers, agricultural production formations, rural communities, breeders, scientists, is a key condition for the successful implementation of the Strategy.

An indicator of a strong connection between collections and users is that:

- users have easy access to the material in the collection;
- users have easy access to all the information available in the collection about genetic material;
- users participate in activities such as characterization and evaluation, field trials, etc;
- mechanisms are in place to monitor, determine and improve the effectiveness of the services provided to users;
- users are represented on the boards or other governing structures of the genebanks;
- the banks are closely associated with implementation services or other similar structures;
- genebanks have links to seed assistance and agricultural development programs.
- Strengthening the collections' ties to users is a priority of the Strategy. Collections must meet certain requirements in order to receive continued financial support from the state and international funds:
- how many specimens have been distributed by the collection holder/genbank, for what period, and to whom;
- whether the holder of the collection maintains records of the quality, usefulness and actual use of the distributed the quality, usefulness and actual use of the distributed genetic material;
- whether the holder of the collection regularly analyzes the usefulness of the services provided to the users, and whether measures are taken to further improve communication with users based on the results of such analysis;
- how and to what extent the genebank promotes its genetic material to farms and/or breeding institutions;

- whether the collection holder/genebank has refused to make genetic material available, and if so, what were the reasons for the refusal;
- whether the information and documentation on the material available is sufficiently complete, easily accessible and useful for the identification of the material in question;
- whether the material is healthy and available in sufficient quantities, whether the quarantine procedures are are substantial and effective;
- what other linkages with users, such as participation of farmers and/or breeders on the Genebank Board or other governance mechanisms; and whether Genebank managers or staff are involved in planning local, national or regional research and developing strategies and priorities. International cooperation, the role of international centers and organizations.

Agricultural research, education and implementation in the country are represented by a wide network of research institutes, experimental stations and farms, training universities, institutes and other authorities. The agrarian science and industry of the country faces many problems, the stabilization and economic growth, achievement of food security and elimination of poverty depend on their effective solution. It is very important to activate international relations of the country in the sphere of agrarian science, training and professional development of personnel, exchange of breeding and genetic material, introduction of new technologies and highly productive resistant varieties into production.

International cooperation is one of the most important mechanisms of achieving the goal of the National Strategy. This cooperation is based on the balance of international obligations on preservation of agrobiodiversity and the sovereign right of the state to use its plant genetic resources. As already mentioned, the system of international cooperation on the conservation and use of PGR includes a number of global, regional and bilateral conventions, agreements, programs and organizations as well as information networks, databases and data banks. The development of the country's international cooperation should be carried out in the following main directions:

- fulfillment of international obligations in the sphere of PGR resulting from the country's membership in international treaties and participation in international organizations, such as FAO, the Islamic Organization for Food Security (IOFS), etc;
- organization of effective interstate coordination of activities in the field of preservation and use of GEO;
- interaction with international development agencies and financial organizations to attract international expertise and resources;
- using the capabilities and financial resources of international donors to ensure priority activities;
- active cooperation and involvement of international research and educational centers in the National Strategy.

The most important role in the development and implementation of the National Strategy, establishment of cooperation and coordination of activities in the field of plant genetic resources is assigned to international centers and organizations. The experience of almost 15-years work of the Consultative Group of International Agricultural Research (CGIAR) in Kazakhstan shows the effectiveness of cooperation of national agricultural programs with the leading world scientific centers, which actively attract the world experience, the richest global gene pool of plants, modern methods and methodologies of crop improvement, consultations of leading foreign scientists, and through this contribute to the most rapid integration of the region into the modern world scientific and technical process.

At the present time, a number of organizations of the Consultative Group on International Agricultural Research (CGIAR) system are operating in Kazakhstan, among which there are world-renowned centers for plant improvement, such as Bioversity Int., CIMMYT, ICARDA, etc. These centers can and should be of great help to the country in effective conservation and use of PGR, replenishment of collections, coordination and management of the National Strategy. In order to use these centers effectively, it is necessary to specify the general and specific tasks of each center in the development and implementation of the National Strategy. In particular, international centers with a mandate for these plant species can be responsible for assisting and coordinating the networking of

individual important crop species at the regional level. These same specialized centers can also develop and participate in international and regional projects on specific PGR problems.

8. Building capacity for the conservation and use of genetic resources

For effective preservation and use of PGR, to meet the objectives of the National Strategy, it is necessary to continuously improve the structure and function of the subjects of the Strategy, primarily the genebanks, collections and research organizations on PGR. Practically all of the country's scientific organizations do not have the infrastructure and technical base appropriate to modern requirements for the preservation of PGR and need help from the government and international organizations.

Improvement of material and technical base of genebanks and organizations in the field of plant genetic resources. One of the first-priority measures is to assess the state of material and technical equipment of priority collections and genebanks. In order to receive long-term support from the state and international funds, the holders of collections and genebanks must demonstrate that their potential allows them to solve the assigned conservation tasks. In cases where the capacity of the collection is weak, but there is genetic material of great value, the provision of financial assistance should be decided positively. To determine the feasibility of financial and material support for the collection / genebank, it is important to establish:

- whether the facilities and premises meet the requirements for long-term preservation of material and agreed-upon standards;
- whether the holder of the collection has an established system of regular monitoring of the condition of the material and technical equipment and conservation facilities; whether the equipment, instruments and conservation facilities are adequately installed and maintained according to the relevant requirements.

The Critical Work Plan for the implementation of the Strategy should include a list of equipment, instrumentation, and improvement work for the Material Conservation Facility of paramount importance.

Improvement of the system of provision and exchange of information on the conservation and use of plant genetic resources. Information and analytical support of the fulfillment of tasks is one of the main conditions for effective organization of the strategic process. It is necessary to have a common information platform based on unified standards for conservation and provision of information on genetic material, containing generally accepted protocols for conservation, including cryopreservation, information on genebank management systems, monitoring of work performance, accumulated experience in quality management of collections, organization of work, etc. One of the steps to achieve this could be the creation of a National Information and Analytical Center for PGR, which would also serve as a link in the more general mechanism of regional and global PGR management. One of the most important tasks of this center is to provide information support for management decisions of different levels and conditions of access to information, its use and dissemination for all users.

Personnel training. An important component of the Strategy is the training of qualified personnel in the field of PGR, training specialists in new conservation technologies, staff development through various training courses and programs, familiarization with the experience of leading foreign collections and genebanks, through consultations, lectures and methodological assistance of leading scientists and specialists, etc.

Formation of public awareness and propaganda. The current situation in the country is characterized by poor public awareness with problems of agrobiodiversity, low level of biological literacy and lack of understanding of importance of preservation of PGR, predominant consumer attitude to nature and its resources, reduced attention to environmental problems, rapid changes in public opinion under conditions of social and economic reforms. Therefore, the most important tasks of biodiversity conservation in general, and the National Strategy in particular, are formation of environmental culture of the population, responsible and active position of the society in the sphere of agrobiodiversity conservation, increase of biological and environmental literacy of the population, mastering by the population the ways of nature management and tech-

nologies which preserve agrobiodiversity and PGR. To solve these tasks, it is necessary to activate the following areas of work:

- promotion of the need to preserve agrobiodiversity and PGR in the media, during various public events and campaigns;
- ecological and biological education and enlightenment of the population, dissemination of biological and agricultural knowledge, popularization of modern nature-saving technologies;
- development of national educational programs on ecology and biodiversity conservation for secondary and higher schools;
- informing the population about the status of PGR and threats to them, international agreements in the field of biodiversity, PGR for agriculture and food, etc;
- support of population initiatives on preservation of agro-biodiversity and PGR, environmental movement.

Such types of work require a broad partnership of all structures that influence public consciousness - the media, various public associations, national and international organizations in the field of science, education and culture, individual outstanding personalities, etc.

Scientific support of the National Strategy, monitoring of agrobiodiversity, updating and replenishment of ex situ collections, collection of genetic material. To date, it should be recognized that in the country after the collapse of the Soviet Union there was a sharp decline in the level of scientific research, there is an acute shortage of personnel for scientific research, material and technical base of science does not meet modern requirements. This general situation is also reflected on the possibilities of the country in solving the problems on preservation and use of PGR in agriculture and food production. Taking into account the real situation, it is necessary to concentrate the efforts of the country and international organizations on the most important directions of scientific support of the National strategy, such as:

- inventory of agrobiodiversity and PGR for agriculture and food production;
- study of the dynamics of PGR diversity;
- scientific basis for effective conservation and reproduction of rare and endangered species and valuable plant genotypes;

- scientific basis for sustainable use of agro-biodiversity and PGR for agriculture and food production;
- scientific and legal studies for the conservation, use, access and exchange of PGR;
- economic research in the field of conservation and use of PGR, improvement of methods of economic evaluation of agrobiodiversity and PGR.

Monitoring should provide management bodies at various levels, national and international scientific organizations to provide information on the status of PGR and trends in their changes. Operational information about the state of PGR should allow timely correction of control actions. The following actions are needed to form a PGR monitoring system:

- organization of regional and national information and analytical centers (information systems) on PGR and agrobiodiversity;
- development of unified standards for collection, conservation and presentation of information on PGR
- organizing the preparation of PGR monitoring data for their use in decision-making at all levels of management in the field of preservation and use of PGR;
- providing training for specialists in the field of monitoring and information systems.

The creation of high-yielding, biotic and abiotic stress-resistant, nutritionally valuable varieties and diversification of crop production requires increasing genetic diversity and expanding the set of crossbred genotypes. The world's leading scientific centers and genebanks can provide great assistance in replenishing national genebanks and collections. It is necessary to conduct regular expeditions to collect plants in the country and the region both to monitor the state of biodiversity and to update and replenish collections. In this direction joint efforts of the countries of the region and international organizations are especially important and necessary.

9. Improve regulatory mechanisms for the conservation, use and exchange of genetic resources

The improvement of regulatory mechanisms must first of all be aimed at introducing biological principles of conservation and use

of biodiversity with consideration of socio-economic conditions for their implementation.

At the national level, the modern legislation of the country is based on the provisions of the Constitution of the country and, in general, represents a system of legal institutions, norms and regulations aimed at ensuring biodiversity conservation. In Kazakhstan the main legislative documents/acts on preservation and use of PGR are:

- Environmental Code (2007);
- Forest Code (2003);
- Land Code (2003);
- Law "On specially protected natural territories" (2006);
- Law "On Plant Quarantine" (1999);
- The Law "On Plant Protection" (2002);
- The Law "On seed production" (2003);
- The Law "On Protection of Breeding Achievements" (1999);
- The Law "On food safety" (2007);
- The Law "On Grain" (2001).

However, it must be recognized that the existing legislation and regulatory mechanisms in the area of conservation and use of PGR have many gaps and contradictions. Further efforts are needed not only to introduce amendments and additions to the current legislation, but also targeted work on the creation of new directions of lawmaking policy laid out in the Convention on Biological Diversity. The most important task is the development of legislation on regulating access to genetic resources and the benefits from their use, based on the fact that a country can act both as an exporter and importer of genetic resources.

The system of international law and cooperation is the most important regulatory mechanism for the conservation, use, and exchange of genetic resources. As noted, the system of international law and regulation is based on a balance of international obligations and the sovereign right of states to use their resources. At present, there are a number of international agreements, treaties and documents concerning the regulation of conservation, use, access and exchange of plant genetic resources. The most important of these are:

- Convention on Biological Diversity;

- International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA);
- International Convention and International Union for the Protection of New Varieties of Plants (UPOV);
- World Trade Organization (WTO);
- Global Plan of Action for the Conservation and Sustainable Utilization
- Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture;
- Cartagena Protocol on Biosafety.

There is a lot of work to be done for the country to participate in these international treaties and agreements. To date, Kazakhstan has acceded to the Convention on Biological Diversity and signed the Cartagena Protocol.

An important document with legal force and relevance to PGR, access and benefit sharing is the International Treaty on Plant Genetic Resources for Food and Agriculture, adopted in 2001 and entered into force in 2004. The ITPGRFA establishes a multilateral system and mechanism for access and benefit-sharing. The Treaty seeks to balance the rights of different interest groups, including farmers, as well as to recognize intellectual property rights. The ITPGRFA, which is administered by FAO, has so far been ratified by over 100 countries. It should be emphasized that the country's acceptance of this document is of key importance for the implementation of the National Strategy.

Improvement of regulatory mechanisms in the area of conservation, use and exchange of genetic resources must be carried out along the following main lines:

- further improvement of existing legislation in the area of biodiversity conservation and use;
- development of legislation in the area of regulation of access to genetic resources and benefits from their use;
- identification of state bodies responsible for the issues of PGR, access and benefit sharing;
- access and benefit sharing;
- signing, ratification, adoption by the country of international agreements, treaties and documents in the signing, ratification, adoption of international agreements, treaties and instruments

by the country to regulate the conservation, use, access and exchange of plant genetic resources;
- fulfillment of international obligations arising from the country's membership and participation in international fulfilment of international obligations arising from the country's membership and participation in international organizations and treaties on the conservation and use of biodiversity and genetic resources;
- organization of effective coordination of activities at the national and regional levels of effective coordination of activities for the fulfillment of international obligations, the creation of a mechanism for the implementation of this work.

10. Financing

One of the key conditions for implementing the National Strategy is the funding mechanism. Under current conditions, the financing system should provide support for both the most valuable and vulnerable areas of conservation and use of PGR. Such a system of financing should combine the program-targeted principle with a broad attraction of funds from various sources for specific programs and projects of PGR. Thus, the implementation of this Strategy is ensured by the multiplicity of funding sources and targeting of allocated funds. The main sources of funding for the implementation of the National Strategy are as follows:
- National targeted scientific and technical programs on biodiversity, plant genetic resources;
- programs of fundamental and applied research of the ministries of agriculture, education and science, ecology, geology and natural resources;
- targeted innovation and investment funds for the development of PGR, created including at the expense of deductions from the income of highly profitable agricultural structures (large agricultural companies, cooperatives, joint stock companies, associations of farms, etc.);
- funds from international funds for the development of agriculture, agrarian science, food production;
- international programs and projects, including joint projects with international agricultural research centers;

- multi-purpose entrepreneurial funds, financial support from national and foreign sponsors;
- funds earned by the collections and genebanks themselves through the provision of services and material. At the same time, payment for access to genetic resources should differ depending on their subsequent use: non-commercial (not related to profit - for scientific, educational purposes) and commercial (transfer of genetic materials to companies for production purposes).

Over time, new opportunities and forms of earning and raising funds may emerge. Therefore, the structural and functional organization of genebanks, collections and PGR organizations should be as favorable as possible to such innovations.

If we consider the problems of financing in the context of three interrelated areas of effective use of agrobiodiversity for agriculture and food, namely PGR, breeding and biotechnology, the analysis shows that the main source of their funding is the state budget, primarily the scientific and technical programs of the ministries of agriculture, education and science.

The share of international programs and projects, innovation and investment funds in the total financing of biotechnology, breeding and PGR is insignificant. Practically these works do not receive financial support from agricultural and biotechnological industries, national and foreign sponsors. This is another confirmation of the fact that domestic scientific developments continue to be poorly demanded by the economy, the principle of formation of programs from the "end user" does not work. As it has been repeatedly noted, many scientific directions develop without close interaction, sometimes duplicating each other, which is caused by the presence of inter-branch and interdepartmental barriers, the absence of a single body to coordinate the entire system of scientific research, developing and coordinating large multidisciplinary projects. Many ministries and departments have their own scientific programs financed from the state budget, and each department pursues its own "scientific" policy. The government recognizes that "...the majority of projects on the development of innovative products are initiative developments, rather than regional and scientific and technical orders, i.e. the developers themselves invent some product and sub-

sequently have to search for its application ... The management and financing model of Kazakh applied science is largely focused on satisfying scientific interest, rather than solving problems of technological nature..." (Decree of the Government of the Republic of Kazakhstan № 1308 of November 30, 2010).

The analysis of funding of scientific work in biotechnology, breeding and PGR has shown that today there are practically no large multidisciplinary projects and programs that combine the efforts of these areas to solve specific practical problems. According to scientists, the main reason is the interdepartmental fragmentation of the institutes. Even within one scientific organization it is not possible to form interdisciplinary projects. To overcome these and other negative factors in Kazakhstan measures are taken to improve the system of financing of scientific and technological activities. According to the new Law of the Republic of Kazakhstan adopted in 2011, funding is provided in the following forms:

- basic funding;
- grant financing;
- program-targeted funding.

Time will show how fruitful this system will prove in the long-term perspective. One thing is clear that without effective reforms and improvements in funding mechanisms, coordination and management, cooperation and partnership, there will be no effective link between science and production (and in the context of the problems discussed in this publication, between PGR, breeding and biotechnology).

11. Mechanisms for evaluating and monitoring the effectiveness of the implementation of the Regional Strategy

Evaluation of the results of the National Strategy is carried out during its implementation and after the completion of individual stages of work based on the following criteria:

- indicators characterizing qualitative and quantitative changes in the state of priority PGR conservation activities (conservation and maintenance of genetic material, regeneration, characterization, documentation, germplasm health, germplasm distribution

and communication with users, duplication for safe conservation, acquisition and replenishment of collections);
- indicators characterizing cooperation and coordination of PGR conservation and use (areas of cooperation, mechanisms of cooperation, coordination at national and regional levels, communication with users, international cooperation);
- indicators characterizing the state of the material and technical base of genebanks and collections, information system, personnel training, scientific support of the National Strategy;
- changes in public awareness and propaganda in the field of biodiversity conservation and PGR;
- changes in the regulation of conservation, exchange, access and benefits from the use of PGR;
- changes in the field of financing and raising resources for the implementation of the National Strategy.

The composition of indicators and methods of their evaluation can be adjusted depending on the available information and the degree of accuracy of the justifications.

One of the conditions for the successful implementation of the Strategy is a well-organized system for monitoring its implementation, tracking the progress of its implementation and regularly informing about the completed and implemented stages of the Work Plan, the difficulties encountered and ways to overcome them. A generalized assessment of the implementation of the Strategy should form the basis for the development of areas of action and activities for the next period.

The management structure and mechanism of the National Strategy must provide the opportunity to monitor and evaluate its implementation. The National Coordinator and the National Council/Committee on PGR are responsible for the overall monitoring and evaluation of the implementation of the Strategy. They monitor and evaluate the preservation, sharing and use of PGR at the national level. The process is carried out through regular visits, reviews and hearings of progress reports from genebanks, collections and PGR organizations.

At all levels of implementation of the Strategy, monitoring and evaluation are based on annual work plans. At the national level, annual meetings/ staff meetings are held to summarize the work for

the year, conduct an overall assessment of the implementation of the Strategy, approve the plan for the next period. The documents developed at these meetings/staff meetings are submitted to the relevant superior management bodies of the strategies - the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan.

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SESSION 3:
CONSERVATION AND REPRODUCTION OF ANIMAL GENETIC RESOURCES. ACTIVITIES OF SCIENTIFIC ORGANIZATIONS.

Mr. Talgat Karymsakov
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Genetic resources of farm animals of the Republic of Kazakhstan and possible ways of preserving endangered breeds.

Genetic resources of livestock breeding are an important part of agriculture, providing production of more than half of its gross output. The importance of cattle breeding is determined not only by its high share in production, but also by its great influence on the economy of agriculture and on the level of food security of the country.

The problem of preserving the gene pool of animals occupies a special place among the global problems of human development. Kazakhstan possesses the richest genetic resources of plant and animal life. The vast expanse of pastures of the Republic (187 million hectares) represents a significant potential for breeding of farm animals on this territory. The country has optimal raw material resources, the structural and key link of which, in no small measure, are pastures.

The particular importance in the development of genetic resources is the breeding base. Today 22 breeds of cattle, 24 breeds of sheep, 8 breeds of pigs, 12 breeds of horses and 2 breeds of camels are bred in the republic. It should be noted that the propagated breeds in the country, 27 are breed in Kazakhstan, including 4 breeds of cattle, 15 breeds of sheep, 1 breed of pigs, 5 breeds of horses, 2 breeds of camels and 1 breed of birds.

The number of breeding stock of sheep in Kazakhstan is 2725.6 thousand heads, goats – 6.3 thousand, camels – 17.3 thousand, horses – 225.3 thousand, pigs – 124.1 thousand, cattle – 978.6 thousand heads; poultry – 7182.1 thousand heads. It should be not-

ed that the share of breeding animals in the structure of each type of animals is still not high enough as of January 1, 2021.

In recent years, Kazakhstan has been actively working to improve the management of genetic resources. In particular, by subsidizing the breeding stock, there is a significant increase in the number of cattle and sheep in the country. Principles of selection and breeding work at the level of countries with developed livestock breeding are introduced in the breeding business. Breeding republican chambers on various kinds of animals were established at the legislative level. The number of livestock in organized agricultural enterprises is expanding, which contributes to reducing the number of cattle in private farms and increasing the tribal population in the country as a whole.

Currently, there is active work on targeted management of genetic resources, but its activities do not cover the preservation, development and replication of the gene pool of small, local and endangered breeds of domestic breeding. In particular, because of the high popularity of Holstein breed in the country, Aulieati, red steppe and Alatau cattle breeds disappear. Due to low demand for merino wool and karakul pelts, small cattle breeds such as Kazakh, North-Kazakhstan and South-Kazakhstan merino, Kazakh semi-tonkorun breed with crossbred wool, Kazakh meat short-mature semi-tonkorun and Tsigai, as well as karakul sheep are disappearing. The Aksai group of pigs, Alatau egg bird crosses, Medeo and Arman ducks practically disappeared.

In this regard, in the future it is necessary to create a well-established national system for the management of all genetic resources and to create programs for the conservation of endangered breeds and indigenous species, by involving various governmental and nongovernmental organizations, including international ones.

Thus, within the framework of such programs it is necessary to conduct returnable crossbreeding of high-blooded genotypes by improving breed in order to receive from them seed and embryos, and also to organize a bank on conservation of genetic material in the territory of the Republic of Kazakhstan, to create gene pool farms in order to preserve the genetic reserve in the form of living individuals, and also to announce grant or target financing on preservation and further reproduction of disappearing and local breeds.

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Mr. Bolat Seisenov
President of "Asyl tulik" JSC
National Agrarian Scientific and Educational Center NASEC

"Republican Center for Breeding Livestock" Assyl Tulik JSC

The Breeding Center in Kosshi village of Akmola region was established in accordance with Government Decree of the Republic of Kazakhstan № 1167 of 01.08.2000 to implement the national target program "Conservation, development and use of the gene pool of agricultural plants, animals and microorganisms for 2001-2005".

In the form of the "Asyl Tulik" Joint Stock Company was approved by the Decree of the Government of the Republic of Kazakhstan No. 1256, dated August 27, 2009 "On establishment of the Republican Center for Breeding Livestock "Asyl Tulik" and was opened with the personal participation of the First President of the Republic of Kazakhstan Nursultan Nazarbayev.

The tasks of the "Asyl Tulik" JSC are receiving, accumulation, conservation and distribution of the gene pool of highly productive animals with the aim of introducing the technology of artificial insemination and other biotechnological methods of animal reproduction and distribution of breeding material, highly productive producers, breeding bulls to improve productivity, breeding qualities of livestock of agricultural animals in the Republic of Kazakhstan.

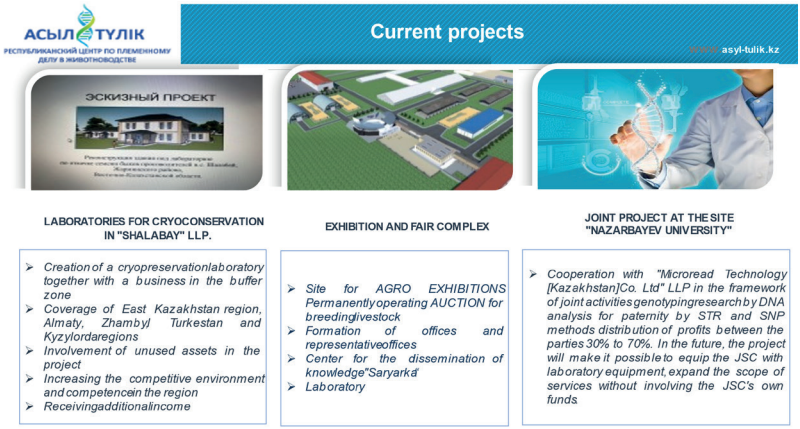
Providing services to agricultural producers on selection of pedigree bulls breed of foreign and domestic selection from accumulated in gene pool of JSC's breed of bulls and rams of producers, the company delivers semen in liquid nitrogen to distribution centers and rural districts to points of artificial insemination, assigns to mother stock of bulls-producers selected by productivity, provides evaluation of bulls by progeny and own productivity, services on artificial insemination, training in artificial insemination technologies, control and timing of insemination of cows and heifers, synchronization of cows and heifers, ultrasound scanner services for the examination of sterility of cows, consulting services and support of veterinary and sanitary measures in beef and dairy cattle, horse breeding and sheep breeding.

The specialized cryopreservation laboratory of the JSC annually replenishes the gene pool with the seed of bulls, rams and goats - producers according to the GOST 26030-2015 standard. Frozen seed is produced in a certified laboratory for bottling, packaging, labeling and preservation in accordance with the technology of the laboratory "IMV" (model-IS4, France) in polypropylene straws (paillettes-0.25).

More than 11 million seed doses have been produced and more than 6 million were sold in the regions of the country since 2000. At present, more than 6.2 million doses are conserved in the bio-conservation facility of the breeding center.

The breeding center "Asyl tulik" has set the task of meeting the needs of agricultural producers with the seed of bulls-producers of zoned breeds. The practice of work over the past periods has shown that own production of semen from domestic and foreign breeding bulls-producers is cost-effective and much cheaper than importing semen from other countries.

The main competitors of JSC in the field of artificial insemination are dealers and distributors selling imported products from Europe, USA, Canada, Russia and Ukraine. The JSC products are not inferior in quality to imported and even superior in many parameters, including price.



The JSC, having a certificate of accreditation as a subject of scientific and scientific-technical activity, participates in scientific projects of target financing and conducts scientific research as a co-executor with leading scientific organizations of NASEC. In the future JSC plans to independently conduct scientific research in the areas of breeding of farm animals, gene pool preservation, etc.

Specialists of the "Asyl Tulik" JSC closely interact and cooperate with representatives of the Republican Chambers of breeding animals and for this purpose there is a certain work on the use of valuable genetic potential on the basis of its own breeding base. There are six breeds zoned for development of meat cattle breeding in the country. Priority is given to domestic breeds, in which Kazakh white-headed breed occupies the largest specific weight - more than 62%.

Together with the Republican Chamber of the "Kazakh Whitehead" pedigree animals, in order to improve the hereditary qualities of the genetic potential of the Kazakh Whitehead, the JSC purchased 10 head of "Shagatai inbred ", "Ankata" types of steers from the "Sabit" farm and the "Aisulu" LLP. From "Galitskoe" LLP of Pavlodar region 5 cows.

АСЫЛ ТҰЛІК
РЕСПУБЛИКАНСКИЙ ЦЕНТР ПО ПЛЕМЕННОМУ ДЕЛУ В ЖИВОТНОВОДСТВЕ

Supply and demand. Current situation

Market DEMAND	Assyl Tulik SUPPLY	Alternative
Tribal material.Popularization of IO technology.For reference: coverage of AI dairy herd in the Republic of Kazakhstan is 15%, (RF - 70%, RB, Ukraine - up to 90%, USA, Canada, Europe - 100%)	➢ Production per year up to 300 thousand doses ➢ Coverage (up to 20% of market demand) **Gene pool base** ▪ Cattle: 303 bulls in 22 breeds ▪ Small Ruminants: for 13 breeds	➢ LLP Assyl ➢ Cattle 2.2 mln
Regional centers for cryopreservation of breeding material	➢ Pilot project (East Kazakhstan, LLP Shalabay)	➢ Suggested North KZ, West KZ
Training of higher education and professional development in various branches of animal husbandry	➢ In 2021, 160 agricultural inseminators were trained(market of 2.0 thousand specialists)	➢Extension
Scientific support of the breeding process taking into account international experience	➢ poor provision of scientific personnel (3 graduated employees)	➢ LLP NPC
Auctions, specialized exhibitions	➢ Absent	KORME, Mynbayevo

At the same time it is planned to use experience of French breeding centers, which create research groups together with scientific centers of their regions, thereby implementing close cooperation with advanced farms in the field of genetic research in cattle breeding.

Borrowing the international practice of close cooperation of activities with business, increasing competitiveness and efficiency, the JSC plans to create a unit in Zharminskiy district of East-Kazakhstan region with the joint participation of business and the Republican Chamber of the "Kazakh white head" breeding animals. Within the framework of the memorandum on cooperation, construction of a cryopreservation laboratory with the task of producing semen of bulls of domestic breeds (in the buffer zone) – the Kazakh Whitehead, Kalmykian, Alatau, Aulietiskaya, Simmentalskaya and other breeds began in the "Shalabay" LLP. The JSC participates in this project as a research center with the provision of laboratory equipment and qualified specialists in cryopreservation and bacteriology.

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Mr. Roman Yashchenko
Director General of the Institute of Zoology

State, prospects of conservation and rational use of the agrobiodiversity of wild animals' genetic resources.

The Institute of Zoology of the National Academy of Sciences of the Republic of Kazakhstan is a leading world-class scientific organization in the field of fundamental and applied zoology. **The main activities of the institute**: obtaining new knowledge about the modern state of fauna of Kazakhstan, establishing patterns of population dynamics of invertebrates and vertebrates depending on environmental conditions; as well as the taxonomic diversity of faunas of ancient geological eras and scientific substantiation of implementation of results in the practice of geological services of the republic; study of evolution, phylogeny, taxonomic diversity of modern and ancient fauna and scientific substantiation of introduction of new effective developments carried out on the basis of scientific research; solution of zoological problems of socio-economic and ecological significance; use of relevant scientific achievements in the Republic of Kazakhstan.

The diversity of different animal groups in Kazakhstan: mammals are represented by more than 180 species, birds by more than 500 species, reptiles by 50 species, amphibians by 12 species, fish by 147 species, lampreys by 3 species, insects by < 50 species and invertebrates by < 50,000 species. The team of the institute has published more than hundreds of monographs dedicated to the study of animal diversity in Kazakhstan.

The number of domesticated animal species is very small not more than 25. For domestication it is necessary that the animal kept in captivity regularly gives birth to offspring, i.e. artificial conditions of keeping became the normal habitat for it. Only after that it is possible to engage in selection and, keeping and multiplying the number of individuals with the most valuable features for humans and after many centuries to get not just a tame, but a real domestic animal. The problem of the origin of domestic animals is not limit-

ed only to establishing their wild ancestors (Table 1). In doing so, it is necessary to study the patterns of animal transformation from wild ancestors to modern highly cultivated forms, and on the basis of these, to facilitate the management of animal breeds to improve their productivity. Archaeological examination identifies two independent foci of sheep domestication in Turkey: the upper Euphrates Valley in eastern Turkey, and central Anatolia (Peters et al., 1999). Three wild sheep species (Urial, *Ovis vignei*; Argali, O. *ammon*; and Eurasian mouflon, O. *orientalis*), have been identified as ancestors of modern domestic sheep (Ryder, 1984) or at least their introgression with some local breeds has occurred. However, recent genetic studies have not confirmed these data regarding urial and argali (Hiendleder et al., 1998), which has led to the belief that the Asian mouflon (O. *orientalis*), widely distributed in the geographic area from Turkey to at least the Islamic Republic of Iran, is the only ancestor of domestic sheep. Unfortunately, we have not yet studied wild animals such as urial and subspecies of wild argali for a more detailed analysis of the domestication process of the domestic sheep.

There are different opinions about the origin and domestication of the horse (Equus caballus). As a fact, it can be assumed that its wild ancestor is extinct. Two species are considered as supposed wild ancestors of the horse: the tarpan (E. ferus) and the Przewalski's horse (E. przewalskii). The Przewalski's horse, although a close relative of the wild ancestor, is most likely not a direct ancestor of domestic horses (Olsen, 2006). In research, it is difficult to assess whether the archaeological remains belong to a wild or domestic horse. There is evidence that the horse was domesticated around 3700-3100 BC. (Copper Age) in northern Kazakhstan (Botai culture) (Olsen et al., 2006). The Institute of Zoology has carried out work to bring Przewalski's horses and now the animals are in the national park of Altyn Emel and further research is needed.

It should be emphasized that at present there are processes of domestication of other animal species: maral, yak, sturgeon, salmon, partridge, quail, pheasant, bustard and others. In hunting farms various species of newly domesticated animals, most species are birds.

The use of genetic resources of wild species in the breeding of farm animals. The Kazakh arharomerino is the only breed of sheep that has been bred through interspecific hybridization. The idea of distant hybridization of farm animals as an additional means of breed formation was formed by the Soviet livestock scientist Mr. M.F. Ivanov in the 1920s. The work on breeding a hybrid of wild mountain sheep-arkhar and merino sheeps based on this idea began in 1934 on the initiative of J. Ya. Lus. The aim of the breeding was to combine fine fleece and high merino cuts with adaptation to year-round keeping in the high mountain pastures. Hybridization was carried out at the Kurmektinsky experimental base of the Kazakh SSR Academy of Sciences. At the first stage, New Caucasian Merino sows were inseminated with wild argali sperm. Sheep - mestizos of the first generation were crossed with the breeding queens of the Precos and Rambouillet breeds. The third generation of mestizos were bred in themselves. Cross-breeding was accompanied by year-round keeping on the mountain pastures of Kungei Alatau and Zailiyskiy Alatau. Breeding of the breed was completed in 1950.

Semirechenskaya breed of pigs was bred specifically for the southeastern Kazakhstan conditions, which are characterized by a sharply continental climate, high summer temperatures (48 ° C) with large differences in day and night temperatures (from 48 ° to 5 ° C), cold (up to -50 ° C) and little snow in winter. The breed was created as a result of crossing crossbred animals (large white x wild boar) with pigs of the Kemerovo breed, followed by breeding the best animals with 3/4, 7/8 and 15/16 shares of the blood of factory breeds "in themselves" and crossing among themselves for 4 —5 generations. The breed was bred under the guidance of employees of the Institute of Experimental Biology of the Academy of Sciences of Kazakhstan. The Semirechensk breed of pigs was approved in 1978. Pigs of the Semirechye breed combine the high productivity of factory breeds and the strength of the wild boar constitution, are resistant to the extreme climatic conditions of the southeast of Kazakhstan, despite the white color they do not suffer from sunburn.

Wild argali are represented by a great variety on the territory of the Republic of Kazakhstan:

Ovis vignei arcal – urial, Ustyrsty mouflon, arcal

Ovis ammon ammon – Altai mountain sheep

Ovis ammon severtzovi – Kyzylkum mountain sheep
Ovis ammon karelini – Tien Shan mountain sheep
Ovis ammon nigrimontana – Karatau mountain sheep
Ovis ammon collium – Kazakhstan mountain sheep.

It should be noted that studies on the effect of different methods of cryopreservation of fibroblasts of animals of the genus *Ovis*, wild sheep, Tarbagatai population of Kazakhstan argali subspecies (*Ovis ammon collium* Severtzov, 1873) were carried out using fibroblasts of Kazakhstan mountain sheep (argali) (Fig. 1) as an object of research. And also, there were carried out researches on study of development of cloned embryos after transfer of somatic cells nuclear of Kazakhstan argali (*Ovis ammon collium* Severtzov, 1873) by HandMade Cloning method (Fig. 2).

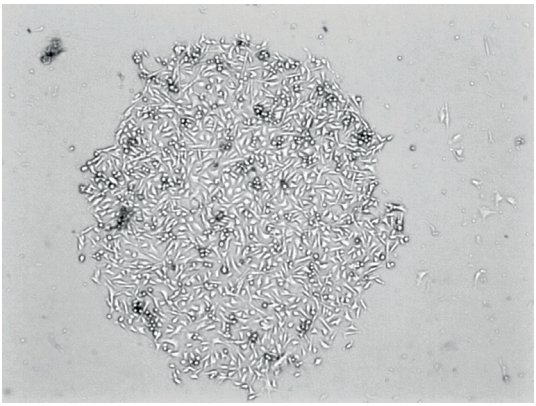

Figure 1: Fibroblasts of** Ovis ammon collium **Severtzov, 1873 cultured in vitro (photo provided by the Institute of Experimental Biology named after F.M. Mukhamedgaliev).

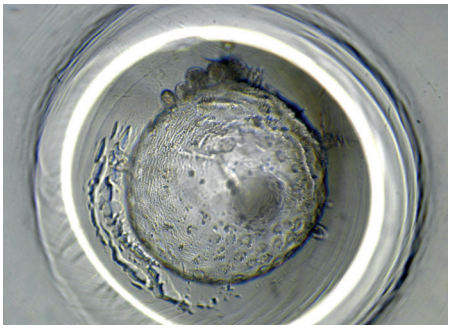

Figure 2: Cloned embryo after somatic cells nuclear transfer

The International organization INTAS (The International Association for the Promotion of Co-operation with Scientists from the New Independent States of the former Soviet Union) has allocated a grant for performance of the project "Embryo Transfer of Deer" the head, academician of National Academy of Sciences of Kazakhstan, Mr. M.M. Toishibekov In the project interspecific transplantation of embryos of maral (*Cervus elaphus sibiricus*) to recipients of a spotted deer was spent. Similar works were carried out on Bukhara deer (Pereladova et al., 1999). Studies on cryopreservation of fish's milks: Balkhash perch and bighead carp were also conducted (Galushchak et al., 2006).

We consider it particularly important to preserve the genetic resources of not only vertebrates but also invertebrates such as bees (*Apis melifera*). The idea of the program is to conduct comprehensive research on cryobiology, cellular and molecular biology to assess the status of bee populations bred in different regions of the country and to improve the method of drones sperm cryopreservation to develop technology for increasing the productivity and stability of honey bees (*Apis mellifera*) in Kazakhstan. The diversity of available honey bee genes is rapidly decreasing, facing massive introgression of alien genotypes. The development of cryopreservation methods is a multifactorial task related to the optimization of freezing regimes, thawing rate, nature and concentration of cryoprotectants, and composition of optimal diluent. It is also planned to create a cryobank of germplasm from zoned populations of bees in Kazakhstan.

For various research and conservation of genetic resources it is necessary to comply with regulations and laws, such as international obligations and the legislation of the Republic of Kazakhstan.

Kazakhstan's international obligations under the conventions:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora,
- The Convention on International Trade in Endangered Species of Wildlife (CITES).
- The Convention on Biodiversity Conservation (Convention on Biodiversity Conservation).
- Convention on Migratory Species
- Convention on Wetlands (Ramsar Convention on Wetlands).
- etc.

The compliance with the legislation of the Republic of Kazakhstan (Laws of the Republic of Kazakhstan on the conservation of rare and endangered animal species (according to CBC, CITES, CMS and on the use of derivatives (according to CITES):

- "On Protection, Reproduction and Use of Animal World"
- "Specially protected natural areas"
- "On the protection of animals" draft law of Kazakhstan
- Environmental Code of Kazakhstan
- etc.

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Table 1. The process of domestication of farm animals

Domestic species	Wild Ancestor	MtDNA contribution	Number of domestication events	Place of domestication
Cattle	**Tours (3 subspecies) (extinct)**			
Bos taurus taurus	*B. primigenius*	**4**	**1**	**Near and Middle East (West Asia)**
	B. p. opisthonomous	**2**	**1**	**Northern Indian subcontinent**
Poephagus grunniens	*P. mutus*	**2**	**1**	**Qinghai Tibetan Plateau**
Sheeps	**Asian mouflon**			
Ovis aries	*Ovis orientalis*	**4**	**4**	**Near and Middle East/Turkey (Central Anatolia)**
Goat	**Bezoar goat**			
Capra ferus	*Capra aegagrus (3 subspecies)*	**5**	**2**	**Near and Middle East/Northern Indian subcontinent**
Horse	**Extinct**	**17**	**Multiple**	**Eurasian Steppes**
Equus caballus				

Domestic species	Wild Ancestor	MtDNA contribution	Number of domestication events	Place of domestication
Bactrian (two-humped camel)	**Extinct****			
Camelus bactrianus	*C. b. ferus*	**H**	**1**	**Central Asia (eastern part of the Islamic Republic of Iran)**
Dromedary (one-humped camel)	**Extinct**	**H**	**1**	**Southern part of the Arabian Peninsula**
Camelus dromedarius				
Domestic hens	**Red jungle hen**			
Gallus domesticus	*Gallus gallus (4 subspecies.* *G. G. spadiceus, G. g. jabouillei* *G. g. murghi, G. g. gallus)*	**5**	**2**	**Indian subcontinent, China-Southeast Asia**

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Mrs. Leila Zhansugurova
Director General
Institute of General Genetics and Cytology

Molecular genetic analysis of farm animal populations and other collections of the Institute of Genetics and Physiology

We started our research work on molecular-genetic certification and cytogenetic attestation more than 15 years ago with Kazakhstan sheep breeds. Cytogenetic and molecular genetic studies based on ISSR- and STR-markers of individual populations of the following sheep breeds were conducted: Chingizskaya, Chuyskaya, Saryarkinskaya, Kazakh fine-wool, Edilbayskaya and Kazakh arkharomerinos. ISSR-PCR analysis of sheep breeds revealed species-specific, breed-specific fragments. Using microsatellite panel (32 STR-loci recommended by International Society of Animal Genetics - ISAG) we characterized Edilbay and Kazakh Arharomerinos sheep breeds (8 populations), evaluated information capacity and resolution of 32 STR-loci. A wide polymorphism in allele length was detected both when comparing different breeds and within each breed. Ten informative markers were selected for each of the two breeds. Special attention was paid to unique alleles found only in one population. The study of molecular variability of fecundity genes GDF9 and BMP15 in Kazakh meat-wool sheep breed is also conducted, which will help to facilitate and significantly speed up breeding work and create groups of animals with desired genotypes in a short time.

The molecular genetic characterization and cytogenetic certification are also performed for some dairy cattle breeds. We analyzed the karyotype features of the animals by morphology and structure of chromosomes, the level of spontaneous chromosomal mutations. Microsatellite analysis included studies on 11 STR loci recommended by ISAG. As part of the research work, cytogenetic and molecular genetic studies of 3 groups of cattle were conducted: red-motley type, brown type and Alatau breed. The features of karyotypes that include breed-specific translocations of chromosomes have been established. The studied types of cattle are ge-

netically diverse, since unique STR alleles that are not present in representatives of other types have been revealed for almost every microsatellite locus studied. We identified 6 such alleles in the brown type population and 9 such alleles in the red-motley breed population. In addition, milk productivity genes (4 genes) were studied in bulls-producers and mothers, which allowed us to establish, a high frequency of BB genotypes by the kappa-casein gene CSN3, which ensure high milk productivity of brown type cattle. Animals with desirable genotype were selected and recommendations for further breeding work were given.

The work has begun on full-genome sequencing of camel DNA. To date, we have 1 sequenced genome of a hybrid individual.

In order to create a unique genetic bank is started collecting biomaterials of Tazy breed dogs from different regions of Kazakhstan. The profile of the national Taza breed dogs will be compiled using the 22 STR loci recommended by ISAG for analysis of the origin of the dogs. Currently, biomaterials from 26 individuals have already been collected and their certificates of origin and pedigrees have been obtained.

To study the species diversity of wild and farm-used bees, biomaterials were collected from Talgar district of Almaty region, and methods of molecular genetic identification of bees (STR- and SNP-markers) were worked out.

There is a unique lineage collection of the classical genetic object, the fruit fly *Drosophila melanogaster*, including more than 300 lines of interest for genetic analysis, educational purposes and fundamental research.

A unique collection of seeds of coniferous and deciduous tree species growing in Central Asia has been created. On the basis of biotechnological methods, technologies of accelerated cultivation of coniferous (blue spruce, Crimean pine, thuja, etc.) and deciduous (aspen, poplar, birch, turanga, selitrianka, pavlonia) species were created. The molecular genetic certification of valuable species and clones is carried out.

The Institute also presents gene banks representing the population of Kazakhstan affected by man-made disasters (radiation, oil pollution, pesticides), patients with cancer, cardiovascular, neu-

rological, autoimmune diseases, modern Kazakhs and the ancient population of the territory of Kazakhstan (archaeological samples).

Currently, to assess genetic diversity and identify functional variants, we apply technologies to identify and typing SNP markers, Sanger DNA sequencing (Seq-studio), high-throughput sequencing (MiSeq), SNP microarray genotyping (iScan), bioinformatic analysis of fragment analysis (STR), sequencing and microarray genotyping (SNP) data, experience using international databases (NCBI, EMBL, DDBJ, etc.), phylogenetic analysis and evaluation of the evolutionary origin of allelic gene variants.

The international exchange of materials and genomic information is carried out within the framework of collaboration according to concluded agreements with observance of international standards and ethical norms. The exchange and sale of biomaterials within Kazakhstan, as well as Russia and Kyrgyzstan are carried out according to the concluded contracts and price proposals.

Figure 1 - Molecular genetic certification and cytogenetic certification of Kazakhstani sheep breeds

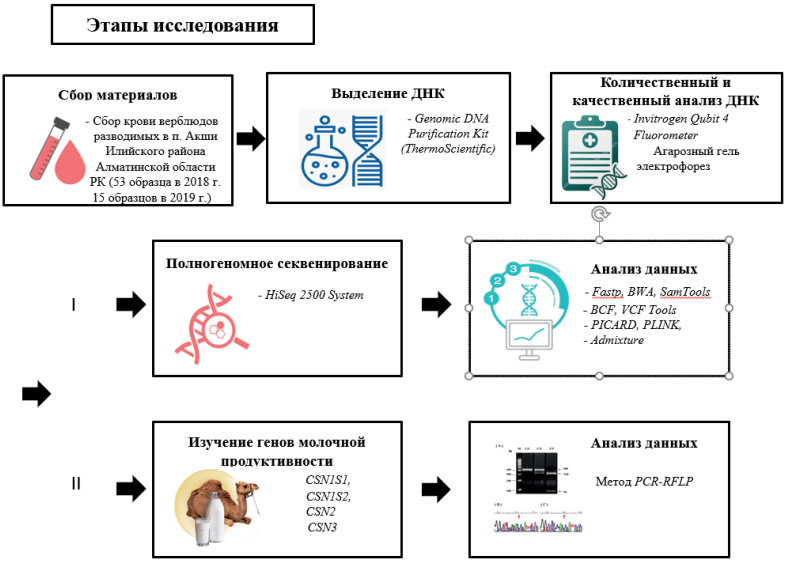

Figure 2 - Molecular genetic studies of camels

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Mr. Yerzhan Toishibekov
Director
Institute of Experimental Biology named after F. M. Mukhamedgaliev

State and prospects of conservation and reproduction of animal genetic resources. Activities of scientific organizations

The conservation and rational use of genetic resources of farm animals, as a problem of global universal relevance, requires serious scientific support. This is evidenced by the intensive scientific search in the developed countries of the world for the conservation and rational use of both cultural, created on the basis of artificial selection and selection of domestic animal breeds, and indigenous animal breeds and populations formed over many centuries on the basis of natural selection and popular breeding.

The Food and Agriculture Organization of the United Nations (FAO) published *"The State of the World's Animal Genetic Resources for Food and Agriculture"*, the first global assessment of livestock biodiversity, which reflects the current state of this important issue against the background of the growing global problem in food supply in 2007. [1}

Wise use of the world's diversity of agricultural resources is becoming an increasingly important challenge for the global community. The livestock sector in particular is undergoing dramatic changes with the expansion of mass production due to the increasing demand for meat and milk. The diversity of genetic resources in livestock production is necessary for the adaptation and development of agricultural production. Climate change and the emergence of new diseases of viral origin in animals underscore the need to maintain animal adaptability.

Against the background of the above, genetic diversity is threatened. The rate of extinction of breeds cannot help but be alarming; even more regrettable is the fact that some unclassified genetic resources were lost before their characteristics could be studied and their potential assessed. The FAO *Global Information System on Animal Genetic Resources for Food and Agriculture* contains in-

formation on 7,616 livestock breeds. Of these, about 20 percent have been classified as being at risk. Even more worrying is the fact that 62 breeds have become extinct over the past six years: almost one breed dies every month. These statistics present only a partial picture of genetic destruction. Breed inventories, and especially the study of population size and structure at the breed level in many parts of the world, are not up to international standards. Population data are missing in 36 percent of the cases. Moreover, among many of the most productive cattle breeds, genetic diversity within a breed has been undermined by using only the few most common breeding animals for breeding [2].

The economic development in the second half of the twentieth century - commercialization of livestock production, increasing demand for livestock products in developing countries, differentiation in production between developed and developing countries, new reproductive biotechnologies facilitating the migration of genetic material and the ability to control production regardless of its geographical location. All these factors have led to a new phase in the history of international migration of genetic material. The movement of genetic material at the international level is now taking place on a very large scale, both within the developed world and from developed to developing countries. This migration of genes is limited to a narrow number of breeds. There is also some movement of genetic material from developing countries to developed countries, both for scientific purposes and to satisfy lovers of exotic species and suppliers of products that occupy a certain market "niche" (e.g., alpaca). Today, the most common breed of cattle in the world, the Holstein-Friesian, is distributed in 128 countries. Among the other animal breeds are the Large White Pig (117 countries), the Saanen goat (81 countries), and the Suffolk sheep breed (40 countries) [2].

Several important conclusions can be drawn from the above historical overview. First, countries and regions of the world have long been interdependent and have used the same genetic resources. Second, the rate and level of diffusion of these genetic resources has increased dramatically in recent decades, which has distorted the genetic structure of livestock breeds. Third, these changes may have narrowed the basic genetic resources of the world's livestock

products. Both at the national and international levels, it is necessary to assess the significance of these processes in order to take effective steps to promote continued use and to conserve those genetic resources that are on the verge of extinction.

Also, the above-mentioned report reflects the state of genetic resources conservation programs, emphasizing that conservation programs are very important and necessary, especially in those countries where valuable genetic resources are on the verge of extinction. A number of conservation methods are available, including *in situ* methods (national parks, zoos, farms) and *ex situ* methods for the conservation of genetic material in liquid nitrogen. *In situ* conservation measures maintain and ensure the adaptive management of animal genetic resources in productive landscapes. *In situ* measures promote continued coevolution in different environments and avoid stagnation of genetic stocks. *Ex situ* conservation measures are an additional safeguard in the case of loss of animal genetic resources in a given region due to erosion of genetic material or due to extraordinary circumstances. *Ex situ* measures are complementary to *in situ* measures and should be applied in conjunction with each other. *Ex situ* material collections can also play an active role in strategic breeding programs.

Many countries (48%) were found to have no *in vivo* preservation programs. An even higher percentage (63%) of countries did not have an *in vitro* conservation program. This condition differs when comparing regions. Conservation is much more common in Europe, the Caucasus and North America than in the rest of the region. Individual country reports show that numerous organizations are involved in breed conservation: national governments, universities and research centers, livestock associations, nongovernmental organizations, livestock companies, farmers and shepherds. In general, the analysis of country reports leads to the conclusion that conservation opportunities need to be significantly increased at the global level, taking advantage of new models and the interaction of organizations among themselves. International and regional cooperation plays a key role in the implementation of the genetic material bank project and other transboundary species conservation activities. This cooperation will be facilitated if harmonized protocols (e.g. on zoosanitary requirements) for *in vitro* conservation programs are drawn up, operating at the international level. Genetic conservation

programs should include measures to protect rare breeds of animals. Herders and small farmers conserve a large part of the world's biological wealth in the form of local, indigenous animal breeds [2].

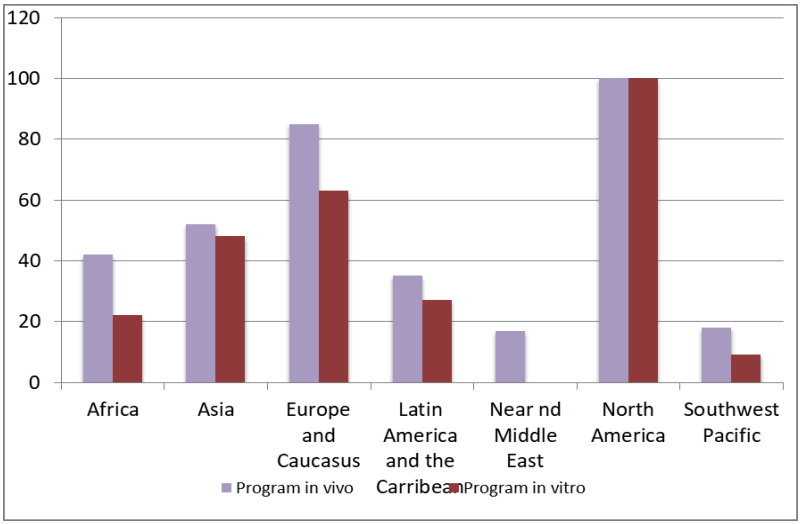

Figure 1 - Percentage status of** of in vivo **and** in vitro **conservation programs in different regions (State of World Animal Genetic Resources in Food and Agriculture FAO Report, 2007).

The Islamic Organization for Food Security (IOFS) organized a Conference on Development of National Genetic Banks in the OIC Member States on July 5-6, 2020, chaired by the UAE government with the participation of international experts. The conference resulted in the adoption of the "Dubai Declaration" in which experts and participants stressed the importance of intensifying the work of OIC member states on the conservation, use and exchange of genetic resources.

However, according to FAO (2002) the situation with conservation of farm animal genetic resources in Kazakhstan causes particular concern, since the number of all species of farm animals has declined sharply in the past 16 years (© FAO Statistics Division 2009 | 25 January 2009). For example, in Kazakhstan, the number of livestock decreased from 1992 to 2007:

- sheep from 33.91 million to 13.04 million. (losses amounted to 61.5% of their number in 1992);
- cattle from 9.08 million to 5.66 million. (losses amounted to 37.7% of their number in 1992);
- horses from 1.67 million to 1.23 million. (losses amounted to 26.3% of their number in 1992).

In the Republic of Kazakhstan, research on the conservation of genetic resources of farm animals is carried out in the research institutes: the "Institute of Experimental Biology named after F.M. Mukhamedgaliev" LLP, the "Institute of Zoology" RSE on the REM of the SC of the MES of the RK, Kazakh Scientific Research Institute of Animal Husbandry and Forage Production of the Ministry of Agriculture of the RK, the Republican center of livestock breeding "ASYL TULIK" JSC, RSE on the REM "Institute of General Genetics and Cytology" of the SC of the MES of the RK, others. Summarizing the directions of researchs and the diversity of species and breeds of animals, it should be emphasized that researchs are conducted on modern equipment and cryobanks of animal germplasm have already been created (Table 2)

The Institute of Experimental Biology named after Mukhamedgaliev LLP, carried out researches in this area under the fundamental researches programs of the Ministry of Science and Education, under the programs of the National Center for Biotechnology of Kazakhstan and also the international project "The conservation and cryopreservation of genetically diverse sheep breeds in Kazakhstan" ISTC, implemented jointly with the National Center for Genetic Resources Conservation USA (NCGRP-ARS_USDA).

Also, for the first time in Kazakhstan, the scientific articles on molecular genetic studies based on microsatellites (STR) of sheep breeds in Kazakhstan were conducted and published:

1. Blackburn H., Toishibekov Y., Toishibekov M., Wilson C.-W., Spiller S., Brown M. Comparison of Genetic Diversity between US and Kazak Sheep Breeds// Journal of Animal Science, 07.12.2009

2. H.D. Blackburn, Toishibekov Y., M. Toishibekov, C.S.Welsh, S.F.Spiller, M.Brown, S.R.Paiva Genetic diversity of *Ovis aries* populations near domestication centers and in the New World. Genetica, 2011 Sep., Volume 139, Issue 9, pp 1169, – 1178.

Based on the above, we can conclude that the material and technical equipment, legal basis and scientific capacity of research on the conservation of animal genetic resources in the Republic of Kazakhstan is at a high level and meets international requirements. Thus, the Institutional Assessment of the Republic of Kazakhstan meets all the necessary requirements for the establishment of the International Center for the Conservation of Animal Genetic Resources of the Organization of Islamic States in the project of the Islamic Organization for Food Security.

Table 1: Institutional assessment at the country level

Scientific research	Knowledge	Understanding the problem	Infrastructure/ Opportunities	Local/ regional participation	Laws, political programs	Degree of implementation
+	+	+	+	+	+	+

Table 2. **Current status of methods of cryopreservation, assisted reproductive technologies and molecular genetic analysis of different animal species in Kazakhstan**

Ex situ preservation	Sheeps	Goats	Cattle	Horses	Camels	Chickens	Fishes	Maral	Argali	Wild goats	Bees
Sperms	+	+	+	+	n/a	+	+		+	+	+
Oocytes	+	+	+			0					
Embryos	+	+	+			0					
Ovarian tissue	+	+									
Somatic cells (fibroblasts)	+	+									
Primordial germ cells (PGC)	+					+					
Embryonic stem cells	+	+									
DNA isolation and preservation	+	+	+		n/a						
Assisted reproductive technologies											
Artificial insemination	+	+	+	+					+		

Embryo transplantation	+	+	+					+			
Cloning (Somatic Cell Nuclear Tranfser)	+	+							+		
Oocyte culture (in vitro maturation)	+	+									
Fertilization of oocytes in vitro	+	+									
Intracytoplasmic sperm injection (ICSI).	+	+									
In vitro cultivation of embryos	+	+									
Molecular genetic analysis	+	+	+	+	+						+

(Note: + positive research results; n/a lack of publications)

List of using sources:

1 “The State of the World’s Animal Genetic Resources for Food and Agriculture” FAO report, Commission on Genetic Resources for Food and Agriculture. / Food and Agriculture Organization of the United Nations. - Rome- 2007.- 38 p.

2 The Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration adopted at the International Technical Conference on Animal Genetic Resources for Food and Agriculture. - Interlaken, Switzerland – on September 3-7, 2007. - 39 pp.

3. The Dubai Declaration, adopted at the end of the Conference on the Development of National Genetic Banks in the OIC Member States, organized by the Islamic Organization for Food Security (IOFS) on July 5-6, 2020.

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SESSION 4:
RESOLUTION ON THE ESTABLISHMENT OF THE CENTER

Mr. Timur Savin
Chief Manager of the Department of Science and Education
National Agrarian Research and Education Center

RESOLUTION
Conference "Conservation and Reproduction of Genetic Resources for Sustainable Agriculture and ensuring Food Security at the OIC scale" (May 25, 2021, online)

The participants of the Conference "Conservation and Reproduction of Genetic Resources for Sustainable Agriculture and ensuring Food Security at the OIC scale" held in online format on May 25, 2021, state the particular importance of the topic of this event for Kazakhstan.

The Conference was organized by the Islamic Organization for Food Security (IOFS), which provides a platform for the scientific community of Kazakhstan to discuss the current situation of the conservation and use of plant and animal genetic resources in Kazakhstan, as well as to consider the establishment of the International Centre for Plant and Animal Genetic Resources under the auspices of the Organization of Islamic Cooperation (OIC) and its importance for member countries.

The event was held in Russian and was attended by 70 representatives of interested government agencies, research institutions, universities and scientific organizations of Kazakhstan.

The participants listened to the reports and presentations, which reflected the issues on the current situation of conservation and reproduction of plant and animal genetic resources in Kazakhstan; the activities of genetic banks and scientific organizations in Kazakhstan; also presented international experience, in particular, the activities of national genetic banks of OIC member countries, as

well as discussed the prospects for creating an International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources under the auspices of OIC in Kazakhstan.

The participants noted the importance of agrobiodiversity conservation and rational use of genetic resources to ensure sustainable food security in the world, taking into account the trend of declining crop yields as a result of environmental degradation, increasing water and energy shortages, climate change impacts, and continuous population growth in the world.

A number of countries around the world are actively working to conserve genetic resources and use them effectively to provide farmers with modern varieties and seeds. Efforts are also focused on the conservation of animal genetic resources and their rational use to provide farmers and interested organizations with cryopreserved germplasm of animals, which is the cheapest way of transportation and the possibility to obtain animals of the desired genotype. At the same time, activities in OIC countries in this area do not meet current challenges and require many efforts to strengthen food security and develop sustainable agriculture.

The participants noted the need to consolidate efforts for the conservation and use of genetic resources in Kazakhstan and highlighted the importance of establishing the International Center for the Conservation and Reproduction of Plant and Animal Genetic Resources in Kazakhstan, given the huge potential of the country's agricultural sector and its importance in ensuring food security not only in Central Asia, but also in OIC countries.

The IOFS Secretariat (hereinafter referred to as the Secretariat) listened to the reports and presentations of the Conference and accepted them for further work. The Secretariat also reported that, in accordance with the Dubai Declaration of July 5-6, 2020, the IOFS and member countries are currently working to consider the establishment of an International Centre for Plant and Animal Genetic Resources, and to ensure that a Concept and Feasibility Study (FS) to be developed.

It is expected that if such a Center is established under the auspices of the OIC, its activities will be financially supported through membership fees from OIC countries and the participation of OIC

institutions such as the Islamic Development Bank and other international donors under the coordination of the Secretariat.

Participants expressed their appreciation to the Secretariat for successfully organizing and coordinating this Conference and for all efforts to ensure a fruitful outcome. Participants also thanked speakers for the quality of their presentations, which contributed to the success of the Conference. It was agreed that, following the event, the Secretariat would work with the speakers to publish the Proceedings of the Conference and make them available to all participants.

It was decided to send this Resolution in the form of a Address to the President of the Republic of Kazakhstan Mr. Kassym-Jomart Tokayev on behalf of all participants of the Conference, the scientific community of Kazakhstan, in order to consider the possibility of strategic support by the Government of the Republic of Kazakhstan of the Concept for the establishment of the International Center for Conservation and Reproduction of Plant and Animal Genetic Resources in Kazakhstan and its further implementation together with the IOFS and OIC.

The Resolution was adopted in Nur-Sultan, on May 25, 2021.

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INFORMATION
about the Islamic Organization for Food Security

The Islamic Organisation for Food Security is a specialized institution of the Organization of Islamic Cooperation (OIC), aimed at promoting agricultural and rural development, as well as enhancing food security in OIC member states.

The 39th Session of the OIC Council of Foreign Ministers, held in Djibouti on 15-17 November 2012, decided to establish an OIC Food Security Institution in Astana (presently Nur-Sultan), Republic of Kazakhstan. Subsequently, during the 40th session of the OIC Council of Foreign Ministers in Conakry, Guinea, on 9-11 December 2013, the name "Islamic Organization for Food Security" was approved, and the IOFS Statute was signed by 19 OIC member countries. The IOFS Statute finally entered into force on 19 February 2018, in accordance with its article 21, and the IOFS Secretariat began its activities on March 1, 2018. Within the framework of the Third General Assembly on 2-3 December 2020 in Ankara, Turkey, all 16 IOFS strategic programs were approved by the member countries. Currently, 36 OIC member countries have signed the IOFS Statute.

Key objectives of the IOFS, as per the Statute, are:

- to provide expertise and technical know-how to member states on various aspects of sustainable agriculture, rural development, food security, and biotechnology;
- to assess and monitor the state of food security in member states to be able to identify emergencies, provide social safety nets and humanitarian assistance through food security reserves;
- to coordinate, formulate and implement common agricultural policies, such as exchange and transfer of appropriate technology and public food management systems;
- to address problems posed by desertification, deforestation, erosion, and salinity;
- to mobilize and manage financial and agricultural resources to enhance food security.

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CONSERVATION AND REPRODUCTION OF GENETIC RESOURCES FOR SUSTAINABLE AGRICULTURE AND ENSURING FOOD SECURITY AT THE OIC SCALE

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