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

WORKSHOP ON DEVELOPMENT OF NATIONAL GENE BANKS IN OIC MEMBER STATES

Theme: Promoting Intra-OIC Food Security through Agricultural Biodiversity

CONCEPT NOTE

Introduction

The establishment of the Islamic Organisation for Food Security (IOFS) as a specialised institution of the Organisation of Islamic Cooperation has reinforced the desire of OIC member states to intensify South-South Cooperation in the domain of agriculture and rural development and food security. Consequently, the question of supporting developed, competitive and resilient food systems in the various member states of OIC, in such a manner as to ensure sustainable food security, has become very crucial within the socio-economic developmental agenda of the Organisation.

2. With an agricultural Gross Domestic Product (GDP) of US$666 billion in 2018, representing 20% of the world agricultural production, the OIC constitutes an influential bloc in the world's food security architecture and the attainment of the global Sustainable Development Goals (SDG). In view of the need to promote global food production to cater for the estimated population of 9.8 billion in 2050, within a persistent food insecurity engendered by poor harvests, extreme weather effects and inadequacy of traditional food production methods, there is a desperate need to embrace creative and innovative methods to promote food and nutrition security.

3. Consequently, agricultural biodiversity has always remained top on the agenda of international organisations, considering its relevance to sustaining human life and livelihood, particularly among developing countries, and indeed the OIC member states, which are plagued by increased food and nutrition insecurity, hunger, malnutrition and chronic under-development. It is widely acknowledged that no country can sustain an advanced and competitive agricultural development based on local plants alone. The possession of significant gene-diversity in a particular crop or livestock does not necessarily translate to having major ex-situ collections of the same crop or livestock, while being a major producing country of a crop or livestock does not suggest being a major consumption of the same crop or livestock. In the same vein a country may be a major producing country of a crop or livestock but not possessing major breeding and research studies on the same crop or livestock. Such is the degree of interdependence in the world of biodiversity that dictates that countries must cooperate together based on their comparative advantage.

4. In this regard, the importance of pooling resources in the area of conservation, sustainable use and exchange of plant and animal genetic resources for food and agriculture among member states of the OIC cannot be over-emphasised. This is considering the organic relationship between sustained food security and bio-diversity and the various challenges facing most OIC member states, ranging from increased food deficit, low investment in agriculture, economic and political crises, natural and man-made disaster, poor and dilapidated infrastructure and archaic and inefficient agricultural production methods, among others.

5. Accordingly, the protection of biodiversity and the management of plant and animal genetic resources through ex-situ conservation, sustainable use and exchange would address the major requirement for innovation and a scientific paradigm shift with regard to food production and food and nutrition security. The development of National Gene Banks in OIC member states through coordinated efforts by member states is very urgent, in order to realise the objectives of food security for the teeming populations of its member states, as enunciated in the Statute of IOFS, approved by the Council of Foreign Ministers in 2013 and other international conventions and treaties. The need to address hunger and poverty in an integrated and holistic manner is more pressing in line with the major provisions of the Sustainable Development Goals (SDGs). OIC, through its new specialised institution, IOFS and other relevant OIC institutions should seize the occasion of the Workshop to create an enduring cooperation for the protection of plant and animal genetic resources to prevent their progressive erosion and the attendant challenges of food security. Similarly, regional and international cooperation must be intensified to ensure that OIC member states contribute meaningfully to on-going partnership for ensuring food systems resilience.

6. Pursuant to the foregoing, the proposed Workshop on the Development of National Gene Banks in OIC Countries is being organised by Islamic Organisation for Food Security (IOFS) in collaboration with the Government of United Arab Emirates, Food and Agricultural Organisation (FAO), OIC Standing Committee on Scientific and Technological Cooperation (COMSTECH), and the Islamic Development Bank (IsDB). It would, among other objectives, examine the possibility of elaborating a regional mechanism for protection, conservation, exchange of views, human and institutional capacity development with regard to plant and animal genetic resources for food and agriculture in OIC member states. It will seek to create a permanent framework for cooperation among member states with a view to supporting local, national and regional actions and collective responses on the sustainable use of plant and animal genetic resources for increased agricultural productivity and sustainable food and nutrition security.

Activities Relating to Protection Plant Genetic Resources for Food and Agriculture (PGRFA) in OIC Member States

7. The Statute of Islamic Organisation for Food Security stated in its Article 4.1(a) that one of the aims and objectives of IOFS is to "provide expertise and technical know-how to member-states on the various aspects of sustainable agriculture, rural development, food security, and bio-technology.". Accordingly, the First 5-year Action Plan adopted by the Inaugural General Assembly of IOFS vide Resolution GA/6-2016 of 28 April 2016 incorporated crop breeding activities and biodiversity on IOFS' short-term priorities. Furthermore, the OIC Science, Technology and Innovation (STI) Agenda 2026 adopted at the First OIC Summit on Science and Technology held in Nur Sultan, Republic of Kazakhstan on 10 September 2017 contained

provisions, aimed at encouraging the setting up of National Gene Banks for conservation and exchange of Plant Genetic Resources (PGR) with research centres in OIC member states.

I- International Biodiversity-related Agreements and OIC Member States

8. However, available records indicate that a few OIC countries do maintain Gene Banks or substantial activities on diversity and collections of germplasms, except that more OIC countries are parties to international biodiversity agreements. On its own, OIC does not have any multilateral agreements on bio-diversity or related activities. The following is the status of OIC member states vis-à-vis international agreements on biodiversity and related activities:

(a) International Treaty on Plant Genetic Resources for Food and Agriculture, 2001

Objectives:

(i) Conservation and sustainable use of plant genetic resources for food and agriculture;

Fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.

Number of OIC Member-States, parties to the above Treaty (44)

(b) Convention on Biological Diversity (CBD), 1992.

Objectives:

(i) Conservation of biological diversity;
(ii) Sustainable use of Convention's components;
(iii) Fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Number of OIC Member-States, parties to this Convention (56).

(c) International Union for the Protection of New Varieties of Plants (UPOV), 2004.

Objective:

Provision and promotion of an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.

Number of OIC Member States, parties to this Convention (10), with 27 OIC member states with observer status.

(d) International Plant Protection Convention (IPPC), 1951.

Objective:

Securing common and effective action to prevent the spread and introduction of pests of plants and plant products; and to promote appropriate measures for their control.

Number of OIC Member States, parties to the Convention (50).

(e) Cartagena Protocol on Biosafety, 2003.

Objectives:

(i) Contribution to ensuring an adequate level of protection in the field of the safe transfer; and
(ii) Handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements.

Number of OIC Member States, parties to this Protocol (54).

II- Distribution of Accessions Stored in National Gene Banks of OIC Countries, 1996

9. It is significant to examine the distribution of the various genetic resources stored in National Gene Banks or conservation programmes of OIC member states, in order to ascertain the level of development of bio-diversity activities therein. The following is the available distribution of accessions stored in the National Gene Banks of OIC countries:

Number of accessions	**Countries**
no data	Albania, Bahrain, Benin, Brunei Darussalam, Burkina Faso, Comoros, Djibouti, Gambia, Guinea-Bissau, Kuwait, Qatar
less than 1000	Algeria, Guinea, Mali, Oman, Somalia, Gabon, Chad
less than 10000	, Syrian Arab Republic, Iraq, Turkmenistan, Yemen, Togo, Jordan, Afghanistan, Cameroon, Libyan Arab Jamahiriya, Mozambique, Sierra Leone, Tunisia
more than 10000	Nigeria, Senegal, Uganda
more than 20000	Kyrgyzstan, Indonesia, Côte d'Ivoire, Morocco
more than 30000	Azerbaijan, Kazakhstan, Lebanon, Malaysia, Maldives, Mauritania, Niger, Saudi Arabia, Sudan, Tajikistan, United Arab Emirates
more than 40000	Bangladesh, Iran
more than 50000	Turkey, Uzbekistan, Pakistan, Egypt

III- Global Interdependence in Crops

10. The free exchange of germplasm and the unfettered mobilisation of agro-biodiversity are directly related to the enhancement of food security. Since no country can stand alone in the domain of genetic diversity, regional and international cooperation for the exchange of genetic resources has become a significant factor for ensuring access to environmentally sustainable and pest resistant crops that are crucial to food security and agricultural development.

11. Consequently, international agreements and conventions are needed in order to ease exchange of crop varieties and germplasms among countries. While a significant gene diversity exists in the Amazon Basin and Central America for cocoa, the major producing countries are found in Brazil, Cote d'Ivoire, Ghana, Indonesia and Nigeria as distinct from the major consumption countries, which are France, Germany, Japan, Russia and USA. In the case of rice, the regions of South, East and South East Asia and Africa have significant gene diversity of this crop, the major importing countries of rice are Iran, Iraq, Nigeria, Philippines and Saudi-Arabia. The available Table of Global Interdependence in Crops collated in 2010 is annexed to this Concept Paper.

IV- Animal Genetic Resources for Food and Agriculture

12. Details on activities of member states in the domain of animal genetic resources for food and agriculture are not provided in this paper. However, it is obvious that OIC member states featured prominently among the 169 countries that participated in the elaboration of the Global Action Plan for Animal Genetic Resources and the ensuing Interlaken Declaration adopted by 109 countries on 7 September 2007. The main objectives of the Plan of Action are similar to the PGRFA, as they seek to ensure the conservation, sustainable use and development of livestock genetic resources. The latter include an integrated approach to ensuring funding for research and development and wider involvement of farmers, breeders and pastoralists on the need to preserve and protect animal genetic resources for future generations, while ensuring their utilisation for increased food and nutrition security.

13. It is therefore desirable that this exercise would include commitments by OIC member states towards the sustainable use and preservation of all genetic resources for food and agriculture, including planta, forestry and animals, in line with national laws as well as regional and international conventions and the Sustainable Development Goals.

Country Reports

14. The following country reports have been provided to the Secretariat of IOFS based on its Note Verbale No. IOFS/OIC/4-337 of 10 December 2019. The various inputs by OIC/IOFS member states are useful in ascertaining the extent of the development of plant genetic resources for food and agriculture in OIC member states. The listing of the reports follow the order in which the reports were received, while subsequent reports would be attached progressively.

I- Turkey's National Experiences on the Plant Genetic Resources

15. Turkey is one of the significant countries with its rich plant genetic resources/plant diversity. Two of the Vavilov's Centre of Origin (i.e., Near Eastern and Mediterranean Centres) extend into Turkey. This, of course, indicates that Turkey is one of the Centre of Origin and/or Centre of Diversity of several crop plants with wild weedy and cultivated forms and many plant species. Moreover, Turkey is also one of the domestication centres where ancient agriculture had started. Turkey is endowed with a rich diversity of family, genera and species of plants (163

family, 1 225 genera, and 12 000 species). Biodiversity conservation, ex situ and in situ, of plant diversity is conducted within the framework of the "National Program on Conservation of Genetic Resource/Diversity" since 1960s. In Turkey, the ex situ conservation is implemented both for generative and vegetative collections which are preserved at two seed gene banks at 2 different institutes and field gene banks at 18 institutes.

16. Turkish Seed Gene Bank has conducted; collecting, documentation, preservation and regeneration of landraces, village populations and crop wild relatives on the basis of the FAO Gene Bank Standards. Turkish Seed Gene Bank consists of documentation, seed physiology laboratory for germination tests, drying unit, preservation rooms, herbarium unit and fields for regeneration. In addition, 18 field gene banks hold vegetative plant genetic resources. Turkish Seed Gene Bank holds about 52.000 accessions of 900 species. 70% of accessions belongs to genus Triticum. Furthermore, regeneration of approximately 2.000 wheat materials is carried out annually. After regeneration process, the seeds are firstly cleaned and then dried to the desired 5-6% moisture content according to the FAO Gene Bank Standards. After cleaning and drying process, if the regenerated seed quantity is sufficient, 2 sets are kept as base collections and 1 set is kept as active collections. Also, materials are distributed for approved research projects to carry out characterization and other scientific studies. The base collections are preserved at (-18 ^{0}C) for long term and the active collections are preserved at (+10^{0}C) for medium term conditions.

17. In order to raise awareness about the Turkish plant biodiversity and national endemic plant potential as well as to record traditional knowledge, project-based studies are carried out in cooperation with universities, public and non-governmental organizations. In addition, students from primary and secondary schools and universities are informed about national plant biodiversity and endemic plant potential through the training programs. Turkish Seed Gene Bank has sufficient capacity for international black box accessions. Furthermore, 14.000 accessions belonging to ICARDA Gene Bank are held as black box from 2014 to 2019. General Directorate of Agricultural Research and Policies of the Turkish Ministry of Agriculture and Forestry carried out legal work to develop national legislation in this field.

18. About 55 000 materials over 3 000 species are kept in the National Gene Bank. Of those materials, about 20 000 belong to 2 221 wild species. Garlic, some medicinal and aromatic plants and ornamental collections are also kept as field collection. The field gene bank collections of vegetatively propagated species consist of over 100 species. The national collection contains landraces, local types, wild and weedy relatives, other wild species which are especially economically important plant and endemic species (totally 70 000 accessions of seed and vegetative collections). The main users of the material are the plant breeders and researchers both from Turkey and abroad. There are some research activities on the in vitro storage techniques of some vegetatively propagated plant species. At the National Seed Gene Bank, seed samples of plant genetic resources of Turkish origin are preserved as addressed within the scope of the "Generative (ex situ, seed) Conservation Project" for plant genetic resources. Those seed samples belonging to land races/local varieties of Turkey, improved or developed varieties, breeding lines with certain significant characteristics and wild relatives of cultivated plants existing in the natural flora and other wild varieties and weedy forms of the species. Within the cold rooms at the National Gene Bank, two sets are preserved, namely the long-term base collection at -18/-20^0 C and the medium-term active collection at CPC. The Gene Bank features high-capacity spare preservation rooms (total of 12 cold rooms at the size of 680 cubic meters) for future conservation efforts. The safety duplicates of the base collections are kept at the Turkish Seed Gene Bank.

II- Genetic Resources of Plants in Kazakhstan

19. Kazakhstan is one of the 152 countries in the world that signed the "Convention on biodiversity", which imposes, first of all, responsibility for the conservation and rational use of its own Plant Genetic resources. Since 1996, the ways of implementing the provisions of the "Convention" have been marked by the main directions of the Republican program on Plant genetic resources for food and agriculture (PGRFA): collection, study, documentation, storage and use. Rational use of PGR is a priority direction of the Republican program of agricultural science.

20. One of the main requirements is that PGR should reflect the diversity of species and ecosystems in the region. In Kazakhstan focused exploration of the unique agrobiodiversity of global significance. They include 194 plant species belonging to 24 agricultural crops. A number of them are of significant value both for the development of agriculture and for expanding the export potential of the Republic. More than 210 species of flora of Kazakhstan are wild relatives of agricultural plants. The southern and South-Eastern regions of Kazakhstan are highlighted by N. I. Vavilov as centers of origin of three types of wheat-T. Aestivum L., T. compactum host (KAZ. T. sphaerococcum PERC. (Vavilov, 1967). Kazakhstan is also an important area of growth of the progenitor of cultural barley-Hordeum spontaneum L. among perennial forage grasses, alfalfa is the most famous and widespread. Its gene pool in Kazakhstan belongs to one of the richest centers – Central Asian, which is considered the primary source of alfalfa seed. The wild gene pool of other forage crops is represented by 70 species belonging to 29 genera. The TRANS-ili and Jungar Alatau are the centers of intraspecific diversity and domestication of Apple and apricot trees. It is home to the world's largest resources of wild Apple trees, as well as the primary and oldest source of domestication of Apple trees and the origin of this culture on the globe.

21. The agrobiodiversity of South Kazakhstan and Zhambyl regions is unique, where forest-seeded areas of walnuts, pistachios, grapes, and Regel pears are distinguished. In Kazakhstan, there are 120 species of wild relatives of onions and garlic, including their progenitor species. The flora of the TRANS-ili Alatau is a constant source of introduction to the culture of medicinal plants (13 species of 9 genera).

22. Incomplete representation of taxa, incomplete geographical coverage, loss of known local and local old-time varieties, loss of historical varieties are the main gaps found in stored collections. The samples stored in the Republic's genebanks are an ideal material for research in the field of agronomy, selection and genetics. The assessment of germplasm of cultivated crops and their relatives is carried out mainly on the grounds that are of primary importance for direct use as a source material for breeding new varieties, i.e., productivity, grain quality, resistance to biotic (diseases and pests) and abiotic (frost and winter hardiness, drought resistance, etc.) factors. Currently, the priority is to increase the use of molecular markers to assess the genetic diversity of ex situ collections, and to increase the number of samples characterized on the basis of molecular markers and biochemical indicators.

23. Currently, breeding is carried out in the Republic in more than 20 scientific organizations for about 50 crops. Kazakhstan took part in two international projects on documenting PGRFA in the region: "Plant genetic resources conservation, documentation and utilization in Central Asia and the Caucasus" (ACIAR, 2004– 2005) and "Establishment of national information sharing mechanism on the implementation of the Global Plan of Action on plant genetic resources for food

and agriculture" (FAO, 2005-2007). In the framework of international and national projects on PGRFA as of 01.01.2012 in national database (NBD) PGRFA RK contain passport information of more than 56,0 thousand samples, 223 of cultures 9 groups according to economic use: cereals, legumes, forage, vegetable, fruit, technical, cereals, medicinal, timber and tree species, which are identified by status, type of development, the originator of the collection. For the analysis of passport databases, the information search system SACDB_ ICARDA was used. However, to date, Internet access to the already created parts of the NBD PGRFA RK has not been provided to interested consumers. The problem of unifying documentation has not been fully worked out.

24. Research covering the period from 1996 to the present has collected the gene pool of agricultural crops, which includes about 75 thousand samples. The collected gene pool requires special attention of researchers for its effective maintenance and preservation-planned regeneration, regular monitoring of viability and genetic integrity.

25. Thus, more than 80% of the grain collections are represented by wheat, and the collections of forage plants are dominated by cereals and legumes. Two crops – melon (2246 samples) and tomato (1500 samples) - make up 51.3% of the collections of the gene pool of vegetable and berry crops. The genofund of fruit trees is the most widely represented in the genofund of Apple trees (48.1 %) – the main fruit crop of the temperate climate, representatives of 8 species are preserved. Collections of different groups of cultures are formed by certain categories of materials. The status of cultivated / improved varieties is: (crops): 67 % – grain, 46 % – grain fodder, 75 % – legumes, 57 % – potatoes, 58 % – fruit and berry.

26. Collections of plant germplasm in Kazakhstan are preserved with varying degrees of risk of loss. More than 70 % of the samples available in collections are stored for a short time in non-controlled temperature and humidity conditions. In this regard, the storage optimization exploration is a key priority activity on PGRFA.

III- Major Achievements of Saudi-Arabia on Gene Bank

27. The major achievements of the Kingdom of Saudi Arabia in the domain of development and operations of Gene Bank can be summarized as follows.

Rules and Regulations

- Establishment of a Seeds Center
- Approval of rules and regulations for treatment of Plant Genetic Resources for Food and Agriculture;
- Creation of a national committee and general secretariat for administration of plant genetic resources.

Activities

- Preparation of 1st National Report on status of bio-diversity for food and agriculture in Saudi-Arabia with regard to PGRFA under FAO;
- Recovery of some plant varieties belonging to Saudi Arabia from international conservation centers, such as International Maize and Wheat Improvement Center (CIMMYT) and International Center for Agricultural Research in the Dry Areas (ICARDA);

- Providing researchers and post-graduate students and farmers with local plant varieties available in the Gene Bank;
- Organising training sessions for students of universities and technical schools;
- Holding workshops on conservation of plant genetic varieties and its sustainable use and benefits in Riyadh in March 2019, with participants from universities, government officials and farmers;
- Holding of sensitization workshops on the functions and responsibilities of PGRFA operations, management and organization entities and roles of stakeholders in September 2019.

IV- Country Report on Ex-Situ Plant Genetic Resources Conservation in Pakistan

28. Plant Genetic Resources Program (PGRP) works under Bio-resources Conservation Institute (BCI) of the National Agricultural Research Center. PGRP hosts the sole National Genebank of Pakistan for conservation of plant genetic resources and having allied research facilities including Exploration Lab, Seed Preservation Lab, *in vitro* Conservation Lab, Evaluation Lab, Plant Introduction and Seed Health Lab and Data Management Lab. The institute also has 06 green houses, 15 isolation cages and field area for conducting experiments.

Mission

29. Acquisition, conservation, evaluation and sustainable use of biological resources for agricultural research and food security.

Objectives

- Explore and collect plant biodiversity from diverse ecologies.
- Serve as the national facility for conservation and distribution of plant genetic resources to researchers.
- Characterize and evaluate crop germplasm for improving agricultural productivity to ensure food security.
- Document/disseminate information on plant genetic resources.
- Generate knowledge and create awareness about plant genetic resources.

30. According to Plant Breeders' Rights Act (2016), Genebank will conserve germplasm/varieties developed by the plant breeders and presented for protection at Plant Breeders' Rights Registry.

Research Facilities

31. National Genebank of Pakistan: Handsome collection of the plant genetic resources from diverse ecologies of Pakistan has been collected through 130 germplasm collection expedition missions. Genebank conserves more than **41,000** accessions of **400** plant species. The genebank provides about 12000 accessions every year for agricultural research. Since 1996 to date gene bank has provided more than 210,000 germplasm accession for R&D. Thegenebank has two types of conservation facilities for the seed of orthodox crop species at low temperature and relative humidity. These facilities include active collection and base collection. These two types of collections complement each other. The seeds are stored at 10°C and 30 percent relative humidity in active collection and at 5°C and 30 percent relative humidity for base collection. We also have limited facility for the long-term conservation at -20°C.National Genebank of Pakistan has also

played its role in the restoration of agriculture in disaster affected areas of Pakistan by providing seed of lost crop varieties that was previously conserved in the Genebank.

32. Germplasm Exploration Laboratory: Plant exploration is the avenue to germplasm for crop improvement, which cannot be obtained by exchange. The spread of improved varieties has resulted in the loss of indigenous crop genetic diversity. The Plant Exploration Laboratory has organized more than 130 expeditions in different agro-ecological regions of Pakistan to collect the targeted plant species. The main emphasis is to collect the major crops, their wild relatives and MAPs as these species are under threat.

33. Seed Preservation Laboratory**:** Seed stock in the Genebank is periodically subjected to germination tests in Seed Preservation Laboratory for monitoring their viability and vigor. Studies are also conducted to find out most appropriate storage conditions for conservation of germplasm. Physiological and biochemical studies are being undertaken to investigate the process of seed deterioration during storage. The lab also provides services for commercial germination testing through PATCO.

34. In vitro Preservation Laboratory: The in vitro conservation activities in PGRI are related to conservation of vegetatively propagated crops, which cannot be conserved as seed, either due to their heterogeneity or recalcitrant behaviour. The emphasis is given on slow growth culturing techniques at lower temperature or the application of growth retardant in culture media. The major emphasis is being given on research to develop appropriate methods of conservation for sugarcane, sweet potato, apricot, grapes and banana. In vitro laboratory of PGRI has employed a variety of techniques for conservation of the germplasm of vegetatively propagated species namely grapes, peach, pear, sweet potato, banana and sugarcane that are economically high potential crops for sustainable development in agriculture.

35. Evaluation Laboratory: Germplasm evaluation is one of the key research activities in genebanks and genetic resources conservation institutes across the world. Without evaluation, utilization of germplasm in crop improvement is not possible. When Plant Genetic Resources Institute was established in 1993, considering the importance of germplasm evaluation, a modern state of the art Germplasm Evaluation Laboratory was also present in the institute. Since 1994, germplasm evaluation is a regular activity at the institute using agro-morphological, biochemical and molecular markers. The lab has evaluated more than half of the germplasm of cereals, minor cereals, legumes, vegetables, oilseed and medicinal plants, which are being utilized by national and international researchers. On the basis of detailed germplasm evaluation, **s**election of elite germplasm lines is made for utilization in crop improvement programs on the basis of user preferred characters like agronomic characters, quality traits, different uses of crop and resistance to biotic and abiotic stresses. Elite germplasm lines are being tested through outreach experimentations for utilization in crop improvement. Some crop varieties including NARC Kalonji, Dera Moth, Mash I, Mash II and Mash III have been developed using the elite germplasm lines.

36. Plant Introduction and Seed Health Laboratory: The Plant Introduction and Seed Health Laboratory is charged with acquisition of exotic germplasm and indexing the health status of material stored in the Genebank. Avoiding contamination by pathogens and pests is essential in managing plant germplasm. In addition to imposing quarantine, it is also necessary to secure the vigor and longevity of stored seeds and avoid cross-infection during multiplication. Introduced germplasm as well as the conserved seed stocks are examined for contamination by the pathogens and pests. Indexing the health status helps in avoiding the spread of pathogens to new geographic regions. New seed borne pathogens especially viruses have been detected in the laboratory in the material even coming from international agricultural research centers. The Seed Health Laboratory also investigates the propagation methods to get healthy seeds from contaminated lots.Plant

Introduction and Seed Health Laboratory is maintaining locally collected as well as exotic medicinal and aromatic plants germplasm. Keeping in view, the status and potential of essential oil industry, facilities were established for the extraction of essential oil through steam and hydro-distillation process at small scale from mint germplasm. Essential oil extraction is being carried out from basil, rosemary, lavender, oregano, thyme, geranium and other medicinally important aromatic plants. Distillation unit (20L capacity) for the large scale extraction of essential oils and hydrolates is also working. Characterization of chemical constituents of essential oils is being carried out through TLC, GC/MS and HPLC in collaboration with different labs. Likewise, fungal pathogens are being continuously isolated by screening of germplasm preserved in the gene bank of PGRI. Essential oils of different medicinal plants were tested against the important pathogens.

37. Data Management Laboratory: The information about crop germplasm conserved in the Genebank is compiled in database system. The management system of plant genetic resources information consists of three main areas including passport data, stock control data and evaluation data. The Data Management Laboratory maintains the genetic resources information and disseminates this information to the national and international stakeholders.

38. Clonal Repository: Clonal repository is field Genebank where genetic resources of clonally propagated crops like fruits are preserved as living plants. Plant Genetic Resources Institute maintains the clonal repository of more than three hundred accessions of fruit plants including grapes, guava, pomegranate, plum, peach, almond, pear, apple, apricot, fig, persimmon, citrus, pecan nut and walnut.

International Collaboration:

39. The institute has made considerable international collaboration regarding conservation and research of plant genetic resources. The institute has represented Pakistan on international forums like, Global Crop Diversity Trust, Biodiversity International, Svalbard Global Seed Vault, Millennium Seed Bank, Royal Botanic Garden- KEW and other international agricultural research institutes. Besides international forums, the institute has also made collaboration with national agricultural research institutes of different countries like USA, Netherlands, UK and Japan. These collaborative efforts resulted in improved collection and acquisition of genetic resources from Pakistan and abroad through joint germplasm expeditions and germplasm exchange. Education and skills of the scientists of the institute regarding conservation and research of plant genetic resources also improved as a result of these collaborations.

V- National Experiences and Activities on "Plant Genetic Resources" in Suriname

40. Plant Genetic Resources (PGR) are the mechanisms responsible for crop propagation, increased crop production and the productivity and sustainability in agriculture. The ministry of Agriculture, Animal Husbandry and Fisheries (MAAHF) in Suriname is responsible for Plant Genetic Resources with regard to food-plants and has developed policies to conserve the PGR and make their wider use. Several activities were undertaken:

- The MAAHF, in collaboration with the Food and Agriculture Organization of the United Nations (The FAO), executed the project "PR 45708 — Establishment of a National Information Sharing Mechanism on Plant Genetic Resources for Food and Agriculture and preparation of an updated National Re-port on Plant Genetic Resources for Food and Agriculture" in 2012. Several activities were carried out during the project phase, such as launch of PGR portal (still under construction) for the Republic of Suriname, public awareness campaigns, was launched;

- Since 22 December 2012 there is a National Committee for the coordination of activities on PGR to avoid unnecessary duplication of efforts and to oversee the efficient use of funds. The general goal of this committee is to promote the conservation and sustainable use of Plant Genetic Resources (PGR). The committee consists of representatives of national Institutes engaged in Plant Genetic Resources and is responsible for among others, national policy, guidelines, the necessary legislation on conservation and exchange of genetic material.
  - MAAHF - PGR Focal Point
  - MAAHF — Department of Research
  - MAAHF — Department of Agriculture (extension)
  - ADRON — (Anne Van Dijk Rice Research Institute)
  - CELOS (Centre for Agricultural Research Suriname)
  - Anton de Kom University of Suriname — National Herbarium

41. Below are various documents, which can be downloaded from: http://www.fao.org/pgrfa-gpaarchive/sur/documentsil.html pdf. PGR Country Report Suriname 2012 pdf. PGR Country Report Suriname 2009 pdf PGR Country Report Suriname 1996 pdf Synthetic Account Second Report on World PGRFA pdf Second Global Plan of Action for plant genetic resources for food and agriculture pdf Synthetic Account of the Second GPA (2012) Country Reports in the world Second Report SOW PGR 2010.

42. The committee has executed several public awareness activities such awareness on: Neglected and Underutilized Crop Species (NUS) and Landraces of Crops of Suriname 3. Conservation of plant genetic materials are taking place in experimental gardens of the ministry: Genebank with several citrus collection at experimental Garden Dirkshoop-Genebank with different collection Sweet potato varieties (2 Surinamese and 3 Cuban) at the experimental Garden Dirkshoop Seed unit together with other divisions of MAAHF are preserving seeds of several Surinamese traditional vegetable varieties (eggplant, bittergourd, yardlong bean, tomato, hotpepper, african eggplant, cucumber). Due to the fact that most of these varieties are exported to the Netherlands, an IDB programme has been started to produce clean seed of eggplant, bittergourd, yardlong beans and sweet potato. Training of farmers in "how to produce clean seed" is also an activity under above mentioned project.

43. Together with Brazil some upland rice varieties has been compared with Surinamese varieties and seeds are stored for further research. ADRON is producing rice seed for farmers and executing rice breeding programs NUS. To promote the use of NUS for enhancing food security, a project document has been submitted in December 2019 at SCF (Suriname Conservation International) by the Committee.

VI- Uzbekistan Country Report

44. The following is the information on the status and scientific potential of the unique object of world diversity collection of the cotton gene pool of the Institute of Genetics and Plant Experimental Biology Academy of Sciences of the Republic of Uzbekistan.

45. The problem of creating and maintaining collections of the cotton gene pool is included in the general problem of wildlife conservation. Genetic stocks of plants are the most valuable natural resources. The collection of the cotton gene pool of the Institute of Genetics and Plant Experimental Biology Academy of Sciences of the Republic of Uzbekistan (IG PEB AS RU), currently totals more than 9,000 cultivated accessions from all cotton-growing countries of the

world, including 40 (out of 50) representatives of wild-growing species and their varieties (from gene centers of their origin) and more than 1,500 unique synthetic hybrids and are the most complete and rich in diversity of wild species in our region and the world.

46. . Despite the fact that our country is not the birthplace of cotton, the centers of origin and growth of its wild relatives are located in the tropics and subtropics of five continents, so far (over 65 years) it has been possible to collect a unique gene pool of the biogenetic diversity of cotton. It is registered by the FAO "UNESCO" International Committee at the United Nations as one of the most diverse and valuable for our region.

47. This gene pool is a source of various genotypes of many biological properties and agro-ecological characteristics, from which valuable and necessary modern varieties for genetic-selective works on modelling can be chosen. Consequently, the cotton gene pool is the basis for the successful development of cotton production in our country and the basis for fundamental and applied research. All works to preserve the integrity and viability of the gene pool collections is essential for the successful and effective development of cotton production. Some representatives of this gene pool have already served as the basis for creating varieties of past and present selection.

48. Currently, thanks to the developed methods and recommendations based on fundamental research, a prerequisite has been created for the use of a number of wild forms and intergenomic hybrids in practical selection. Some of them were the basis for the creation by our breeders of new and promising and local varieties – Uzbekistan – 4, Chillaki, AN – 510, AN-Bayaut-2, AN-Uzbekistan, AH-517-Y, Tashkent-1, Tashkent-6, varieties 514, 515, Kupaysin, Genofund-2, etc.

49. Recently, linear materials based on trigenomic synthetic hybrids have been created: lines with natural early deciduousness (70,390,594 leaves fall by September), linear materials with signs of high yield, early maturity and technological qualities of fibre obtained based on complex synthetic hybrids G.hirsutum G. (G.thurberi x G.raimondii).

50. The interest of foreign scientists of such countries as America, China, and India in the collection of the world diversity of the cotton gene pool is increasingly growing, it should be noted that, together with US scientists, scientific grants PL-480, P-120 and P-120a (2006-2008) were implemented.

51. In order to replenish the cotton gene pool with new samples of wild-growing species that are not in the collection, as well as new varieties of cultivated species, by exchange, 700 samples were received under the agreement from the US Department of Agriculture under the research project R-120a.

52. Thus, the conservation, replenishment and comprehensive study of the richest genetic potential contributes to the development of new trends in cotton growing, optimization and acceleration of the breeding process, and the creation of new intensive varieties that meet the modern needs of the national economy and competitive in the world market.

53. Recently, the government of Uzbekistan has been paying special attention to the country's genetic resources, and the collection of the cotton gene pool has been ranked as a unique object and is annually financed for its maintenance.

54. The following conditions must prevail, given the disappearance of many genetic resources as a result of global natural changes, the long-term storage of seed materials of a unique object and the need for conducting year-round effective research on utilisation of the potential of the cotton gene pool and preserving it for future generations:

- construction of a new seed storage, phytotron or reconstruction of the existing stock, new modern equipment is required; and
- the existing greenhouse complex and photoperiodic houses do not meet the required conditions for storage and cultivation of wild-growing species and unique cotton hybrids.

VII- National Experiences of Egypt on Gene Bank

55. Egypt signed the Convention on Biodiversity in June 1992 and ratified it in June 1994. It also signed the International Treaty on Plant Genetic Resources for Food and Agriculture in August 2002 and ratified the latter in 2004. The Treaty provides guidelines for collection, characterisation, evaluation, maintenance and certification of plant genetic resources. It also defines national commitments for sustainable use of these resources by parties. The Egyptian National Gene Bank represents Egypt in ICARDA and the International Plant Genetic Resources Institute (IPGRI). Egypt implements the international treaty of Plant Genetic Resources for Food and Agriculture (PGRFA) in respect of 35 crops and 29 feeds and ensures sustainable conservation and utilisation of PGRFA and fair and equitable sharing of the benefits attendant thereof.

56. The Egyptian National Gene Bank was established in Egypt on 6 October 2004, as a coordinating authority to harmonize the breeding programs in both public and private sectors, as well as the system for seed supplies and genetic resources programs.

57. The Egyptian National Gene Bank is entrusted with collecting plant and animal genetic resources, its characterisation, regeneration, maintenance, evaluation, conservation and certification within the agricultural sector.

58. The Egyptian National Gene Bank was established with the responsibility for conserving: Crop Wild Relatives, farmers' varieties and farm animals. As its major priorities, the Egyptian National Gene Bank focuses on conservation of national genetic resources and makes it available for agricultural sustainable development without affecting biodiversity and biosafety.

59. Objectives of the Egyptian National Gene Bank:

- Collection, evaluation, documentation and conservation of plant and animal genetic materials, to protect them from erosion and extinction;
- Conservation of the genetic materials in long-term conservation rooms (-20oC);
- Availability of genetic materials for the breeding programs towards developing high yield, better quality, pest and disease resistant crops;
- Sharing information relating to the genetic materials with other local or international gene banks;

60. Departments of the Egyptian National Gene Bank. The Egyptian National Gene Bank's organizational structure was established and comprises:

- Field crops genetic materials;
- Horticulture genetic materials;
- Animal genetic materials.

61. The Egyptian National Gene Bank comprises divisions, laboratories and institutions that assist the above-mentioned main departments:

Division for Conservation of Genetic Resources;

- Conservation of true seeds, consisting of:
  - Short term conservation (+5 oC);
  - Medium term conservation for the active group (-5 oC);
  - Long term conservation for the basic group (-20oC);
  - Med and long term conservation for plant tissues using the ultra-freeze (-196oC);
  - Conservation in the original habitats.

Division for Testing Seeds Vitality and Multiplication

- Seeds vitality test before and during the conservation of genetic materials;
- Multiplication and maintenance of genetic resources;
- Preparation of seed samples of genetic resources for conservation.

Evaluation Division

Evaluation of all the genetic materials based on their environmental stress tolerance (for example: salinity, drought, temperature) and the biological stress (for example: varieties resistant to diseases and insects) in all regions.

Identification and Evaluation Division:

Repartition and classification of genetic resources, especially varieties of genetic materials and its related wild relatives, local varieties and the preservation of samples in the Bank's herbarium. The Division is also responsible for taking care of genetic resources in the natural reserves.

Division for Documentation and Information.

- Preparing a database on genetic resources groups;
- Providing breeding programs with the basic and necessary information.

Division of Medium and Long term Conservation for Plant Tissues: using the ultra-freeze (-196oC). Multiplication and conservation of plants that rare or difficult in seed production and vegetation propagation plants.

Genetic Engineering laboratories

- Performing genetic fingerprint and genetic map for genetic resources;
- Definition and Identification of the genetic information responsible for environmental and biological stress resistance.

Cell Genetic Laboratory

- Studying the genetic structure stability for genetic resources;
- Studying the chromosomal maps for wild plants and plant and animal genetic resources applicable to the breeding programs.

Chemical Analysis Laboratory

- Determination of the quality characteristics;
- Chemical analysis for different components in the genetic resources.

Farm

- Multiplication and evaluation of the genetic resources in the farm.

Green houses

- Preservation and multiplication of some horticultural crops requiring special conditions

Botanical Garden:

- Comprising some rare plants such as trees and ornamental, medicinal and aromatic plants.

Field Bank for Egyptian Genetic Resources

- Comprising different varieties of fruits (pomegranate, grape, citrus, stone-core fruits):
- Plans for cold conservation rooms to accommodate about 200 thousand accessions of the short and medium groups (+5 oC and -5 oC) (active group) and long term conservation (-20 oC) (basic group);
- The cold conservation room in the Egyptian Gene Bank contains more than 50 thousand genetic accessions of the following types and species:115 field crops, 56 vegetables, 232 trees and 564 species;
- Achieved the classification, regeneration and evaluation of 8,000 genetic resources of field and horticulture crops (morphologically, genetically and cytologically).

Egyptian National Gene Bank: Strategies

- Designing research plans to collect the genetic resources and ensuring safety of these resources and providing different breeding programs with genetic resources and information needed;
- Characterisation of the collected genetic resources;
- Strengthening public awareness towards preserving genetic resources, protecting them from erosion as well as ensuring their orderly utilisation;
- Participation in specialised exploratory trips aimed at collecting genetic resources from their original habitats;
- Participation in setting up guidelines, test and production regulations for collecting genetic resources and documentation of new plant species and animal breeds;
- Facilitating sharing of genetic resources and implementation of the Intellectual property laws relating to national genetic resources;
- Documentation of Egyptian genetic resources in the database of the Egyptian National Gene Bank data;
- Enhancing international cooperation in the field of genetic resources for food and agriculture;
- The Bank seeks to enact a national law to protect and preserve genetic resources for food and agriculture that will facilitate the Implementation of the Intellectual Property Law for national genetic resources, including the wild relatives and local breeds and varieties, thereby assisting in retrieving the genetic resources of Egyptian origin from different foreign gene banks.

Objectives of the Workshop

62. The Workshop is aimed at stimulating intra-OIC action in the use of modern, scientific and innovative methods for increased food systems' resilience, competitiveness and stability. It would seek to achieve the following objectives:

- The protection, conservation, management and exchange of animal and plant genetic resources in OIC member states;
- Strengthening human capabilities and institutional capacities to maintain sustainable use of agricultural biodiversity;
- Developing an appropriate mechanism for regional exchange of information on plant and animal genetic resources;
- Supporting incorporation of biodiversity into national development agenda, including mobilisation of funds for infrastructure development through the various national and intra-OIC financing institutions, within the framework of South-South Cooperation and the reverse linkage initiatives.

- Assisting in the elaboration of appropriate national legislations and social awareness programmes, aimed at protecting, and equitable sharing of gains accruing thereto, plant resources, including mobilisation of farmers, herders, pastoralists, local and community-based, youth and women stakeholders;
- Assisting member states to establish and manage national gene banks;
- Cooperation with local, regional and international bodies and institutions in the implementation of international agreements; and
- Training of staff and raising community awareness of the importance of plant genetic resources.

Expected Outcomes

63. The Workshop is expected to produce the following outcomes:

- Production of a Status Report on the development of genetic resources in OIC member states;
- Elaboration of an OIC/IOFS Plan of Action for intra-OIC cooperation in the area of GRFA, including creation of an intra-OIC regional Gene Bank;
- Recommendation on the creation of an OIC Steering Committee and Sub-Regional Centres of Excellence on Gene Banks as a support mechanism for protection of plant genetic resources.

Structure of Workshop

64. A 3-day Workshop is expected to examine various thematic issues relating to the acquisition, utilisation and conservation of plant genetic resources for food and agriculture. The major themes to be discussed are as follows:

- Role and Importance of Gene Banks for Conserving Genetic Resources for Food and Agriculture.
- Country Experiences on Gene Banks and International Collaboration, including on-going initiative by COMSTECH on intra-OIC capacity-building on plant genetic resources for food and agriculture;
- Overview of Global and Regional Agreements on PGRFA, including forests and animal genetic resources for food and agriculture;
- Agricultural Bio-diversity and Resilient Food Systems;
- Issues and Challenges on Conservation and Sharing of Genetic Resources ;
- Developing National Capacities on Bio-Diversity and Role of Regional Centres of Excellence

65. Presentations would be conducted by invited resource persons/delegates from member states of OIC/IOFS and invitees from partnering institutions, such as COMSTECH, IsDB, ICARDA, ICBA, NASEC (Kazakhstan) and FAO, among others. Rapporteurs for each thematic session would be selected from delegates of member states and representatives of partnering institutions.

Thematic Sessions

66. There would be Five thematic sessions and a Wrap Up Session to deliberate on the recommendations of the Workshop. These recommendations would be presented to the relevant decision-making bodies of OIC/IOFS for adoption. Furthermore, consultations are underway with host authorities to arrange a field visit to any Gene Bank facility during the last day of the Workshop.

Participants, Resource Persons and Invited Guests

67. The Workshop is to be attended by delegates/experts representing all OIC/IOFS member states- All OIC member states;

- Relevant OIC Institutions, including members of the IsDB Group, SESRIC, ICDT, IUT, COMCEC, COMSTECH, COMIAC, ISESCO;

- Observer member states of OIC/IOFS and guest institutions.

Language and Mode of Presentation

68. The Workshop would be conducted mainly in English language. However, presentations in any of the other two official languages of IOFS (Arabic and French) shall be acceptable subject to prior arrangements for translation and interpretation. Similarly, adequate facilities shall be provided for power-point presentations by participants.

Venue and Date of the Workshop

69. The Government of the United Arab Emirates has graciously agreed to host the Workshop in Dubai, United Arab Emirates on 5-7 July 2020. Invitations enclosing the Agenda and Work Programme would be distributed in due course.

The Secretariat
Islamic Organisation for Food Security
Nur Sultan, Kazakhstan
24 February 2020

Annex

Global Interdependence in Crops collated in 2010

Crop	**Region(s) of significant genetic diversity [1]**	**Major *ex situ* collections [2]**	**Major producing countries [3]**	**Major breeding and research activities**	**Countries for which major consumption has been recorded [4]**	**Products/ importing countries [5]**
Cacao *(Theobroma cacao)*	Amazon Basin, Central America	Brazil, Costa Rica, Trinidad and Tobago, Venezuela (Bolivarian Republic of)	Brazil, Cote d'Ivoire, Ghana, Indonesia, Nigeria	Brazil, Costa Rica, Cote d'Ivoire, Ghana, Papua New Guinea, Trinidad and Tobago	France, Germany, Japan, Russian Federation, United States of America	Cocoa beans Belgium, Germany, Malaysia, Netherlands, United States of America
Groundnut *(Arachis hypogea)*	South America	CGIAR, US DA, India, China, Senegal,Brazil	China, India, Indonesia, Nigeria, United States of America	Australia, Brazil, China, India, United States of America	Confectionary China, India, Indonesia, Nigeria, United States of America	Groundnut shelled Canada, Mexico, Netherlands, Russian Federation, United Kingdom
Maize (Zea *mays)*	Asia, Central America and Mexico, North America, South America	CGIAR, India, Mexico, Russian Federation, United States of America	Argentina, Brazil, China, Mexico, United States of America	CGIAR, Africa, Brazil, China, Europe, India, United States of America	China, India, Indonesia, Mexico, South Africa	China, Japan, Mexico, Republic of Korea, Spain

Potato (Solarium tuberosum)	South America	CGIAR, Colombia, Czech Republic, Japan, Netherlands	China, India, Russian Federation, Ukraine, United States of America	CGIAR, Argentina, Australia, Canada, Chile, China, Colombia, Ecuador, France, Germany, India, Netherlands, Poland, Republic of Korea, South Africa, United Kingdom, United States of America	China, India, Russian Federation, United Kingdom, United States of America	Belgium, Germany, Italy, Netherlands, Spain
Rice (Oryza spp.)	South, East, and Southeast Asia, Africa	CGIAR, Benin, China, India, Philippines, Thailand, United States of America	China, Bangladesh, India, Indonesia, Viet Nam	CGIAR, China, India, Philippines United States of America	Bangladesh, China, India, Indonesia, Viet Nam	Rice, milled Iran (Islamic Republic of), Iraq, Nigeria, Philippines, Saudi Arabia
Safflower (Carthamus tinctorius)	Egypt, Ethiopia, Far East, India, Middle East, Pakistan, Southern Europe, Sudan	China, Ethiopia India, Mexico, United States of America	Australia, China, India, Kazakhstan, United States of America	Australia, Canada, China, India, Mexico, Spain, United States of America	Seed Oil Belgium, China, Germany, Japan, Netherlands, Netherlands, Philippines, United United States of Kingdom America, Yemen	Safflower seed Belgium, China, Netherlands, Philippines, United Kingdom
Sesame (Sesamum indicum)	Central Asia, China, Horn of Africa, India, Near East	China, India, Israel, Mexico, Venezuela (Bolivarian Republic of)	China, India, Myanmar, Sudan, Uganda	India, Turkey, United States of America	Seed Oil China, Egypt, India, China, India, Japan, Uganda Myanmar, Republic of Korea, Sudan	Sesame seed China, Japan, Republic of Korea, Syrian Arab Republic, Turkey

Soybean *(Glycine max)*	East Asia	AVRDC (Regional), China, Russian Federation, Ukraine, United States of America	Argentina, Brazil, China, India, United States of America		Seed Brazil, China, Indonesia, Japan, Republic of Korea	Oil Brazil, China, India, Japan, United States of America	China, Germany Japan, Mexico, Netherlands
Sunflower *(Helianthus annuus)*	North America	France, Romania, Russian Federation, Serbia, United States of America	Argentina, China, France, Hungary, India, Russian Federation, Turkey, Ukraine, United States of America	Russian Federation, United States of America	Seed Brazil, Bulgaria, Myanmar, Spain, United States of America	Oil China, India, Russian Federation, Spain, Ukraine	Sunflower seed France, Italy, Netherlands, Spain, Turkey
Wheat *(Triticum aestivum)*	Central Asia, East Africa, East Asia, Europe, South and East Mediterranean,	CGIAR, Australia, Italy, Russian Federation, United States of America	China, France, India, Russian Federation, United States of America	CGIAR, Australia, Brazil, Canada, China, France, India, United Kingdom, United States of America	China, India, Pakistan, Russian Federation, United States of America		Brazil, Egypt, India, Italy, Japan