

The State of Eritrea Ministry of Agriculture Newsletter



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### Ministry of Agriculture Promotes Genetic Resources Conservation

The Ministry of Agriculture (MoA) is promoting agricultural genetic resources conservation to sustain and improve the country's indigenous species of plants and farm animals. The launch of the gene bank dates back to May 1992, with the help of Eritrean experts abroad. The Eritrean experts received financial support from the agronomy unit and had the aim of conserving endangered agricultural plant species.

Recognizing its importance, the MoA deployed experts and began collecting several seed varieties from different regions of the country. It kept them in freezers procured with the support of various development partners. Despite limited human and infrastructural resources, the collection process was effective and experts managed to collect a considerable number of white cereals and leguminous plant seeds. In addition, a few varieties of fibre, oil, and vegetable seeds were collected.

According to Mr. Amanuel Mahdere, Director of the Genetic Resources Division at the National Agricultural

Research Institute (NARI), in 2003 the National Gene Bank was upgraded to a unit level, with additional experts and equipment being deployed to strengthen the unit. Until 2012, the unit focused only on conserving plant genetic resources. However, after it was restructured and upgraded to a



Mr. Amanuel Mahdere, Director of the Genetic Resources Division

division level, it included a plant genetic resources unit, a farm animal genetic resources unit, and a forest genetic resources unit.

Following its reorganization, the division focused on several major



objectives, some of which are: to conserve and document genetic resources value for agriculture and forestry; to constitute a foundation for future use of genetic variation; to manage and coordinate activities that contribute to a better understanding of genetic resources; and to contribute to a long-term sustainable use of genetic resources.

Currently, the division possesses 36 freezers, a fridge, a germination chamber, a seed dryer, a mini seed drying cabin, an electrophoresis chamber, several GPS, 20 temperature and humidity data loggers, and an array of other laboratory equipment.

Mr. Amanuel outlined that the main functions of the division are: exploration and collection of germplasm; conservation of genetic resources; regeneration and multiplication; germplasm characterization and evaluation; pre-breeding; germplasm distribution; seed handling in seed bank; and genetic resources documentation and information.

#### **Plant Genetic Resources**

According to Mr. Weldetsion Yakiem, Unit Head of Plant Genetic Resources, the unit focuses on the collection of different plant genetic resources which are declining and facing extinction.

After collection, the unit works on maintaining them through ex-situ or in-situ conservation and making them available for breeding purposes to improve production and productivity. (Therefore supporting local livelihoods.) The entire process includes exploration and collection of germplasm, germplasm conservation, regeneration and multiplication, germplasm monitoring,



*Mr. Weldetsion Yakiem Unit Head of Plant Genetic Resources* 

characterization, pre-breeding, germplasm utilization, and plant genetic resources documentation.

# Exploration and Collection of Germplasm

Mr. Weldetsion noted that exploration and collection of germplasm are the primary functions of the unit. Continuous survey and inventory activities are conducted in order to study the places of collection, types of species, and the appropriate time for growing and collection.

Priority is given to indigenous, adapted exotic, and endangered plant species during the collection process. Since 1992, 32 multi-crop collection missions were carried out and 4,557 accessions have been collected from all regions (except the Southern Red Sea Region). Most germplasm accessions were collected from farmers' fields.

#### Seed Handling in the Seed Bank

After collection, different activities, including seed germination tests, seed moisture tests, purity tests, cleaning, drying, threshing, and weighing, are conducted in the seed laboratory. The pure cleaned seeds that have a high ability for germination are then packed in an aluminium foil bag or plastic bottle and conserved in the genetic resources laboratory. In order for the seeds to be preserved, their humidity should be between 3-6% and their rate of germination greater than 85%.

#### **Germplasm Conservation**

The objective of conservation is to maintain the integrity of available diversity for present and future use. Germplasm are conserved in the form of seeds in two ways: base collection and active collection.

Base collection is used to conserve plant materials for a long or extended period (more than 100 years). Its main objective is to maintain the indigenous varieties and transfer them to future generations. Base collection conservation is maintained in a specialized laboratory. It is conserved in a temperature that ranges from -18°C to -20°C.



Once these plant materials are conserved in freezers, they remain out of reach except for monitoring and viability checks.

In contrast, active collection is for a short period of time. It is stored at -18°C to -20°C. Generally, the seeds are used for a variety of laboratory activities, trials, or research.

To date, the conserved germplasm include 87.38% cultivated and 12.62% wild/weedy species of orthodox seeds of cereals, pulses, vegetables, fibre crops, oil crops, forages, medicinal plants, and wild relative species. So far, 6182 samples of more than 152 plant species have been conserved in the MoA's seed banks. From the total accessions conserved, over 4557 are collected, while 1625 accessions have been procured from overseas. Importantly, the MoA prepared the infrastructure and equipment to store more than 20,000 accessions.

According to Mr. Weldetsion, conservation is currently being conducted only through seed in ex-situ. However, there are plans to conserve the plants in the future through on-farm conservation of landraces and in-situ conservation of wild relatives. In vitro conservation or cryo-conservation of vegetative propagated plant species will also be practiced.

#### **Regeneration and Multiplication**

The process of regeneration is usually conducted for seeds that have their germination rate reduced through time. Over the past 30 years, 1274 accessions of several plant species and 21% of the total plant species have been regenerated.

The unit also performs multiplication of accessions. If new samples are few in number or



some seeds from active collections are utilized for different purposes, multiplication is done in the field. So far, a total of 462 accessions of more than 60 plant species in active collections, and 686 accessions of newly-collected or donated plant species have been multiplied.

For instance, oat is one of the indigenous varieties which may be facing extinction in our country. Since the crop demands a long rainy season, farmers do not prefer to cultivate it.

However, recent research indicates that some farmers are cultivating it in limited areas. Subsequently, the Genetic Resources Division has collected and multiplied six accessions of oat from different agro-ecological zones, particularly around Senafe, Golagul-Smejana, and the sub-zone of Serejeka.

A wheat variety, locally known as Demhay, is also an endangered crop species. However, the Genetic Resources Division has managed to conserve and multiply it within its research centre.

Multiplication is a sensitive process carried very carefully. This is to avoid cross pollination and mixing of different varieties which can result in deterioration.

#### **Germplasm Monitoring**

Initially, seed viability, performance, and health status

were checked and evaluated every five years. Recently, however, this monitoring process has been extended to every 10 years. Over the past three years, a total of 752 accessions which amounted to 12% of the entire collections of the seed bank have been monitored.

#### Characterization

Mr. Weldetsion explained that studying the character of each and every collected accession is part of the unit's responsibilities. Based on international standards, 34% of the total accessions are morphologically characterized and molecularly. To date, 1664 accessions of several plant species have been characterized agro-morphologically, while 200 accessions of sorghum, 8 accessions of barley, and 48 accessions of cowpea have been characterized using molecular markers.

#### **Pre-Breeding**

In addition, the unit announced that sorghum genotypes developed by initial crossing of improved *ICSV 111 IN* (Seare) variety with Amge landrace are under evaluation trials. The genotypes of bread wheat have also been developed by crossing eight landrace varieties of *Mana* with improved *Quafza18* bread wheat variety, and two landrace varieties of *Mana* with improved *Katilla11* bread wheat

variety. All the genotypes are undergoing evaluation trials.

#### **Germplasm Utilization**

Most of the germplasm are utilized within the NARI for different research activities. In addition, undergraduate and postgraduate students from Hamelmalo Agricultural College (HAC), as well as agricultural extension agents are also benefiting from it.

To date, a total of 3812 accessions of different plant species have reached end users.

## Plant Genetic Resources Documentation

After passing through the abovementioned procedures, all of the seeds reach conservation, with the complete information and specifications of the seeds being registered and documented in a database with unique identification codes. Prior to being distributed to beneficiaries, they are tagged with their complete information.

Mr. Weldetsion reiterated that,

"The community has a big role and responsibility to play in maintaining and conserving our genetic plant resources. Increased awareness raising programs through training and the mass media are among our future plans."

#### Farm Animal Genetic Resources

According to reports from NARI, the Genetic Resources Division is also working on conserving and managing farm animals' genetic resources through engaging in exsitu conservation and supporting farmers' initiatives for appropriate conservation and sustainable use. In particular, currently the farm animal genetic resources unit is working only in Barka cattle characterization.

So far, 158 cattle in the subzones of Goluj and Tessenai are characterized phenotypically. However, there are plans to conserve the animal genetic resources by collecting and conserving semen.

#### Forest Genetic Resources

The Genetic Resources Division has also been engaged in the field of forestry with the major objective of safeguarding the genetic integrity of the nation's forest resources. This objective is expected to be met through conserving and managing in a form of ex-situ conservation as well as characterizing and making them available for use.

To date, NARI has conserved 17 accessions of forest genetic resources in the seed gene bank together with the plant genetic resources.

For instance, six accessions of an indigenous shrub, colutea abyssinica (an endangered species), are maintained in the seed bank and one accession is conserved in the field.

Notably, there are plans to conserve the species in their ecosystems, botanical gardens, arboretum, and in cryo-conservation system in collaboration with relevant government bodies and farmers.

### Ministry of Agriculture Establishing a 'National Database on Fauna and Flora' in Collaboration with Relevant Government Bodies

The MoA, in collaboration with a number of relevant government bodies and colleges, is in the process of establishing a National Database on Fauna and Flora. The Regulatory Services Department (RSD) of the MoA reported that proper documenting of fauna and flora as a part of national heritage is highly important.

According to the RSD, data and information on fauna and flora resources are scattered among various government institutions, which include the MoA, the Ministry of Land, Water, and Environment (MoLWE), the Ministry of Marine Resources (MoMR), the Forestry and Wildlife



Authority (FWA), the National Higher Education and Research Institute (specifically within the Eritrean Institute of Technology and [HAC]), and other private institutions. As well, data and information on Eritrea's fauna and flora are found outside the country with individual researchers, in museums, and other institutions.

Accordingly, in October 2020 the MoA invited the above-noted institutions to assign relevant experts to establish a technical committee (TC). The TC's focus would be to examine and systematically organize data on fauna and flora, helping enable the country to properly use and manage its resources. Notably, the TC also included some private enterprises, such as RAM Farm and individuals.

The TC, which is led by the RSD, organized itself into two thematic groups, with each working on fauna and flora species (including both marine and terrestrial species). One group focused on the design and structure of a national database, while the other group focused on drafting a strategy on the use and management of the national database.

The working groups made collective and individual efforts

to achieve their objectives. The fauna and flora thematic groups examined all the existing data and information, before finally coming up with a specific number of species in their respective genera of families. Meanwhile, the database working group developed a well-structured database, and took into account feedback from all members of the TC.

Furthermore, the group working on a strategy for the use and management of the national database on fauna and flora drafted a comprehensive document. The core issue of the document is a suggestion to establish a board, whose members would be drawn from the various government institutions mentioned above.

Moreover, the draft document recommended the formation of a national steering committee (NSC), composed of technical experts. According to the proposal, the NSC could also establish thematic groups, which would focus on specific fauna and flora species.

The TC, which began working in October 2020, finalized its June assignments in 2021. Following discussions with various concerned institutions, the TC held a workshop on August 17, 2021. Officials and ministers from the MoA, the MLWE, and the MoMR, along with other experts and personnel participated in the workshop. During the one-day workshop, the national database on fauna and flora and the strategy on its use and management were presented. Generally, participants offered constructive suggestions and positive feedback. Importantly, workshop participants also urged the higher authorities to provide guidance on the proposed institutional structure for the use and management of the National Database on Fauna and Flora (NDFF), establishment and composition of the proposed board, formation of the NSC, possible housing of the NDFF.



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