Interview with Mr. Tsegay Berhane, Head of

Eritrea's National Agricultural Research Institute(NARI)

A Journey and History of 100+ Years in Brief

The National Agricultural Research Institute (NARI) is one of the major bodies of the Ministry of Agriculture (MoA) of the State of Eritrea. The establishment and operation of a strong agricultural research services was given high priority following Eritrea's independence in 1991, and a lot of investments were made to establish research stations operating in all agro-ecological zones. Following is an interview with Mr. Tsegay Berhane, Head of NARI, which focuses on the history and achievements and challenges of the institute since its establishment.

Let's start with a brief history of agricultural research activities in Eritrea.

Records reveal that agricultural research in Eritrea began during the Italian period. In 1910, research stations of coffee, citrus, palm and eucalyptus trees were established in Filfil, Fagena, Keren and Adi Wegri. Later, in 1920s, cotton, in the Western lowlands; and wheat germplasm, in the highlands, were introduced. During the federation period with Ethiopia (1952-1962), new research centers were established in Sembel, Daero-pawlos, Paradizo and Adi-wegri. Then, wheat and barley were selected as high priority crops for the highlands. Moreover, documents indicate that some linkages were initiated with Kenya and International Maize and Wheat Improvement Center (CIMMYT) mainly with the objective of material exchange. Research activities deteriorated following Eritrea's forced annexation by Ethiopia. Later, in 1976, cotton germplasm was introduced in Alighider from the USA and Israel, and a variety "Acala 17c" was developed. Green houses and other research facilities were also established in Sembel and Paradizo. Asmara University also established research

centers that focused on cowpea, chickpea and beans at Embatkala, horticultural crops and cereals at Halhale) and animal feed at Abardae.

What about the activities during the armed struggle for independence? In the mid-1980s the Eritrean People's Liberation Front (EPLF) started to implement research programs on soil fertility, agronomic practices, crop protection, forestry, rangeland management, livestock and farm machinery across the liberated areas. The front was conducting research and training activities along with farmers. Then, soil and water laboratory became one of the major pillars in the research undertaking.

Let's go onto the new era, the post-independence period.

As a continuation of the research that started, the new government of Eritrea gave special focus to the importance of research and human capacity development. Subsequently, the agricultural research body of the MoA went through a number of structural transformations to come to its current status. For instance, agricultural research and extension was its first structure after independence (1993-1997), followed by Agricultural Research and Human Resources Development in 1997, which was operational until 2003. Then it acquired its current name and structure – the National Agricultural Research Institute (NARI).

Why do you think that agricultural research is important for a nation? Agricultural research is important to any country because throug applied and basic research you generate viable technologies to solve farmers' problems. For instance, NARI is working to achieve these goals through the identification and promotion of high value crop and livestock commodities within different production systems. This is done based on demand and institutional analysis of the small-scale farmers and small and medium commercial farmers to ensure the relevance, sustainability, efficiency, effectiveness and impact of the research which is normally conducted in a participatory manner.

Let's come to the current structure and major pillars of NARI. Currently, NARI is composed of five technical divisions: Crop Improvement, Natural Resources Research, Livestock Improvement, Agricultural Engineering Research as well as Genetic Resources Research. Support units like Administration and Finance, Bio technology. Planning and Statistics and Food technology play a significant role.

Mr. Tsegay. Let's see individual achievements of these bodies. Could we start with the Genetic Resources Division as it is the backbone of all kinds of research?

Conserving and developing a country's genetic resources is not just a technical work but it also holds strategic and security importance. Hence, NARI gives special attention to conserving genetic resources of crops, trees and animals. So far, 6182 accessions of 158 crop types, out of which 4557 are from within Eritrea, are collected. The remaining crops were supplied by external research institutions. In addition, agro morphological research on 1664 crops and molecular characterization on 256 crops were carried out. Maintenance and multiplication of collected and conserved samples are also among the most important activities. On the whole, 1274 samples of cereals and pulses were maintained and 686 newly collected samples were multiplied for the purpose of conservation.

What about initiatives taken to conserve animal genetic resources?

Conserving and improving indigenous animal genetic resources remains an important pillar of the Genetic Resource Research Division. However, this research area is at its infant stage. Phenotypic characterization was conducted on a total of 158 cattle that are believed to share genetic attributes of the indigenous Barka breed, which were collected from Goluj and Tessenay sub-zones. The process involved adherence to 40 genetic parameters.

What is the future plan to reinforce this research area?

Strengthening genetic resources conservation on crops and trees (in-situ and ex-situ); holistic research on the characteristics of the already collected crop samples; establishment of domestic animal gene bank; and extensive public awareness raising activities are among the major short and long term plans of the division.

Let's move to crop improvement activities. What are the major achievements of this research area?

The institute has registered commendable progress in crop improvement. The main focus of the research has been on sorghum, pearl millet, barley, wheat and maize in field crops; and in pea, lentils, cow pea and beans in pulses. Moreover, limited crop improvement programs were carried out in oil-crops such as sesame, rapeseed, sunflower and cotton.

Could you tell us, in figures, the released crop varieties?
Starting from 1997, 45 varieties of improved crop varieties -- wheat (16), barley (6), sorghum (11), pearl millet (6), maize (3), sun flower (1) and two varieties of pulses -- have been released from Halhale, Gahtelay, Sheeb, Akurdet, Shambiko, Hagaz and Guluj research stations. Moreover, from 2000-2021, more than 15 quintals of improved foundation seed were multiplied. The improved crop varieties are distributed to farmers through the Agricultural Extension Department (AED) and play important roles in increasing production and productivity. They are also known to be disease and pest resistant.

Reports from the institute reveal that you carry out focused adaptability trials in horticultural crops. What was the outcome of these trials?
With regards to horticultural research, the institute focuses on potatoes, onions, tomatoes, pepper, garlic and fruits. As of now, 34 vegetable and 36 fruit varieties have been identified as promising crops for a number of agro-ecological zones of the country. In line with this, research is conducted on important crop pests and diseases. As a result, 26 plant diseases, three new pests, and two types of weeds have been identified; and a number of effective pesticides have been selected.

Natural Resource Management Division (NRMD) is also an important component of NARI; what are the main achievements in this division?
Conducting research on soil, water and fertilizers are the major mandates of NRMD. Until 2021, the NRMD conducted laboratory analyses on more than 15 thousand soil samples, over 400 water samples, around 80 fertilizers samples, and on more than 1300 plant samples. Moreover, two guidelines for fertilizer application on sorghum and wheat were made available for users. Furthermore, a soil profile research was conducted on more than 50 thousand hectares of land, and a partial soil suitability map was drafted. However, rigorous efforts need to be made with regards to the drafting of National Soil Suitability Map

In addition to soil, water and fertilizers, what kind of research does the NRMD conduct?
The Forestry and Wild Life Research Unit of the NRMD, on its part, managed to collect a total of 1819 Kgs of seeds from 39 tree species (22 indigenous and 17 exotic) seeds. Meanwhile, assessment and selection processes were done on 52 tree species and 59 seed provenances, i.e. in the context of proper forestry management. And various trees and shrubs were planted for research purposes in the Central (Merhano), Southern (Debarwa Sub-Zone) and Gash Barka

(Shambuko, Akurdet and Goluj) regions; and further studies are being carried out on them. Likewise, similar initiatives were taken in some areas of Anseba and Northern Red Sea regions for some time. Reports from the watershed management unit of this division also indicate that several research studies were carried out on the impact of different types of physical soil and water conservation measures.

Would you give us a brief explanation on the overall bio-technological activities of NARI along with their impact and the challenges faced, if any?

The Bio-technology unit focuses on tissue culture and molecular biology. Although it is not a long-established unit, it has, so far, registered remarkable achievements in terms of producing virus-free potato seeds and banana seedlings. For instance, in the course of the years 2016-2021, around 150 quintals of virus free potato seeds were produced and distributed to farmers, and thus raising the average national potato yield to over 160 per-hectare. This figure depicts only the average national harvest of that time. Otherwise, NARI's reports indicate that farmers who made overall treatment of their farmland were able to secure up to 450 quintals per-hectare. There are also reports that farmers who managed to achieve good and continuous harvest up to nine generations. Likewise, more than 2,000 banana seedlings produced through tissue culture were distributed to farmers during the years 2018-2021. Currently, greater emphasis is being placed on date palm tissue culture propagation. This undertaking is at its preliminary level, but it is equally worth mentioning that in the course of the period 2018-2021 more than 7,800 imported date palm seedlings were distributed to several farmers and institutions in the Northern and Southern Red Sea regions after the seedlings were properly hardened at MoA nurseries.

What can you tell us regarding NARI's initiatives on livestock research?
Livestock production and productivity can be addressed effectively on the basis of maintaining standardized nutrition, good health and selected breeds. That is why all possible research efforts have been made to ensure comprehensive achievement in these three areas starting immediately after independence. Pursuant to the endeavours put up towards improving livestock feed quality, especially concerning diversification of feed options for dairy cattle, trials were made on a total of 261 forage seed varieties, out of which 30 types of grass and 50 types of legumes were selected. Meanwhile, six varieties of sweet potato were planted on trial basis with the intent of studying their effectiveness as

forage, and, out of them, four were selected. With regards to feed block trials, four types were selected to serve as standard options in the highlands, while the numbers of suitable options for the Eastern and Western lowlands stand at two and three respectively. Moreover, a machine that mixes and packs these feed blocks was designed and produced locally. The livestock research division has further managed to formulate preparation of silage using maize and alfalfa. Besides, trial on one kind of calf starter is underway.

You have mentioned the research conducted on animal feed. What about the results of research in breeding?

Even though research activities on livestock breeding is at its infant stage, a promising outcome has been seen with regard to our initiative in breeding and multiplication of competent sheep varieties both in our agricultural site, Halhale, and private farms, following the identification of some researched breeds with high tolerance to external parasites and promising genetic characteristics. We can also say that the establishment of a research centre for local cattle breeds at the Goluj station has given encouraging signals to focus on this subject. In addition, preliminary research was conducted on various types of diseases and pests in collaboration with the National Animal and Plant Health Laboratory (NAPHL). Subsequently, necessary drugs were recommended. According to the research outcome from this division, the number of identified prevalent internal parasites stands at five, while that of external parasites is six.

Could you also brief our readers on the research activities on agricultural engineering?

Agricultural Engineering Research Division is an essential part of NARI as it serves all the other areas of research. Some of the major accomplishments in relation to the strengthening of agricultural research since 1997 are the establishment of seed cleaning facility and meteorological sites; installation of irrigation infrastructure and solar energy; construction of various diversion schemes and dams of limited water-holding capacity as well as water wells, among others. Since 1991, this division has been playing a leading role with regards to the identification of proper tillage alternatives, and the construction of ordinary crop seed stores, cold stores and livestock shelters. NARI has also conducted some research on food technology.

What kind of achievement has, so far, been registered in this field?

Although research activities on food technology are at their initial stage, value addition trials were conducted focusing on various recipes of sweet potato, instant yogurt, pumpkin, flaxseed and various legumes. However, we shouldn’t forget that this area is vast and more needs to be done in collaboration with relevant institutions and actors.

Thank you.

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