



The investigator, the light  
in the farming zone

# DEPARTMENT OF AGRICULTURAL RESEARCH

VOLUME 3, ISSUE 2

www.agricresearch.gov.ls

SEPTEMBER 2019



## Inside this issue:

Message from the Director	1
Climate change and Lesotho's small scale producers	1-2
Harvesting maize crop and grain storage	2-3
Microwave Plasma Atomic Emission Spectrometer	3
Lesotho's Prime Minister launches APPSA and SADP II projects	4
Realizing farmers' rights in the conservation and sustainable use of plant genetic resources	5
Lesotho Gene Bank towards preserving plant diversity under	5-6
DAR Field Day	6-7
DAR Cleaning Campaign	8

## 1. MESSAGE FROM THE DIRECTOR OF AGRICULTURAL RESEARCH

In this issue we present to our valued client, various topics that highlight the achievements in some of the activities the Department is undertaking. Some of the key milestones achieved include the launch of the Agricultural Productivity Program for Southern Africa (APPSA) together with a sister project, SADP II. APPSA aims to increase productivity through development of technologies and their dissemination. The launch was graced by the presence of the Honourable the Prime Minister, Dr. Thomas Motsoahae Thabane. Other crucial issues include efforts to address the challenges facing small scale farmers due to climate change. Through field days, the Department showcases its work and enables learning to facilitate adoption of technologies. For this year it was held in Berea and Butha-Butha. Also through its collaborations with the international research partners the Department has acquired state of the art machinery for testing nutrients in the soil to assist farmers in selecting the corrective measures and to achieve optimum results from their fields. Cleanliness is one of the crucial things for people's wellbeing hence DAR takes this very seriously and thus often embarks on cleaning campaigns. We hope you will learn a lot from this issue and you can contact us for any clarification or queries.

Dr. Lefulesele Lebesa

## 2. CLIMATE CHANGE AND LESOTHO'S SMALL SCALE PRODUCERS

Climate change is an urgent challenge for small-scale farmers in Lesotho. Floods, hailstorms, extreme temperature and droughts are affecting crop and livestock production,

which in many cases is the sole source of income for these farmers. These destructive impacts of climate change happens because most agricultural practices in Lesotho are dependent on natural climate

patterns where a slight change in these patterns may cost a small scale farmer his/her year's income.

To define 'a small scale farmer', many aspects are taken into consideration such as land holding and access to other resources. Nonetheless, FAO (2017a) describes these farmers as 'those farmers that are characteristically at or below the poverty line, that are operating on holdings that are



Fig 1: Maize field badly affected by hailstorms at Machache

used for informal business and/or self-consumption and in which the farmers typically undertake multiple activities both on and off-farm.<sup>7</sup>

Climate change and severe weather events such as extreme temperatures, hail storms and declining rainfall negatively affects farming practices in Lesotho. This happens mostly in cases where agricultural production

is depended on rain. The following pictures show the extent of damage caused by hailstorms in one of the fields in the country recently.

As a result of the above pictures and many other incidences of climate change, adapting farming practices to new climatic conditions has emerged as an urgent priority for Lesotho's small scale farmers. For this to happen, farm-

ers need to be provided with strong research and extension services that will deliver or create awareness on the causes of climate change, measures (use of climate smart crop varieties for example) to curb or adapt to it. Moreover, efforts that provide access to agricultural support services like inputs and weather forecasting services will help enhance Lesotho small sale farmers' adaptive capacity to climate change.

### 3. HARVESTING MAIZE CROP AND GRAIN STORAGE

It is that time of the year when maize farmers must harvest the crop from their fields and then take their harvest to their respective homes. Harvesting should therefore be done timely and appropriately to avoid unnecessary crop losses.

Maize crop is normally harvested when it is dry and when the black layer on the grain is noticed. Traditionally, when maize cobs have dried down and it is time for harvest, the cobs are handpicked, hand shelled and dried in the sun. This is very labour intensive, which has a significant impact on the gross margin for maize. Another option is to machine harvest when moisture levels drop below 18% and then dry down to below 14% for delivery and storage.

#### Mechanical Harvesting

Though this method is not common in Lesotho, it can still be used. There are several methods of harvesting maize by machine where a combine harvester is the most common machine used. The combine harvester picks the cob from the stem and then de-husks the cob and threshes the cobs, and the



Fig 2: Harvesting maize with a combine

kernels are emptied into the truck.

#### Hand harvesting

The entire plant is cut and placed into stacks while green. Once it is dry, the ears/cobs are picked and threshed, or the entire plant with the ear can be utilized as maize hay.



Fig 3: A farmer hand harvesting maize in Butha-Butha

Alternatively, the plants can be left in the field to dry and the ears harvested.

In Lesotho, most farmers harvest maize by hand, plucking cobs from the plant and piling them at the end of the row. In dry winter season, when the maize matures evenly, farmers pick the maize and transport it by oxen carts or trucks for storage at home.

#### Grain storage

To market maize grain effectively, a farmer may need to store it into summer and possibly into the next year or next planting season. To do so, a farmer is going to need to store it properly, he/she may have to market maize grain before they are ready. The

first step for quality grain is to make sure that the storage facility is prepared for grain going to be so.

#### Ideal storage conditions

- Dry, cool locations
- Relatively free of diseases, storage insects and rodents
- Seed or grain biological activity increases as seed moisture and temperature increase, hence avoid high moisture and temperature as these will also increase chances of reproduction of undesirable seed/grain molds and storage insects.
- Good aeration. Appropriate air circulation in the store is imperative
- Store grain in environments with low relative humidity as seeds have the ability to take-up or give off moisture.
- Grain should not be stored directly on the floor, use of pallets is recommended.

Well constructed storage facilities are ideal for storing maize grain for long time to counteract insects and disease incidences. Small holder farmers can construct concrete silos for their grain in their respective homes.

It is recommended that frequent checks be done on the grain and during summer this can be weekly. When a farmer checks the grain, he or she must collect samples to determine the moisture content. Another reason to check grain frequently during summer is to be on the look out for insects.



*Fig 4: One tonne concrete silo for small holder farmers*



*Fig 5: Well ventilated seed/grain store with pallets*

By K. Likotsi

#### 4. MICROWAVE PLASMA ATOMIC EMISSION SPECTROMETER

Accurate, routine testing of nutrients in soil samples is critical to understanding its potential fertility. Many of the nutrients that are vital to plants are exchangeable cations. These are ions loosely attached to and/or adsorbed onto clay particles and organic matter in soil that may become available to plants. Determination of these cations is of great interest for agronomic diagnostic and soil sustainability, enabling more accurate assessment and management of nutrient requirements. If the results indicate that there is a nutrient imbalance, then this can be corrected by the application of a suitably formulated fertilizer.

Deficiencies of secondary macronutrients, such as calcium (Ca) and magnesium (Mg) are less commonly encountered. Micronutrients include iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), and boron (B). The presence of any of the essential elements in excessive amounts may result in toxic effects.

Microwave Plasma Atomic Emission Spectrometer (MP-AES) is gaining attention from soil testing facilities. Agilent's 4100 MP-AES is suited to the multi-element analysis of samples with high dissolved solids content, such as soil. It offers improved performance, with lower detection limits, particularly for boron in this application, and a wider working analytical range. The MP-AES uses nitrogen that can be easily generated from air,



*Fig 6: MP-AES Equipment*

making it attractive to facilities that have difficulty in sourcing gases or are under pressure to improve safety or reduce costs. Eliminating expensive and hazardous gases such as acetylene from the lab also allows the instrument to be operated unattended, even in remote locations. Fully automatic operation. This means that the Lab Technologists can perform other duties, which come in improved capacity; Low detection limits ensures that the equipment does not only benefit the agricultural sector but other industries as well. High accuracy and reproducibility which guarantees the quality of the results of the instrument. Low reagent consumption means that the analysis are run at comparatively low cost in comparison to other methods to deter-

mine similar elements. In response to this need (accurate, routine testing of nutrients in soil samples), the Ministry of Agriculture and Food Security, through the Department of Agricultural Research (DAR) has invested heavily in acquiring this modern equipment. This was purchased with a view to; improve its laboratory services, reduction of time in

awaiting results, capacity to carry out more analyses, assist farmers in implementing suitable application of the fertilizers, both organic and inorganic in pursuit to improving crop yield at the same time having minimal negative impact on the environment. The same instrument can be used to analyze water quality which can be done with a view to generating much needed revenue for the ministry.

By S. Ramakhanna & T. Lekoala

4. LESOTHO'S PRIME MINISTER LAUNCHES APPSA AND SADP II PROJECTS



Fig 7: Prime Minister cutting the ribbon during the launch

The Right Honourable, the Prime Minister of Lesotho, Dr. Motsoahae Thomas Thabane officially launched the Agricultural Productivity Programme for Southern Africa (APPSA) and Smallholder Agricultural Development Project (SADP II) on the 24<sup>th</sup> July, 2019 in Maseru, Lesotho. Both projects are under the Ministry of Agriculture and Food Security and APPSA is housed at the Department of Agricultural Research. APPSA is a SADC Regional Project that is currently being implemented in the three Countries; Zambia, Malawi and Mozambique. Lesotho and Angola are joining in the second phase of the project as Regional Centres of Leadership (RCoLs) in Horticultural base farming system and Cassava based farming system respectively. The objective of APPSA is to promote a regional approach to agricultural technology genera-

tion and dissemination by supporting the strengthening and scaling up of RCoLs on commodities of both regional and national importance. APPSA is a six-year project that supports development of collaborative activities such as exchange of information and material with other sub-regional research institutions.

During the launch, the Director of the Department of Agricultural Research, Dr. Lefulesele Lebesa mentioned that Lesotho's RCoL will be on Horticulture farming system that is fruits (Peaches, Apples), Potatoes (Ware and Seed) and vegetables (Tomatoes, Peppers). Lesotho RCoL will be make use of researchers and expertise from the Department of Agricultural Research, National University of Lesotho, Lesotho Agricultural College as well as other neighbouring countries in the region.



Fig 8: The Director of the Department of Agricultural Research, DR. Lefulesele Lebesa giving a presentation during the APPSA and SADP11 Launch.

APPSA will also support the upgrading of infrastructure at the DAR main station and the regional and sub-stations, including NUL, LAC and Mafeteng District Agricultural Offices as other satellite stations. There will also be strengthening of the institutional capacity through training of researchers from all the National Agricultural Research System (NARS) to support sustainable agricultural productivity and improve the country's Food and Nutrition security. The launch was graced by the presence of the dignitaries from World Bank Lesotho, IFAD, FAO, CCARDESA, Japanese Government, Lesotho Cabinet Ministers, local and international partners, NGO's, Academia, Government officials and farmers.



Fig 9: DAR products displayed during the APPSA launch

By R. Nchee & M. Lephole

## 5. REALIZING FARMERS' RIGHTS IN THE CONSERVATION AND SUSTAINABLE USE OF PLANT GENETIC RESOURCES

Farmers' Rights form an integral part of the FAO *International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)*, also known as *the Plant Treaty*. The ITPGRFA was adopted by the FAO Conference in 2001, and came into force in 2004. Through the Treaty, the contracting parties agree to take actions with respect to **Conservation, Exploration, Collection, Characterization, Evaluation and Documentation** of plant genetic resources for food and agriculture as well as promoting **Sustainable Use** of those resources and to promote **Farmers' Rights**, in accordance with national policy measures. The contracting parties also agree to take steps to minimize or, if possible, eliminate threats to plant genetic resources for food and agriculture.

The concept of **Farmers' Rights** is a means of recognizing the past, present and future contributions that farmers (as custodians of agricultural biodiversity and associated traditional knowledge)



*Fig 9: Bean diversity*

have made and will continue to make in conserving, improving and making available the genetic materials which constitute the basis of food and agriculture.

The purpose of this article is to call for policy intervention and highlight the fact that agricultural biodiversity will not be conserved on-farm unless the farmers see it in their best interest to do so; hence their knowledge, skills and efforts must be appreciated and supported. As a contracting party to the

Treaty, Lesotho should, as appropriate, and subject to national legislation, take measures to protect and promote Farmers' Rights, which include:

- protection of traditional knowledge relevant to plant genetic resources for food and agriculture;
- the right to equitably participate in sharing benefits arising from the use of plant genetic resources for food and agriculture;
- the right to participate in decision-making, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture; and
- the right to save, use, exchange and sell farm-saved seed or propagating material.

By M. Sefotho

## 6. LESOTHO GENE BANK: *towards preserving plant diversity under threat*



*Fig 10: Interior of the NATIONAL SEED GENE BANK located within the Agricultural Research Department about 3Kms from the main city, along the Maqalika dam main North road wing.*

As the global demand for research increases, compounded by the impacts of climate change, the need for reliable, accountable biological repositories is critical and becomes the responsibility of every country. Lesotho is not an exception, hence the existence of the gene bank since 1989 in an effort to conserve agricultural biodiversity. The Leso-

The seed Gene bank is housed within the adjacent building - the National Plant Genetic Resources Centre at the Department of Agricultural Research (DAR).

tho gene bank is mandated to conserve the local plant genetic resources of crops and their crop wild relatives including traditional, indigenous seeds in the face of the changing climate and other threats such as developmental.

The seed gene bank currently accommodates ten full upright freezers. Seed samples (accessions) are kept in aluminum foils bags that fit onto the freezer shelves holding individual accessions. A labeling system to help in locating accessions is established including the freezers and shelves numbers. Given various conservation strategy options, Lesotho opted for Seed banking due to its considerable advantages over other methods of ex situ



*Fig 11: Lesotho National Plant Genetic Resources Centre*

conservation. These include ease of storage, minimal spacing, relatively low labour demands and generally an economically viable and simple method. To ensure

quality of the seed, the latter is dried to suitably low moisture content of less than 5 % according to the international protocols. The seeds are then stored for several years at  $-18^{\circ}\text{C}$  or below without losing viability. The seed DNA however degrades with time and as a result the seeds are periodically replanted and/or fresh seeds collected for another round of long term storage.

Seed collection of crops formally began in the mid-1990s in Lesotho. Since then hundreds of the collected material have been in the custody of Ministry of agriculture and Food Security (MAFS) at DAR. Before then several uncontrolled plant germplasm collections occurred with no trace of the genetic material that were collected, except for the missions that were coordinated by Consultative Group on International Agricultural Research

(CGIAR) centres of which the material can be repatriated if Lesotho decides to do so.

The existence of the gene bank is vital to national efforts to conserve and use crop diversity to respond to National Strategic Development Plan (NSDP) goal (V) "Reverse environmental degradation and adapt to climate change". The Lesotho gene bank as the national repository for genetic resources, is mandated to widen the genetic base in crop improvement by conserving prior to extinction germplasm that seem finite and vulnerable as the best sources of resistance in the prevailing climate menace. This is to curb the severe threats to national and at large world food security. The Lesotho gene bank currently holds and safeguards collections of plants with samples of landraces that have overtime until to date persistently survived a diverse of environmental stress and managed by local

communities as part of their farming systems. The samples are collected from a myriad of remote, isolated locations in the country that still grow traditional crop varieties. These places include Leribe, Thaba Tseka, Maseru and Mokhotlong districts, all of which were mainly rescue missions following the construction of the Katse, Mohale and Polihali dams. The samples are conserved for ease of access and use by plant breeders, researchers for crop improvement. The samples are in addition returned to farmers to maintain the local seed systems of which the largest is the informal sector. The latter is characterized by the use of traditional varieties and to some extent recycled improved open pollinated seed which may have earlier been certified.

By M. Mohloboli

## THE DEPARTMENT OF AGRICULTURAL RESEARCH HOLDS A FIELD DAY IN BERA AND BUTHA-BUTHE

The Department of Agricultural Research (DAR) held a field day in the Northern Districts of Bera and Butha-Buthe. The event was graced by the presence of the Deputy Minister of Agriculture and Food Security Dr Nthabiseng Makoae, the Director of the Department of Agricultural Research; Dr Lefulesele Lebesa, District Agricultural Officers, District Administrators, other Government Officials and Farmers.

The main purpose of the event was to display the different varieties of sunflower and maize that could be used to reduce risks to climate-induced losses in agriculture. In Bera, planted varieties were PAN 3M-01, DKC 73-72, US9723, SN02778, PAN4M-19C and G414; while in Butha-Buthe they were DKC 73-72, PAN 3M-01, SNK 2778, US 9723, PAN 4M-23 and CG 4141.



**Fig 12: Theme of the day:** The Department of Agricultural Research collaborates with Lesotho Adaptation of Small-Scale Agricultural Production Project (LASAP) to mitigate the effects of climate change on field crops.

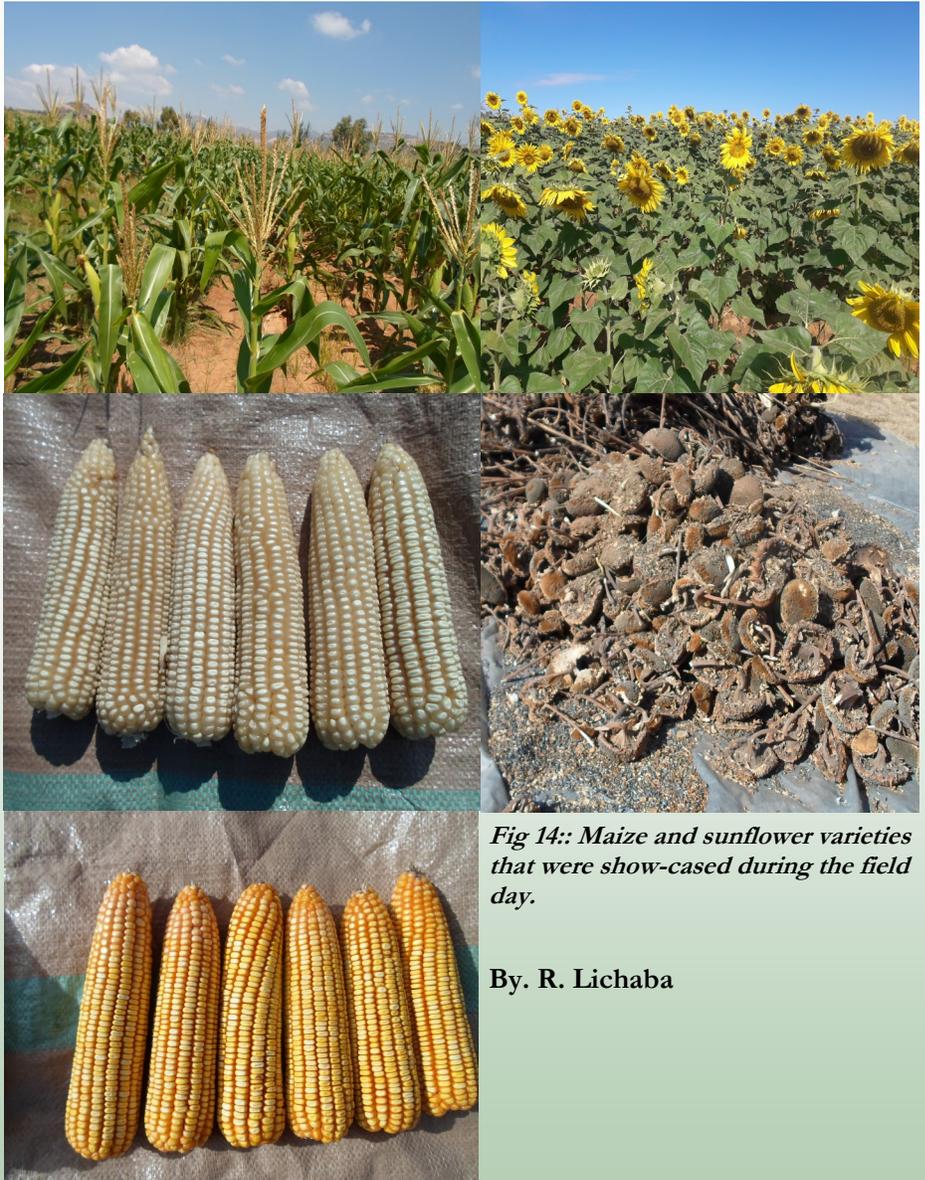
This activity was funded by Lesotho Adaptation of Small Scale Agricultural Production (LASAP) programme under Smallholder Agriculture Development Project (SADP). LASAP is designed to promote resilience in agricultural investments and to build the capacity of Lesotho smallholders to address climate change impacts on agricultural production.

This field was hailed as a milestone within the DAR because these crop varieties were planted under unfavourable weather conditions of severe drought but they still performed well. The idea behind this execution of trials and demonstrations was to test which of the varieties will reach maturity stage earlier than others in the midst of climate change challenges so that the best can be recommended to the farmers.

A farmer representative thanked the Department for the good work done and mentioned how happy they as farmers are of these varieties especially maize that have proven their endurance under the severe dry spell experienced during the previous planting season. He concluded by pleading with relevant stakeholders that these varieties be made available in the local market for accessibility to farmers during coming planting season.



**Fig 13: The Honourable Deputy Minister of Agriculture and Food Security, Dr. Nthabiseng Makoae giving the closing remarks during the field day.**



**Fig 14: Maize and sunflower varieties that were show-cased during the field day.**

By. R. Lichaba

## 9. THE DEPARTMENT OF AGRICULTURAL RESEARCH EMBARKS ON A CLEANING CAMPAIGN

The importance of a clean workplace/environment is that it influences employees' productivity, performance and well-being. Moreover, a clean work environment looks attractive and welcoming to clients and leaves them with the impression of efficiency and strong attention to detail. As such, the staff at the Department of Agricultural Research embarked on cleaning campaign in and outside their premises. The Department's Management initiated this act in an effort to instil the importance of working in a clean environment. This process involves picking up litter, slashing and mowing the grass, sweeping the pavements, picking out weeds tending the roses. This initiative is planned to take place every quarter where the different Divisions that make up this Department are allocated areas within the premises to clean.

**By R. Nchee**



*Fig 15: DAR staff during cleaning campaign*