SADC PLANT GENETIC RESOURCES CENTRE
"Safeguarding plant diversity for sustainable livelihoods
Network News
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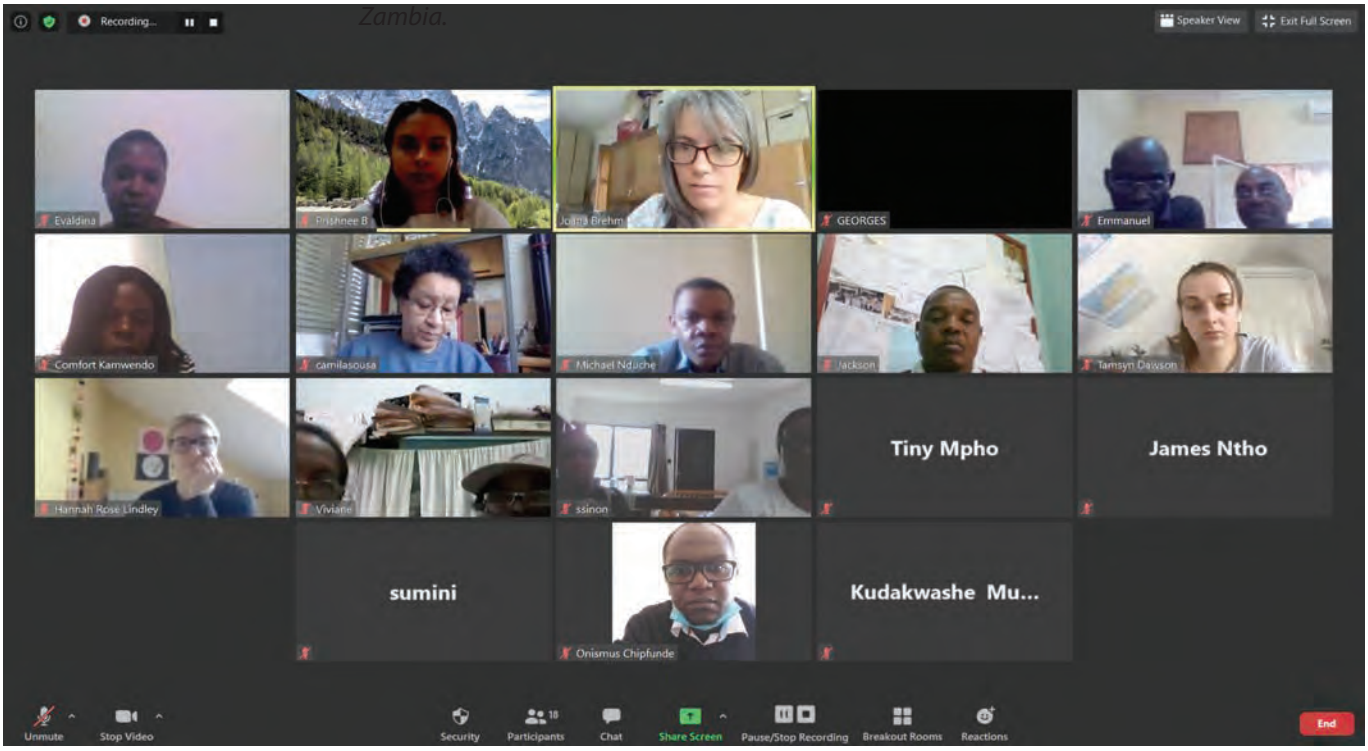
Using Information Communication Technology to enhance Member States capacity building in PGR conservation during the COVID -19 Pandemic new normal:

The Darwin Initiative supported SADC crop wild relatives conservation training goes virtual.

By Mike Daka - SADC Plant Genetic Resources Centre. Plot No. 6300. Chalimbana Research Station. Off Great East Road. Zambia.



The Darwin SADC CWR Virtual Collaborative Meeting

The COVID-19 pandemic undoubtedly has hugely negatively affected the world's economy leading to disruptions in food supply systems and resultantly nutrition status of people. During this unprecedented time, people suddenly had to start learning to live in isolation and survive lengthy lockdowns. Governments had to direct employers to make tough and bold decisions to send all their employees to work from home, a very uncommon practice but vital to avoid any physical contact that would result in the fast spreading of the coronavirus which could potentially lead to complete infection of an entire work force.

Fortunately, Information and Communication Technologies (ICTs) have offered new ways of communicating and exchanging information and knowledge in various sectors of economies during this pandemic including the area of plant genetic resources (PGR) conservation and utilization. Due to technology enablement, most organizations and industries are able to survive even in this tough period by choosing from a wide array of online collaborations and remote working tools such as Zoom, Skype, Evernote, Workplace and GoToMeetings among

Inventory of food plants, vegetable crops and conservation of plant genetic resources in Comoros

To collect the germplasm, the following criteria was taken into account: a local variety bearing the name which has not been collected before, the name of the local variety which had been collected before, but in a different region or presenting different morphological characters, the breeder identifies unusual or interesting characteristics.

After selection, a collection form was completed based on the description of the environment. The genetic material was then collected and labeled from a single plant of each local variety.

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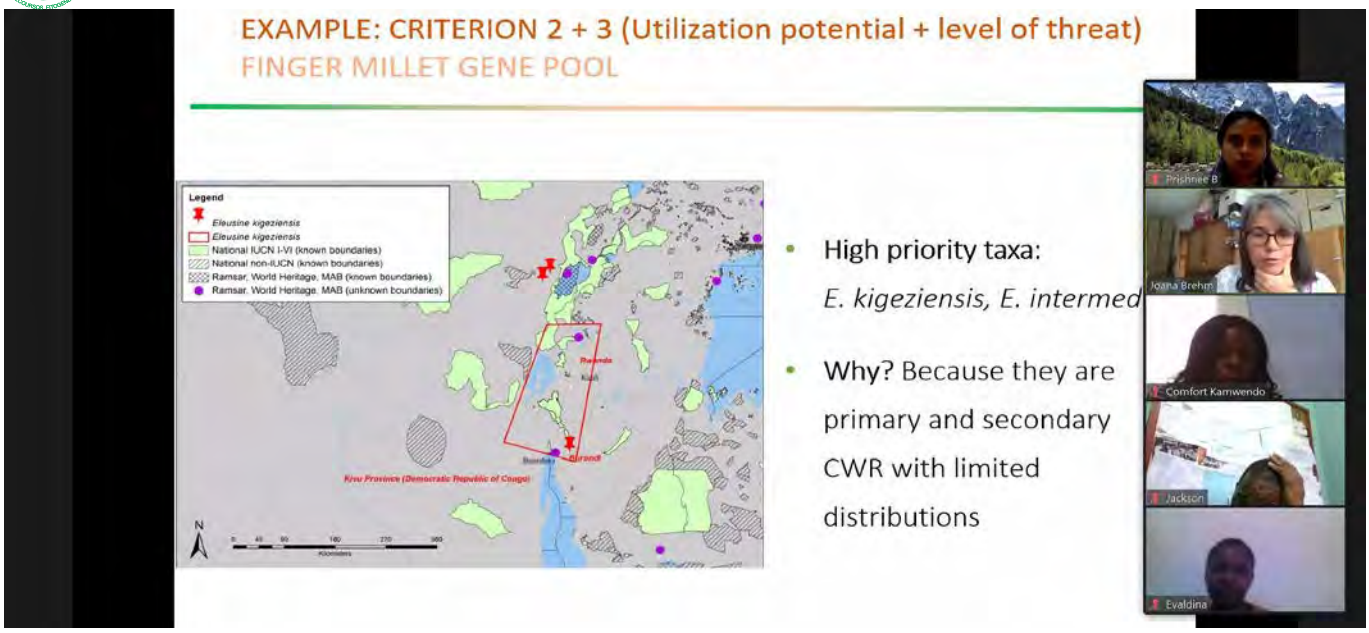

Figure 1: During training session- sharing and exchange of data, information, knowledge, skills, technology and resources was made easy using the Zoom platform (Photo credit: Prishnee Bissessur).

other tools. These and many other cloud-based apps have ensured business continuity during lockdowns and enabled the organizations' workforce that does not require physical presence at the company's premises to work from home (WFH). It is for this reason that the Southern African Development Community (SADC) Secretariat also proactively acquired several Zoom volume licenses, which can support up to 10 regional virtual meetings simultaneously.

The Southern African Development Community (SADC) through its regional centre responsible for coordinating conservation of plant genetic resources, SPGRC, has been using this facility to conduct virtual meetings and collaboration trainings on PGR with various stakeholders. Recently, the preparatory phase of the Training Programme on Crop Wild Relative Conservation (CWR) Planning, under the Darwin Initiative SADC CWR Project was held virtually with participants joining from all SADC member states.

The Darwin Initiative SADC Crop Wild Relative Project, which a is three-year project (2019 - 2022) is a collaborative endeavor between Bioversity International, SADC Plant Genetic Resources Centre and University of Birmingham aimed at enhancing the conservation of CWR, both in their wild habitats in Southern Africa and representation in gene banks to facilitate their conservation and use for improved food security.

The project further aims at strengthening the scientific capacities of national environment conservation scientists, breeders and genebank managers to work in partnership as the effective in situ conservation and use of CWR requires that sufficient knowledge about these resources is collected and documented. The collaborative work will enhance the development of CWR priority checklists, CWR occurrence, ensure that threatened populations of priority CWR are adequately conserved to ensure their availability for use, and that skills and technologies are available to use these resources in research and breeding programmes in Member States.

With the current COVID-19 situation still unresolved, and the day of completely eradicating the virus still uncertain, the future of Agriculture, and PGR conservation work to be specific, clearly lies in embracing Information Technology and using it as a tool for improved sharing and exchange of data, information, knowledge, skills, technology virtually on how best to move forward at national level to achieve sustainable food and nutrition security with limited physical mobility beyond national borders.

Figure 2: A cultivated sorghum plant (left) and it Wild Relative (Right) - (Photo:ICRISAT & Dickson Ng'uni)

Continued from page 1

Inventory of food plants, vegetable crops and conservation of plant genetic resources in Comoros

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ABSTRACT

This study, conducted in some regions of Comoros Island, aimed to take an inventory and characterize some food plants in order to enhence food and nutrition security by improving productivity, coordinating the distribution and increasing the consumption of food products of good nutritional quality through better conservation in gene banks and sustainable use of food plant diversity. The conservation of these crops represents one of the best alternatives to ensuring the safety of Comoros plant genetic resources. To achieve this goal, better knowledge of genetic diversity and mastery of farmer's knowledge is more than essential. Surveys were conducted among producers and villagers in the main growing areas in order to take stock of the varieties commonly used and available local knowledge about them. These studies revealed abundant food plants diversity in the study area which increases the potential for the livelihoods of the community even though the resources face threats from diseases. The number of local varieties used depened on the study area. The study revealed that nationwide, 79 varieties of cassava, 9 varieties of yam, 26 varieties of banana, 12 varieties of taro, 17 varieties of sweet potato, 3 varieties of breadfruit, 6 varieties of pigeon pea are available in Grand Comore Island. Although some varieties have become extinct due to disease pressure, indigenous knowledge systems are helping to improve the livelihoods of communities through increased use of diversified peasant varieties. The study has indicated that conservation of various plant genetic resources plays a critical role in increased exploitation of indigenous crop species, which contribute to food and nutritional security of rural and urban communities.

Key words: plant food diversity, inventory, collection, conservation, gene bank.

INTRODUCTION

Genetic resources for food and agriculture (GRFA), among all their diversity, constitute a strategic breeding ground on which all food production systems depend. The diversity of genetic resources for food and agriculture (plants / crops, animals, aquatic resources, forest genetic resources, microorganisms and invertebrates) plays a crucial role in meeting human food and nutritional needs. It is essential for maintaining and enhancing the efficiency and resilience of production systems, contributing to sustainable diets, and enabling the ecosystem to perform its functions, such as regulating pest and disease populations (FAO). Comoros, a country in the Indian Ocean made up of 4 islands, of which Grand Comore, Anjouan, Moheli and Mayotte remain a rural country. Almost 70% of the population lives directly from agricultural activity. Traditionally, agriculture and animal husbandry have been grouped together on small family farms. Although they have real agricultural potential and the agro-food sector plays a major role in the economy, it is a largely food-deficit island state that imports around 40% of its needs. On this fact, in 2015, in collaboration with the GERMINATION project, the National Research Institute for Agriculture, Fisheries and Environment (INRAPE) started an inventories of food crops (banana, cassava, sweet potato, yam and taro), as well as some legumes and also made morphological characterization of the different varieties of breadfruit available in the country. Ex-situ conservation of certain plants has also started and the selection has been made with regard to some species threatened by extinction.

This study was conducted with the aim of improving conservation of genetic diversity, adopting complementary strategies to sustain ecosystems, promotion of the continued use of RVGAs within them as well as promotion germplasm collections and its ex situ conservation in Comoros.

METHODOLOGY

Study sites

The field survey was conducted in the three islands of Comoros to make an inventory of the different varieties of cassava and other food crops. An inventory of the different varieties of sweet potato, yam, taro and pigeon pea was made in Grand Comore Island. Some collections of the different varieties of banana, cassava, taro, sweet potato and legumes were made on the island of Moheli. Morphological characterization of the different varieties of breadfruit was also done in the Grand Comore Island.

Sampling Strategy and Data Collection

The regions and study villages inspected were chosen following interviews with the directors of the rural and economic development centers (CRDE) in the different regions. Then, contact was made with the various managers of the market gardening sites and the main producers of sweet potatoes, yams, taro, bananas and cassava before leaving the field. The pulse production sites were virtually the same sweet potato production sites. Key informants were identified by CRDE directors while maintaining a balance between gender and age groups. Genetic material (tubers and stems) was collected from participants and passport data recorded in the collection form generated using international morphological descriptors of biodiversity and characterized using morphological characters.

Inventory and collection of genetic material of certain food plants and legumes

The label included the collection number, the local variety name and the village. Photos of each variety collected were taken to include the different parts of the plant, including: whole plant, apical part of the plant with the petioles, single sheet, root, peeled and cut to show all color attributes of the variety.

Setting up collection fields

The seeds collected during the inventory were stored at INRAPE in an ex-situ collection field and are undergoing morphological and agronomic evaluations in order to be able to differentiate them and group them phenotypically and genetically. For cassava, taro and yam, harvesting and collection of data has started. At the same time, the harvested plants were used to renew the collection fields at other INRAPE sites, in particular the Maoueni site and the Simboussa site. Sites for setting up the collection fields were chosen according to the crop history and the type of soil.

RESULTS AND DISCUSSION

The varieties of Cassava collected

Seventy-nine (79) varieties were inventoried and collected at national level, including 41 in Grand Comore Island, 21 in Anjouan Island and 17 in Moheli Island (Figure 1). These local varieties were named by the farmers according to their morphological or agronomic traits and, in some cases, depending on who introduced them to the region or where they originate from.

►The varieties collected are in the process of morphological characterization.

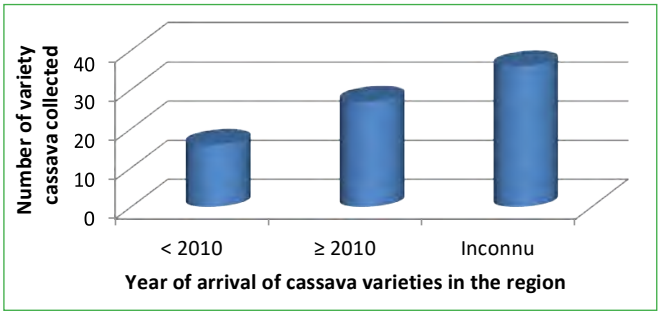

Figure 1: Number of cassava varieties collected according to the year of arrival in the region

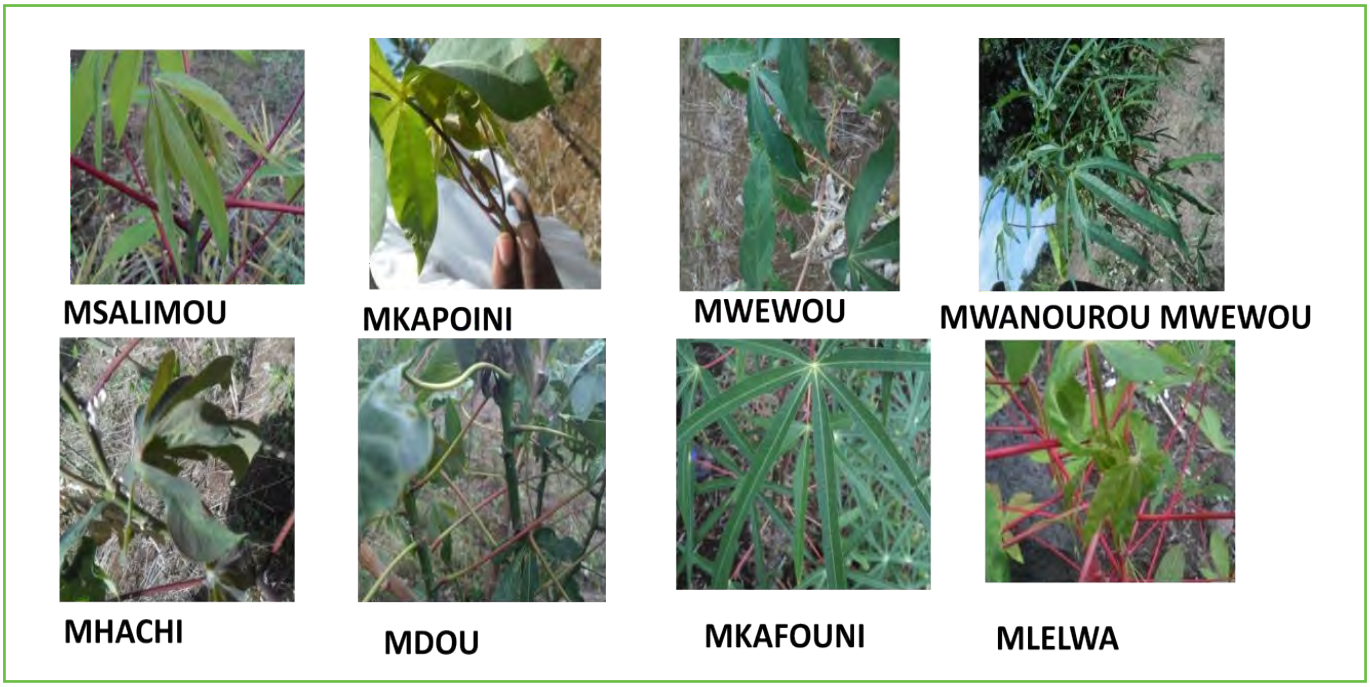

Figure 2: Some varieties of cassava inventoried in Grand Comore island

The varieties of yam collected

At the end of the survey conducted, 9 varieties were collected on the Grand Comore island (Figure 3).

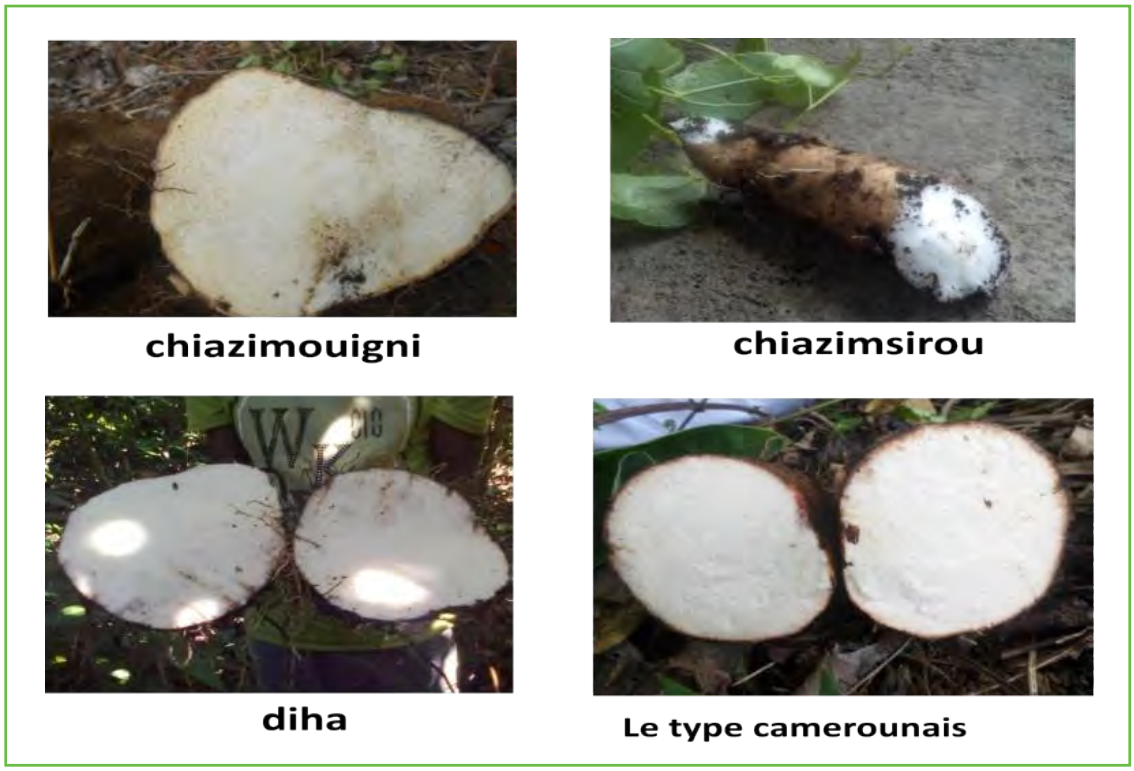

Figure 3: Some varieties of yam inventoried in Grand Comore island.

The varieties of banana inventoried and collected

The collection of the different varieties of banana which was conducted on the Island of Grand Comore made it possible to identify, on the basis of the descriptors and the information received from the producers, 26 varieties (Table 1). The varieties collected are in the process of morphological characterization.

Table 1: The different varieties listed and their local name in Grand Comore island

1. Kontrike	**10. Samba Nkoundre**	**19. Pakalachimanga**
2. Irumbe cheou (vert)	**11. Samba Mouigni**	**20. Ikodo**
3. Irumbe chinkudu (rouge)	**12. Poundrini Nkundre**	**21. Issoukari**
4. Paka	**13. Dimba Msirou**	**22. Barabara msirou**
5. Ikame	**14. Djahavoulwa Ikoudou**	**23. FHIA I**
6. Ikame Nkudre	**15. Mzodjini**	**24. FHIA II**
7.Barabara (Padji Manga)	**16. Ntsounouha**	**25. FHIA III**
8. Padji Ouzi	**17. Gorolo**	**26. FHIA 23**
9. Padji Nkundre	**18. Inconue**	


Kissoukari la asuili


Barabahi djewu


Kontrike

Figure 4: Some varieties of banana inventoried in Grand Comore Island

The varieties of taro inventoried and collected

The inventory revealed 12 varieties of taro from Grand Comore Island. After the collection of the different varieties of taro, morphological characterization in some varieties is in progress.

Fig 5: Some varieties of taro inventoried in Grand Comore island

The varieties of sweet potato inventoried and collected

Seventeen (17) varieties of sweet potato were collected in Grand Comore Island (Figure 6). The most popular and cultivated varieties are: Kadji, Moiirabou 1, Foundi Omar 1 and Abdou mwehamali (Figure 7). Among these varieties collected, some were placed in field collection and morphological characterization has been started.

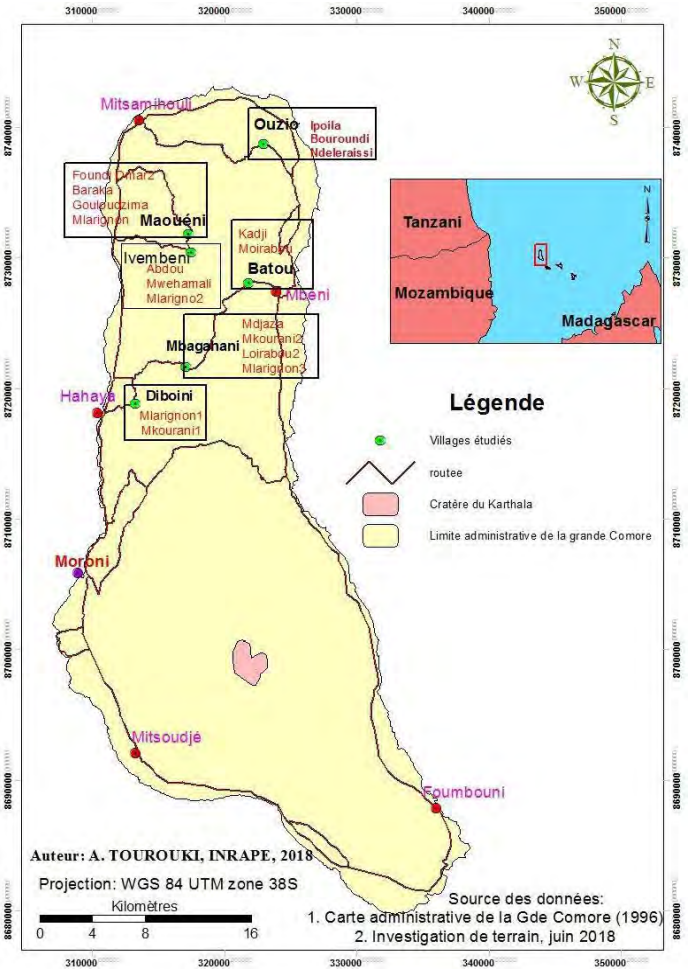

Figure 6: Distribution of sweet potato landraces in the study villages

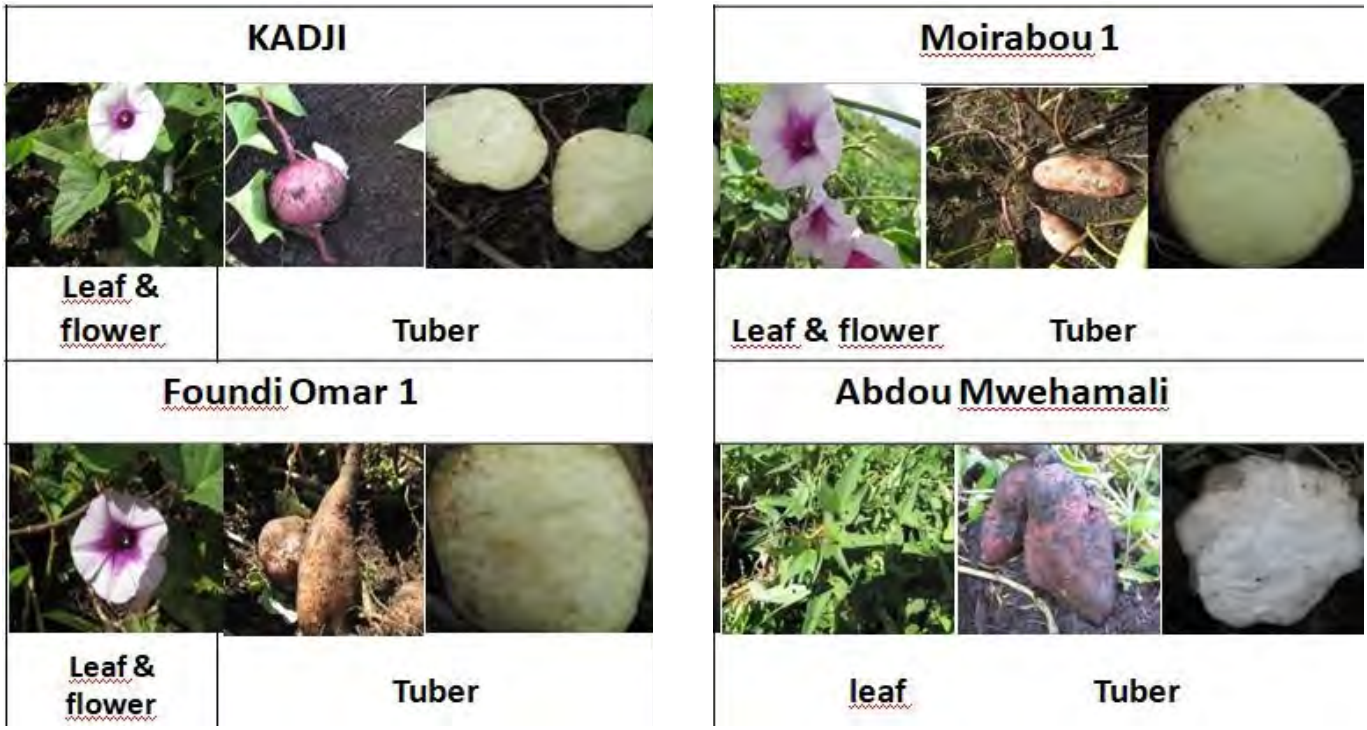

Figure 7: Some varieties of sweet potato inventoried in Grand Comore island

Inventory of different varieties of bread fruit in Grand Comore island

Three (3) varieties of bread fruit were identified (Figure 8). A morphological characterization was made in the field to allow them to be differentiated by using international biodiversity descriptors.

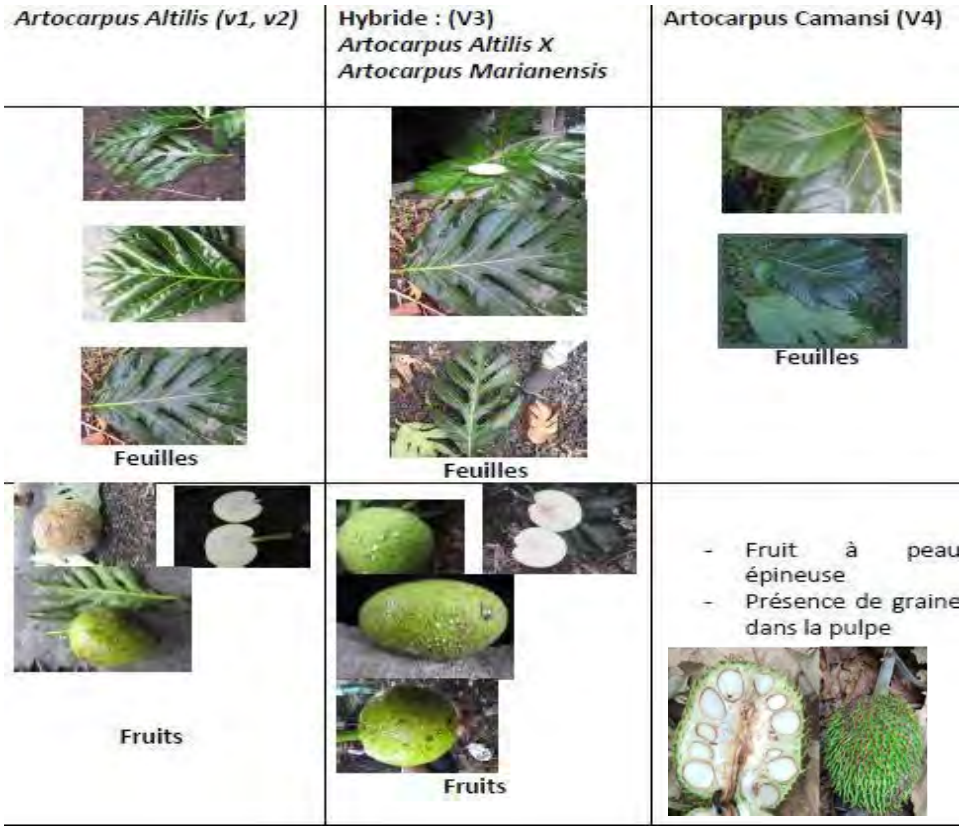

Figure 8: Different varieties of breadfruit inventoried in Grand Comore Island

Different varieties of legumes inventoried

Six (6) varieties of pigeon pea were collected in Grand Comore island (Figure 9). The different varieties are found everywhere in the different production sites.

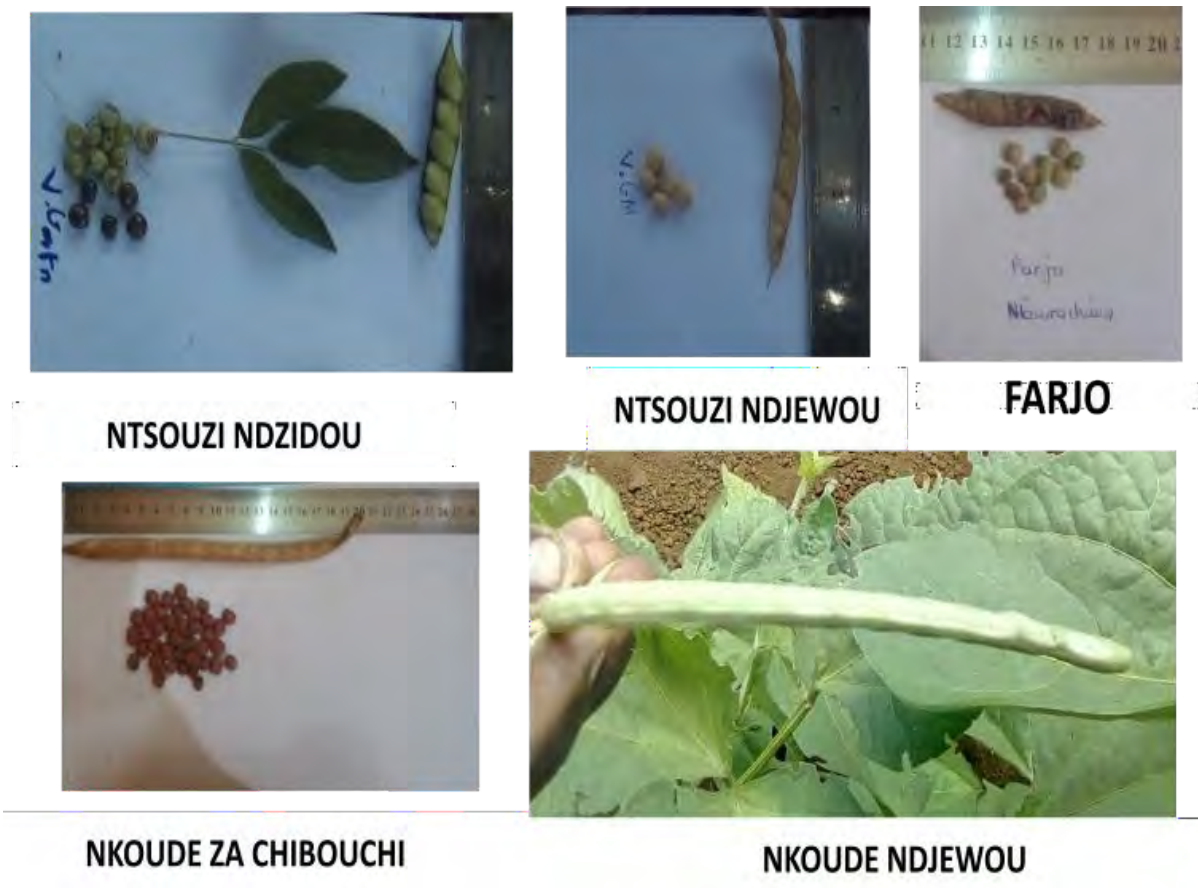

Figure 9: Some varieties of legumes inventoried in Grand Comore Island

Conclusion and Recommendations

- There is a wide diversity in agro-morphological characters between and within some crop local breeds among the collected crops in the study areas (both in number of accessions and in qualitative and quantitative agro morphological traits);
- The named crops have huge potential for the livelihoods of the community, for different purposes, useful characteristics and environmental resilience;
- However, these plant genetic resources face threats of extinction due to underutilization.
- Therefore, popularization of local varieties and their conservation is necessary for the preservation of plant genetic resources in the Comoros.

Outlook

- Others inventories of different varieties of banana, taro, sweet potato, and yam have been conducted on the island of Moheli and morphological and agronomic characterization is in progress.
- A collection and conservation of the same accessions from the island of Grand Comore and Anjouan are planned.
- An inventory, characterization and collection of cash crops (vanilla, ylang-ylang and cloves) in Comoros is planned but are waiting funding.

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Technical Cooperation Programme (TCP) Review - Namibia

Hleni TN Heita and Kahimbi Sikute

Introduction

The SADC Plant Genetic Resources Centre (SPGRC) in cooperation with five (5) SADC member states (Angola, eSwatini, Namibia, South Africa and Zimbabwe) acquired and received funds through the Food and Agriculture Organization (FAO) to address issues of Plant Genetic Resources for Food and Agriculture (PGRFA). Namibia with the National Plant Genetic Resources Centre (NPGRC) as implementing agency became a beneficiary to the SPGRC/NPGRC/FAO Technical Cooperation Programme (TCP). TCP was initiated to assist countries to develop National Strategies and Action Plans for PGRFA and to address capacity needs and link conservation to sustainable use. The project will also develop linkages with the seed delivery systems and extension services in order to provide farmers with the crop varieties they require in the 21st century. The outcome of the implementation is to increase food production and averting the catastrophic impacts of climate change.

The TCP Deliverables in Namibia

Output 1: Development of National strategies for PGRFA

Output 2: Networking and collaborative partnership strengthened

Output 3: National capacities for the conservation and sustainable use of PGRFA strengthened

Output 4: Bridging the gap between SPGRC and NPGRC Collections

Output 1

- Namibia already has a National Strategic Action Plan – Namibia National Strategic Action Plan for Plant Genetic Resources for Food and Agriculture 2016 – 2026 (NNSAP) and it is being implemented.
- With the assistance from the TCP, about 150 NNSAP was printed and 60 were distributed.

Output 2

- Joint Farmer's Field Day organised
- About 40 people attended
- Importance of conserving landraces and the linkages among the breeders, farmers, extension and conservation/NPGRC highlighted
- Farmers showed interest in restoring the lost landraces
- Awareness on the NPGRC raised

Farmer's Field day at Manheim Research Centre, April 2019.

Output 3

Five-days training on plant breeding programs with an Expert from Sudan

Collaborative meeting with breeders and Extension officers-June 2019

Output 4

- Four (4) farmers groups (5 members in each group) were formed
- Two meetings were held in Kavango East and Kavango West regions
- Multiplication and Characterization of agricultural crops were executed

Multiplication and Characterization of crop accessions

Output 2: On-farm meeting in Kavango West region

Output 4: Seed Processing

Output 4: Documentation

Output 4: Harvested crops

Output 4: Processed seed s

Conclusions

TCP Activities were achieved as per FAO, MAWF and SPGRC agreement; seed material (accessions) were sent to the SPGRC; the project ended 31 December 2019.

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Peach fruit germplasm collection in Lesotho

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Lesotho National Plant Genetic Resources Center (NPGRC) is implementing a sub-project titled "**Collection, characterization and conservation of Cassava, Peach trees and Indigenous Leafy Vegetables germplasm in Angola and Lesotho**" under the Agricultural Productivity Programme for Southern Africa (APPSA) project. The objective of this sub-project is to determine the extent of genetic diversity among adaptable species of cassava, peach trees and indigenous leafy vegetables using morphological and genetic markers, thereby enhancing their utilization. Major activities under this subproject include collection, characterization, conservation, documentation and exchange of germplasm.

Collection of peach fruits was scheduled to take place in 10 districts of Lesotho. The activity started in mid-March 2020 covering five districts: Mokhotlong, Botha-Bothe, Leribe, Qacha's Nek and Quthing where a total of 101 fruit samples were collected. Figure 1.1 shows a picture of the collection mission members picking up some peach fruits in Botha-Bothe disctrict. For each sample, a handful of leaves were also collected from the parent tree.

Figure 1.1: Peach germplasm collection in Botha-Bothe district of Lesotho.

This activity was carried out by NPGRC staff in collaboration with officers from the partner institution (National University of Lesotho and Department of Forestry).

The remaining five districts could not be covered due to a total lockdown which was declared as a result of Covid-19 pandemic. Germplasm collection forms were used during the collection expedition to record passport data (Figure 1.2) and indigenous knowledge associated with individual peach samples. Additional information was recorded in the field notebooks and GPS set was also used to record geographic data of collection sites.

Figure 1.2: Documentation accession information provided by the host farmer

By the time the lockdown was eased (in May 2020), it was already off-season for peaches, so it is expected that this activity will continue in the next season. The collected peach fruits were characterized using the IBPGR descriptor list for peaches. Morphological characterization focused on leaf, fruit and stone characters which include, among others, leaf size, leaf shape, fruit colour, fruit type, fruit shape, fruit size, flesh colour, stone size, stone shape, and stone adherence to flesh. Peach seeds (stones) were planted during the cold season at four Research Stations (Siloe, representing Southern Lowlands; Nyakosoba, representing Foothills; Mahobong, representing Northern Lowlands and Molumong representing highlands). Figure 1.3 shows the diversity of the collected peach samples.

Figure 1.3: Peach fruit diversity in Lesotho

SADC Conducts a Regional Workshop on the use of the Web based Regional Database for Plant Genetic Resources Conservation

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SADC, through its institution, the SADC Plant Genetic Resources Centre (SPGRC) has developed a home-grown web-based SPGRC Documentation & Information System (web-SDIS). The system which is now installed and currently being used in almost all SADC Member States' National Plant Genetic Resource Centres (NPGRCs) assists with the management of Plant Genetic Resources (PGR) including facilities, equipment, as well as personnel.

The system is a critical tool in managing data and information on rich biodiversity of the SADC region as it is capable of capturing and sharing data on collected, conserved, evaluated and utilized materials. It further provides information on each sample's passport data and capture its status whilst in the genebank (germination percentage, quantity in conservation) and alerts the genebank manager of actions required, thus, saving the materials from deterioration and/or extinction.

Recognizing the major part documentation work plays in conservation of Plant Genetic Resources, SADC through its regional centre, the SPGRC, continues assisting and supporting stakeholders to improve their capacity to store, manage and share information on PGR in the region. It is for this reason that a regional capacity building documentation and database management (web-SDIS) training workshop was held from 2nd – 7th of March in Johannesburg, South Africa.

The training was all-round and practical-oriented with participants having a hands on experience on data capture, querying and management of their respective country databases. Overall, the training workshop was a huge success as participants were treated to very practical sessions, where real data was inputted into the web-based SDIS system in real time.

Whether refresher or completely new to the system, it is hoped that the skills so acquired will go a long way in enhancing mastery of the web-SDIS, thereby greatly contributing to the improvement of efficiency and effectiveness in PGR data and information management, making data available and sharable with various stakeholders at respective NPGRCs. This in turn help in the conservation and sustainable use of plant genetic resources and contributing to the enhancement of food security and poverty eradication in the SADC region.

Figure 1.1: Head of SPGRC welcomes the workshop participants

Agro-morphological characterization of accessions of local varieties of cowpea [*Vigna unguiculata* (L.) Walp.] anticipating their potential use in Angolan plant breeding programs.

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Abstract
Although cowpea is an important and strategic food legume in tropical and subtropical regions of the world, in Angola it is still little characterized, described and bred crop. The purpose of this study was to carry out a field characterization of 35 accessions of local varieties of cowpea [*Vigna unguiculata* (L.) Walp.] conserved in the gene bank of the Agostinho Neto University Plant Genetic Resource Centre. The study was carried out in the National Seed Service (SENSE) experimental field from June to October 2012. The experiment was set up in a randomized block design with three replicates. The following agronomic characteristics were evaluated: number of days to the onset of flowering (NDF), number of days to maturity (NDM), pod length (COMPV), number of pods per peduncle (NVPD) and number of locules per pod (NLV). The characteristics evaluated were analysed using analysis of variance and the means were compared with the Tukey test at 5% probability. The results revealed significant differences between the accessions for all traits, confirming great variability present among existing local cowpea varieties. This encourages their use in future plant breeding programs.

Keywords: agro-morphological characterization, local varieties, descriptors, cowpeas, plant breeding.

Introduction

The cowpea is a herbaceous dicotyledonous from the family Leguminosae, genus *Vigna* and species *Vigna unguiculata* (Verdcourt, 1970). It is one of the most important and strategic food sources for the tropical and subtropical regions of the planet (Correa *et al*., 2015). Approximately 12.5 million hectares of cowpeas are cultivated around the world of which 8 million (64%) are located in the western and central parts of Africa (Lopes *et al*., 2001; Andrade Júnior et al., 2002; Fall *et al*., 2003). This legume is rich in proteins, carbohydrates and minerals, in addition to having high levels of dietary fibre, whose high consumption allows for a decrease in diseases such as colon cancer, obesity, coronary diseases and diabetes (Vieira, 1983; Grangeiro *et al*., 2001; Andrades Júnior et al., 2002; Fall *et al*., 2003). It plays a useful role in the recovery of soil fertility, is tolerant to high temperatures, low rainfall and adaptable to rustic soils (Fall *et al*., 2003; Lopes *et al*., 2003)
In Angola cowpea is used as food in both rural and urban populations, in combination with cereals, roots or tubers. The leaves, as well as serving as food for livestock, are incorporated into human food, used as mashed green leaves, locally known as "lombi" (Pedro, 2007; David, 2011).

As it is a crop that is poorly described, characterized and improved in Angola, despite having wide genetic variability for practically all the characteristics of agricultural interest, it was proposed to evaluate the existing variability in 35 accessions of cowpea so as to facilitate the selection process of varieties for its improvement (Cruz *et al*., 2004) and highlight some characters strongly related to the productivity of grains, such as the number of pods per peduncle, the number of locules per pod, the number of grains per pod, length of pod, production of grains etc. (Lopes *et al*., 2001).

The agro-morphological characterization was carried out in an experiment using a randomized block design with three replicates. The objective was to characterize accessions of local varieties of cowpea, to identify the variability of agricultural characteristics between accessions and to contribute to plant breeding programs in the country.

Material and methods

The experiment was carried out from June to October 2012 in a National Seed Service (SENSE) experimental field, located in Kikuxi municipality, in Viana, with the following geographical coordinates: Latitude S- 9º 10 '52' ', Longitude W - 13º 14 '50 "and altitude of 135 m (Figure 1.1). The average annual temperature is 24 and 25º C, with a maximum in March of 26º C, coinciding with the maximum rainfall period, and with the minimum of 20.6º C in July and August, (Gadahki, 2001).

The soil is psamitic, the so-called "musseque" soil of the

Figure 1..1: Experiment field layout in 2012

Luanda region. It is characterized by excessive permeability, weak water retaining capacity, low content of mineral nutrients, compactness and very low consistency (Gadahki, 2001).

For the study, 35 accessions of local varieties of cowpea were used, collected from various regions of Angola and conserved in the NPGRC genetic bank. (Table 1).

Table 1. List of accessions of varieties of cowpea, place of harvest and percentage of germination from the NPGRC seed laboratory.

Figure 1.2: One of the 35 accessions in fruit

Accessions	Harvest place		% Germination
	county	Province	
3049	Luau	Moxico	70
3050	Camanongue	"	98
3051	"	"	88
3052	"	"	98
3053	"	"	91
3054	"	"	98
3055	"	"	100
3056	"	"	100
3059	Luena	"	99
3060	"	"	100
3062	"	"	99
3063	"	"	100
3065	"	"	100
3190	Menongue	K.Kubango	92
3191	"	"	94
3192	"	"	94
3193	Cuchi	"	52
3194	"	"	98
3195	"	"	100
3196	"	"	98
3197	"	"	100
3434	Quirima	Malanje	94
3435	"	"	96
2783	Kaombo	"	100
3432	Cuemba	Bié	94
3433	"	"	90
3437	"	"	100
3439	"	"	96
3440	"	"	98
3441	"	"	94
1375	Cubal	Benguela	88
2870	"	"	100
1454	Sumbe	K.Sul	88
1731	Catete	Bengo	92
1764	Ambriz	"	96

The experimental design was composed of a random block with three repetitions. The plots were formed by 35 study rows, each 7 meters long and with two borders rows. The space between rows was one meter and between plants in each row 50 cm. with the last plants at the ends of each row serving as borders. Two seeds were sown per hole and 25 days after sowing, thinning was carried out to leave one plant per hole. A cover fertilizer of ammonium sulphate was carried out 25 days after sowing. Irrigation was carried out using a sprinkler system. Five agronomic characteristics included in the list of descriptors recommended by Bioversity International (2007) were evaluated. They were: number of days to start flowering (NDF), corresponding to the number of days between sowing and the stage at which 50% of each useful area of the row showed the first flowers; number of days to maturity (NDM) counted from sowing to the stage when 50% of the plants in each useful area of the row had mature pods; pod length (COMPV) (cm), referring to the length of 10 randomly harvested ripe pods; number of pods per peduncle (NVPD), obtained by counting the number of pods on the peduncles of 10 plants selected at random; and number of locules per pod (NLV) counted from pods harvested from 10 plants selected at random.

The data was subjected to analysis of variance using the F test and the means were compared using the Scott-Knott test at 5% probability, using the statistical software Assistat.7.7, version 2014 (Silva, 2014). The cluster analysis was performed using the program NTSYS-pc, version 2.1.

Results and discussion

According to the results in Table 2, significant differences were observed between the accessions for all evaluated characteristics. The number of days to start flowering (NDF) ranged from 55 to 69 days with an average of 60 days, with accessions 3062, 3053 and 3056 showing earlier, while accession 1764 was the latest with 69 days. It is important to note that the early varieties are more likely to escape from adverse situations such as droughts that frequently occur in semi-arid areas, and which can impair their development, as they are less exposed to these storms (Ehlers and Hall, 1997) and (Borges *et al*., 2013).

As for the number of days to maturity (NDM), it was found that accessions ranged from 79 to 89 days with an average of 85 days. Classified for the cowpea cycle in tropical conditions, as medium-late (Andrade Júnior *et al*., 2002), a characteristic that, according to the same authors, is noted in local varieties. However, accesses 1375, 1454, 1731 and 1764, had already presented in a previous study carried out by Pedro (2007), greater precocity with an average of 64.75 days corresponding to the early cycle. It is assumed that the current behaviour may have been influenced by the difference in the texture of the soil in which the two experiments were carried out, (sandy-clay soil in the first and sandy soil in the second test) and by the fact that the first one was carried out in October/06 to January/07 and the second in June to September/12, in a similar climatic region.

The evaluation of the average length of the pods (COMPV), varied from 15.40 to 21.27 cm (Table 2). The pods with the highest average lengths were observed in accessions 1764 and 3434. Most accessions have a pod length of around 18 cm, being one of the characteristics of local varieties, according to Andrade Júnior *et al* (2002). However, this pod size is below the commercial standards, that according to Torres *et al*. (2008) is over 20 cm in length.

The number of pods per peduncle (NVPD), gave results that varied between 3.20 to 1.83 and an average of 2.39 pods, with accession 3054 presenting plants with a greater number of pods on their peduncles. According to Lopes *et al*, (2001), the NVPD character, despite being an important yield component, is highly unstable, having limited genetic variability, with 2 to 3 pods per peduncle. Regarding the number of locules per pod (NLV), accessions 1375 and 2870 stood out with 19 and 18 locules respectively, while for other accessions it varied from 12 to 17 locules and the average was 15.34 pods.

The cluster analysis constructed from the 35 accessions evaluated (agro-morphologically) (Figure 1), shows the diversity found in these accessions, particularly with emphasis on the first group which includes just one accession (1764), from the Bengo province.

Table 2. Means obtained from the variable number of days to start flowering (NDF), number of days to physiological maturation (NDM), pod length (COMPV), number of pods per peduncle (NVPD) and number of locules per pod (NLV) obtained from the evaluation of 35 accessions of cowpea.

Accessions	Agranomic characteristics				
	NDF (days)	NDM (days)	COMPV (cm)	NVPD (unit)	NLV (unit)
3056	55.67 d	82.67 b	15.53 d	2.50 a	14.43 c
2783	56.67 d	79.00 b	17.17 d	2.80 a	16.13 b
3440	57.67 c	88.67 a	16.47 d	2.07 b	12.93 d
3050	58.33 c	81.33 b	17.87 c	2.67 a	16.83 a
1454	62.67 b	87.34 a	17.73 c	1.83 b	15.50 b
3065	58.67 c	80.00 b	17.60 c	2.80 a	16.80 a
3439	61.00 b	81.00 b	18.27 c	2.47 a	16.90 a
3196	61.00 b	86.33 a	19.50 b	2.03 b	13.63 d
3197	60.67 b	87.67 a	18.33 c	1.90 b	13.23 d
2870	62.33 b	84.00 b	18.03 c	2.37 a	18.07 a
3052	62.00 b	82.00 b	18.33 c	2.60 a	17.27 a
3054	59.00 c	83.00 b	16.70 d	3.20 a	15.87 b
3193	59.67 c	88.33 a	16.53 d	2.20 b	12.77 d
3063	58.00 c	83.67 b	16.03 d	2.90 a	16.17 b
3049	60.67 b	82.00 b	16.90 d	2.43 a	16.60 b
3441	60.00 b	87.33 a	18.00 c	2.17 b	13.77 d
3437	59.33 c	86.67 a	17.37 d	2.60 a	14.70 c
3055	60.00 b	82.00 b	17.70 c	2.90 a	17,20 a
3194	61.67 b	89.00 a	18.03 c	1.90 b	12.57 d
3434	64.00 b	89.00 a	20.77 a	2.00 b	16.20 b
3191	59.00 c	86.67 a	18.30 c	2.23 b	13.80 d
1375	59.00 c	81.00 b	16.97 d	2.63 a	18.60 a
3062	55.00 d	83.00 b	16.70 d	2.60 a	16.07 b
3192	61.67 b	87.00 a	17.77 c	2.57 a	14.90 c
1731	59.33 c	85.00 a	18.73 c	2.47 a	15.70 b
3060	59.33 c	82.00 b	17.03 d	2.57 a	17.43 a
3435	59.00 c	85.33 a	17.83 c	2.70 a	14.43 c
3053	55.00 d	84.33 b	16.10 d	2.53 a	15.83 bi
1764	69.00 a	88.00 a	21.27 a	1.93 b	16.00 b
3432	61.00 b	88.00 a	17.93 c	2.37 a	14.40 c
3195	61.00 b	88.67 a	16.27 d	1.93 b	15.07 c
3059	56.00 d	83.67 b	15.77 d	2.80 a	15.33 b
3433	61.33 b	88.33 a	17.63 c	2.16 b	13.60 d
3190	58.00 c	86.33 a	16.90 d	1.93 b	12.30 d
3051	61.00 b	82.00 b	15.40 d	2.40 a	16.03 b
Means Test F	59.88 4.60 **	84.87 6.18 **	17.53 6.29**	2.40 3.73 **	15.34 8.12 **
CV%	3.64	2.44	5.06	13,02	6.44

The averages followed by the same letters in the column do not differ statistically from each other, at the level of 5% probability, using the Scott-Knott test. ** significant at 1% by the F test.

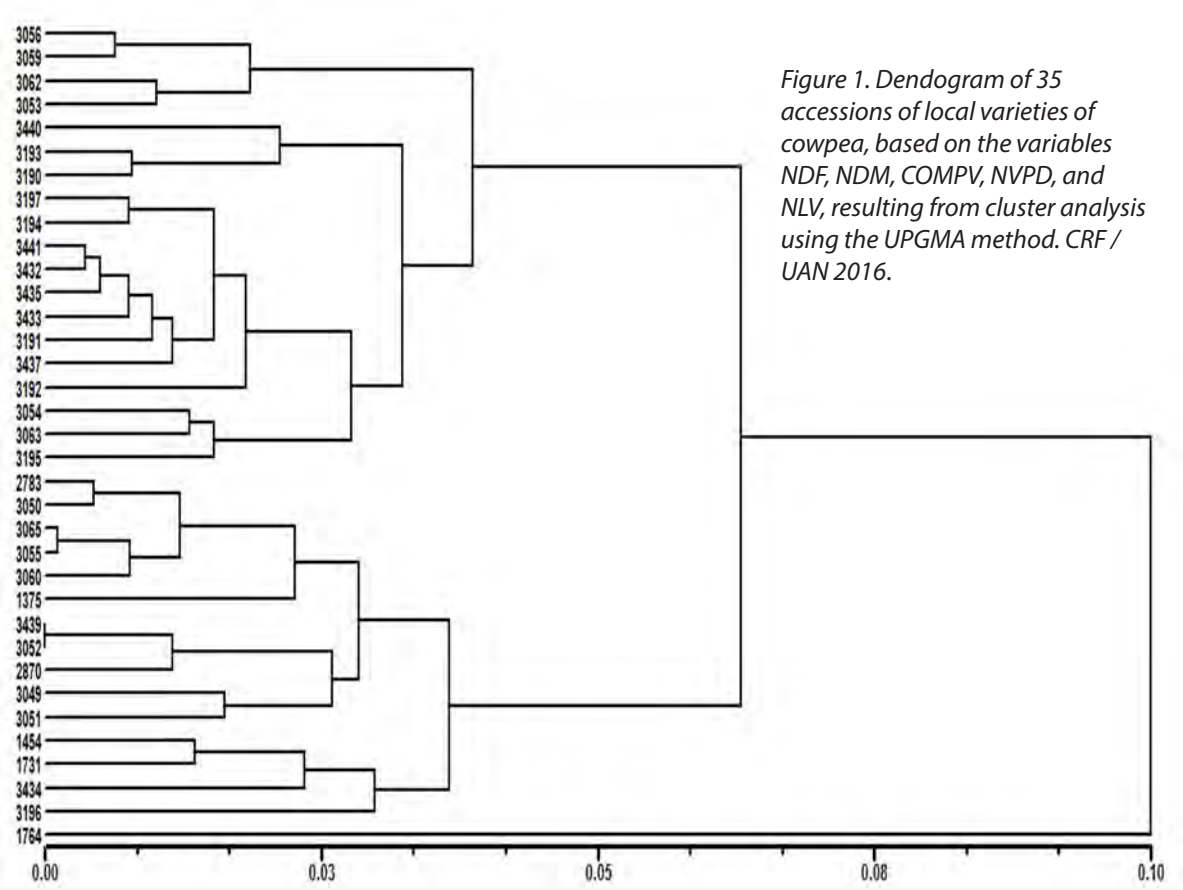

Figure 1. Dendogram of 35 accessions of local varieties of cowpea, based on the variables NDF, NDM, COMPV, NVPD, and NLV, resulting from cluster analysis using the UPGMA method. CRF / UAN 2016.

Conclusions

Considerable genetic variability was observed between 35 cowpea accessions from various localities conserved in the gene bank of Agostinho Neto University Centre for Plant Genetic Resources. However, further studies are recommended, using a greater number of agro-morphological descriptors and evaluating genetic diversity with molecular markers.

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Zambian NPGRC Receives Shot in the Arm

By Tembo Masiye
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The National Plant Genetic Resources Centre (NPGRC) in Zambia recently received a wide range of laboratory equipment and instruments to help boost its PGR conservation programme. The equipment was procured through the World Bank-sponsored Agricultural Productivity Programme for Southern Africa (APPSA), a regional project whose implementation tenure concluded on 31st January, 2020.

APPSA was a six-year project, initially implemented in the SADC countries of Malawi, Mozambique and Zambia (Angola and Lesotho joined much later), with Zambia being the regional centre of leadership (RCoL) on food legumes. Through the project, service delivery in terms of germplasm collection, agro-morphological characterisation, evaluation and regeneration and multiplication for the Zambian NPGRC was significantly enhanced.

Among the equipment and instruments acquired by the genebank were 10 Bosch and 2 Samsung freezers, a germination chamber, a seed counter, 13 laboratory test sieve plates, an oven, a beam balance, a 750L gram chest freezer and a bag sealer. We would like to thank our partners in PGR conservation for this valuable donation.

Below are some of the equipment and instruments procured:

Nuve germination chamber

Laboratory Test Sieves

Oven

Elmor C1 Seed Counter

One of the newly acquired 550L Samsung Freezers

Covid-19 induced threat to crop diversity in Southern Africa

By Justify Shava, SADC Plant Genetic Resources Centre. Plot No. 6300. Chalimbana Research Station. Off Great East Road. Zambia.

Plant genetic resources (PGR) are a resource of immeasurable value to humanity. They are a direct source of diverse national needs for people and their livestock and also as a source of crop variability that is required in the area of plant breeding that results in new crop varieties available to farmers. Plant genetic resources are a source of novel genes with a potential to provide resistance to common challenges being faced by the modern farmers such as salinity, drought, new forms of pests and diseases as well as low nutritional content. Because of immense variability resident in plant genetic resources' genetic make-up and the high potential of gene recombination to bring about new plant characters, plant genetic resources have the potential to solve even emerging future problems in the field of agriculture. Since the beginning of agriculture, plant genetic resources have been resident in farmers' fields and farmers' granaries. Farmers are, therefore, the owners of crop diversity that the world uses to achieve different objectives. However, over the years, we have witnessed severe threat to crop diversity and measures were put in place to conserve it. One notable achievement in Southern Africa is the establishment of the SADC Plant Genetic Resources Centre (SPGRC) by the 16 Southern African Development Community Countries (SADC) to coordinate the regional plant genetic resources conservation efforts. As an effort set up to work against the negative effects of climate change and other related causes of plant genetic resources diversity loss, there was success until now when a new dimension of threat has emerged – Covid - 19.

The Covid - 19 pandemic induced lockdowns and resultant food insecurity

The Covid – 19 pandemic which began in Wuhan China and spread to the rest of the world reached Southern Africa in March 2020. In an effort to reduce the rate of spread of the virus, SADC Member states put in place measures that included lockdowns and travel restrictions among citizens. The intensity of the measures differed from one-member state to another but it has been noted that these measures had the listed below effects on plant genetic resources conservations in the SADC region.

a) **Loss of crops in farmers' fields**

The spread of Covid -19 to Africa saw many countries in the SADC region enforcing measures that were aimed at reducing the spread of the disease. Many countries instituted lockdowns where citizens were confined to their homesteads. In many cases, farmers could not move meters away from their homes to attend to their crops in distant fields. Many crops were, therefore, lost to pests and diseases in the fields and this represented a sizeable quantity of plant genetic resources lost. Since crop diversity starts in the farmers' fields, a loss in farmers' crops in the field implies considerable losses plant genetic resources.

b) **Depletion of stored grain and vegetative crops**

Farmers keep reserve seed of various crops in their granaries. Travel restrictions to look for food forced families to consume whatever food reserves available in their store. This has resulted in some families remaining with nothing as food reserves. Even some vegetatively propagated species that are kept as seed material for future cropping ended up being consumed. This narrowed the crop diversity available in communities.

c) **Plant genetic resources collection missions halted**

The period of Covid -19 lockdown intensification in Southern Africa coincided with the time of the season when collection missions in rural and farming communities are conducted. Lockdowns prevented the plant conservationists from conducting scheduled plant genetic resources

collections missions in which many accessions are either rescued from extinction or are simply collected for central storage in national facilities management by governments and accessible to all users. In the SADC, at least 1000 accessions are collected in the 16 member states.

d) **Plant genetic resources abandoned in the field at national genebanks**

Directives to halt operations and start lockdown processes was announced abruptly and there was no time to put measures in place to safeguard plant genetic resources in the field. This resulted in losses of some accessions from pest diseases and other predatory attacks such as monkeys, birds and other species feeding on plants. Thefts by nearby food insecure communities also increased the losses.

e) **Plant Genetic resources conservation equipment**

In SADC Member States, plant genetic resources are stored in the genebanks where seeds are packed in freezers or cold rooms all powered by electricity. The SADC region has been experienced power outages for some time now and loss of power may have resulted in non-functioning of storage equipment and loss of viability for some crop accessions in genebanks.

Recommended measures to be taken by Member States to halt intense PGR loss during the lockdown period

1. **Provision of social safety nets**

   Most of the loss in plant genetic resources in farming communities is a result of food shortages experienced by community members. Creating social safety nets to support vulnerable communities ensures that they have food and allow them to keep their usual reserves which form part of the genetic resources to collected and stored after the pandemic.

2. **Supervised farmer field crop management**

   It is recommended that farmers with crops in the fields be allowed to monitor their crops adhering to strict social distancing so that their crops do not get lost to different forces. A time table for attending to their crops can be set up and monitoring be done through community leaders where security services cannot access,

3. **Issuance of passes to genebank employees**

   Though in some member states, special passes were issued to essential staff who occasionally monitored plant genetic resources in research centres and national genebanks, in son e countries no arrangements were made to safeguard the genetic resources in the fields and those in storage facilities. It is recommended that arrangements be put in all member states to have reserve staff members to monitor PGR during the lock down period.

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Notice to Readers

Our New Email:

Following upgrading of ICT infrastructure and communication systems, our emails moved to the SADC Domain:

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