

Advancing Regional Food Security: SADC Establishes Field Genebank in Seychelles



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LESOTHO Support to community-based management and sustainable utilisation of plant genetic resources for food and agriculture

In an endeavour to support community-based management and sustainable utilization of plant genetic resources for food and agriculture, the National Plant Genetic Resources Center and the Seed Development Unit of the Department of Agricultural Research facilitated a joint training on seed selection and germplasm collection for farmers and student interns from the National University of Lesotho and Lesotho Agricultural College attached at Southern Mountains Association for Rural Transformation and Development (SMARTD).

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MAURITIUS: Beyond Storage: How Seed Gene Banks Support Research, Farmers, and Future Crops

Seed gene banks are often perceived simply as secure storage facilities where seeds are preserved in cold rooms or vaults. While long-term conservation being a core function, the role of the National Seed Gene Bank of Mauritius extends far beyond storage. It is an active, dynamic institution that supports agricultural research, strengthens farmers' resilience, and safeguards the future of food production and security in the country.



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Advancing Regional Food Security: SADC Establishes Field Genebank in Seychelles

In December 2025, the SADC Plant Genetic Resources Centre (SPGRC) conducted a mission to Seychelles to provide technical support on germplasm collection, establishment of a Field Genebank and documentation of field genebank crops at the Seychelles National Plant Genetic Resources (NPGRC). This technical support was because of the gap identified during the last planning and review meeting to enhance management and conservation of plant genetic resources across the islands. The Seychelles National Genebank is currently managing only vegetative propagated crops which includes Cassava, Sweet Potatoes, and yams.

The objective of the mission was to strengthen the national capacity in germplasm collection, field Genebank establishment and documentation, while ensuring that national activities are harmonized with SPGRC's regional strategies. Specific objectives were to:-

- i. conduct training on In-Situ PGR conservation, germplasm collection and documentation,
- ii. conduct a PGR collection mission with the Seychelles NPGRC team,
- iii. support the Seychelles NPGRC to establish a field genebank at the research centre.
- iv. fully document all planted material in the genebank in the SDIS

The In Situ Conservation training covered all aspects of PGR management including germplasm collection, documentation in the cloud hosted SDIS, sampling techniques, and field genebank establishment.

Following the training, the joint SPGRC - Seychelles NPGRC team conducted a germplasm collection mission in the Val d'Endor region in the south of Mahé Island. Over 50 farmers were visited during germplasm collection exercise. A total of 33 new accessions were collected, consisting of cassava, sweet potato, yam, and cocoyam varieties.



All collected accessions were registered in the SPGRC Documentation and Information System (SDIS), planted at the Crop Research Station field genebank where they will be conserved and evaluated, and banked in the SDIS.

On the final day of the mission, a debriefing meeting was held at the Soil and Plant Diagnostic Laboratory with the Principal Minister for Fisheries, Agriculture and Blue Economy Mr. Wallace Cosgrow and the Principal Secretary for Agriculture



Mr. Keven Nancy. The meeting provided an opportunity for the Chief Agricultural Scientist of the Agriculture Department and the SPGRC officers to brief the Minister on the outcomes of the mission and the way forward. The Minister expressed deep appreciation for SPGRC's long-standing partnership and reiterated the Government's full support for initiatives that contribute to safeguarding national agricultural biodiversity. He emphasized the importance of continued collaborative work as Seychelles expands its plant genetic resources collection efforts.

The mission was a success as it enabled SPGRC to provide technical support to the Seychelles National Plant Genetic Resources Centre to establish a field genebank and thereby ensuring protection of plant genetic diversity in Seychelles.

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LESOTHO

Support to community-based management and sustainable utilisation of plant genetic resources for food and agriculture

By M. Sefotho and M. Selikane

In an endeavour to support community-based management and sustainable utilization of plant genetic resources for food and agriculture, the National Plant Genetic Resources Center and the Seed Development Unit of the Department of Agricultural Research facilitated a joint training on seed selection and germplasm collection for farmers and student interns from the National University of Lesotho and Lesotho Agricultural College attached at Southern Mountains Association for Rural Transformation and Development (SMARTD). The training sessions took place at two locations, Ts'enekeng, Semonkong, in Maseru District and Ha Tlhaku in Quthing district; while germplasm was collected from these villages and the neighbouring villages. The two locations are among the areas where SMARTD is operating and were designated for establishment of community seedbanks. They are found in very remote areas of the country where farming conditions are extremely harsh, at an elevation range between 2084m and 2382m.

Objectives of the training

This initiative was intended to empower SMARTD staff, farmers and students with the skills and knowledge necessary to select the best seeds for the upcoming cropping season from their produce and to familiarize them with the process of germplasm collection and compilation of the associated information.

Key activities

Brief overview: the farmers and students were sensitized on the operations of both the Seed Development Unit and the NPGRC, the importance of seed selection for the next cropping season and germplasm conservation for present and future generations.

Demonstrations: hands-on practical sessions were conducted both in the field (during harvest) and on-farm (after harvest) as shown in figures 1 and 2.



Figure 1 Seed selection briefing by Mrs Selikane at Ha Tlhaku



Figure 2 Demonstration on area of seed selection in the field by Mrs Mabea at Ts'enekeng

Seed selection practical: Seed selection was done through direct observation in the field. Seed was chosen from the best performing true-to-type plants for improved population traits and uniformity. Seed was also collected from healthiest, most vigorous plants in the middle of the field.

For maize characteristics considered were:

- Good cob size/ ear length
- Solid husk cover
- Number of rows/plants
- Number of kernels per row
- Alignment/ arrangement of the kernels
- Quality of ear filling

Farmers and students were asked to select 5 cobs in the fields looking at the desired traits; this was followed by comparison of the characteristics of the seed ears selected by farmers, as shown in figures 3.



Figure 3 Farmers and students selecting for desirable traits from the maize field

For other crops such as beans, peas, characteristics considered were:

- Disease free,
- Uniform seeds in terms of size,
- Colour,
- Free from cracks,
- Shrivelling and discolouration
- Glossy/ healthy looking coats,
- Dense and firm,
- True-to-type seeds

Germplasm collection exercises: germplasm was collected from all seeds which were used in practical sessions, from farmers who were members of SMARTD. The collection was from diverse crop varieties, learning how to record passport data using germplasm collection forms, maintaining genetic integrity and preparing samples for storage; see figures 4 and 5.



Figure 4 Mrs Sefotho capturing germplasm passport data at Ts'enekeng

Outcomes and impact

Knowledge exchange: staff from both institutions shared experiences on challenges such as genetic erosion, climate change impacts and the need for resilient crop varieties.

Enhanced technical skills: farmers gained practical knowledge that will improve their seed selection practices and on-farm conservation strategies. For students, this training was an eye opener; it highlighted the importance of preserving genetic diversity, giving them insights on how genebanks safeguard future food security. They were able to connect seed development with plant breeding, biotechnology and climate resilient research.

Conclusion

This training strengthened institutional linkages between the two institutions, SMARTD and the Department of Agricultural Research through its Seed Development Unit and the National Genebank. It fostered spirit of cooperation, ensuring that seed development and genetic resources conservation are aligned with farmer management practices. The training also laid a strong foundation for sustainable food systems and resilient farming communities.



Figure 5 Diverse crop varieties collected

MAURITIUS: Beyond Storage: How Seed Gene Banks Support Research, Farmers, and Future Crops

By Parvatee Devi Luckho, Hemisha Ujoodah, Vedvyass Syam Mudhoo, Indraneel Buldawoo and Reyaz Allamamaly

Mauritius, like many small island developing states, faces increasing challenges related to climate change, land scarcity, occurrence of pests and diseases, and a high dependence on imported food. In this context, conserving and utilising plant genetic resources is not a luxury but a necessity. The National Seed Gene Bank plays a critical role in ensuring that valuable crop diversity is not lost and remains available for present and future generations.

Conserved accessions contain a wide range of genetic traits such as resistance to drought, salinity, pests and diseases and adaptability to local environmental conditions. These traits form the foundation for genetic studies, crop improvement and conservation planning. In this context, the gene bank actively supports academic research by facilitating access to conserved material. In 2025, 21 tomato accessions, 18 chilli accessions and 29 sweet potato accessions were distributed under the Standard Material Transfer Agreement (SMTA) to university students for research purposes such as morphological and molecular characterisation studies. This will contribute to a deeper understanding of crop diversity and strengthening national research capacity.

In addition to academic research, the seed gene bank also supports formal varietal evaluation. Between 2022 and 2023, a total of six accessions were distributed to the National Plant Variety Seed Office (NPVSO) for Distinctness, Uniformity and Stability (DUS) trials, with two accessions provided in 2022 and four in 2023. This collaboration strengthens the national seed system by supporting the testing, registration of plant varieties and the development of improved planting material suitable for local conditions.



Free distribution of seeds and awareness campaign by NSGB staffs at Salon de l'Alimentation et du Bien-être 2025 (left) and World Food Day event in 2025 (right)

The seed gene bank also provides tangible benefits to farmers and the wider public. Traditional and locally adapted varieties often perform better under low-input and stress-prone conditions than uniform commercial varieties. By maintaining and distributing these accessions, the gene bank helps farmers access resilient planting material suited to local environments. For farmer use and public engagement, a total of 63 accessions were distributed. This included four field accessions supplied directly for cultivation and 22 seed accessions distributed to the general public for backyard gardening during World Bee Day on 20 May 2024.

Public engagement efforts were further strengthened during World Food 2025 which was held over a three-day period from 16 to 18 October. During this event, more than 1500 packets of seed, representing a total of 37 accessions were distributed to the public. This initiative promoted household food production/ kitchen gardens while raising awareness on conservation of local varieties and traditional knowledge.

Seed production and regeneration are another critical aspect of gene bank operations. Seeds are living organisms whose viability declines over time if not carefully monitored. Regular germination testing and regeneration ensure that conserved accessions remain viable and available for future use. In 2023, one chilly accession namely "Chilly Piment Carri" was distributed for seed production at Barkly Experiment Station, supporting seed multiplication and the long-term availability of quality planting material to farmers and general public.



Chilli accessions plantation for morphological and molecular characterisation studies by University students

Additionally, in 2025, a total of 36 seed accessions were issued by the seed gene bank and sent for regeneration and multiplication under field conditions. These accessions were allocated to two outstations under the Ministry of Agro-Industry, Food Security, Blue Economy and Fisheries, namely the Albion Experiment Station and the National Field Gene Bank situated at Nouvelle Decouverte, to ensure the maintenance of seed viability and adequate quantities for future research, distribution and conservation activities.



Bokla accession plantation on outstation for regeneration and multiplication programme

Beyond its technical role, the seed gene bank also safeguards agricultural heritage and traditional knowledge. Many conserved accessions are closely linked to traditional farming practices, food cultures, and local knowledge systems. By documenting the origin, characteristics, and uses of each accession, the gene bank preserves both biological diversity and the cultural knowledge associated with it. This information is valuable for education, research, extension services and community-based conservation initiatives.

In conclusion, the National Seed Gene Bank of Mauritius is far more than a storage facility. It is a strategic asset that supports research, empowers farmers, preserves agricultural heritage, and builds resilience for the future. By conserving and actively managing plant genetic resources, the gene bank ensures that Mauritius is better equipped to face environmental uncertainty and safeguard its food systems. Therefore, investing in and strengthening seed gene banks is an investment in sustainable agriculture, food security, and national resilience for future generations.

SADC: SADC Duplicates Germplasm at the Svalbard Global Seed Vault



The Southern African Development Community (SADC), through the SADC Plant Genetic Resources Centre (SPGRC), has once again contributed to global food security by depositing a new consignment of 1,383 seed accessions to the Svalbard Global Seed Vault in Longyearbyen, Norway.

This marked SADC's continued commitment to safeguarding the region's agrobiodiversity and ensuring the long-term conservation of vital traditional and indigenous crops; including rice, sorghum, pigeon pea, sunflower, and groundnut collected from across the 16 SADC Member States.

The Svalbard Global Seed Vault, often called the world's "Doomsday Vault," serves as a global back-up facility for genebanks worldwide. SADC joined 20 other genebanks at the 68th deposit event on 22 October 2025 and in February 2026, contributing to more than 21,000

seed samples safely stored deep within the Arctic permafrost.

Through this milestone, SADC continues to strengthen its partnership with the Crop Trust,

NordGen, and the Government of Norway, ensuring that the region's crop diversity remains protected and accessible for future generations.



SEYCHELLES:

Seychelles Strengthens National Germplasm Collection through SPGRC Technical Support Mission

By Roy Govinden

The Agriculture Department of Seychelles, in collaboration with the SADC Plant Genetic Resources Centre (SPGRC), successfully implemented a week-long Training and Technical Support Mission on Germplasm Collection and Documentation from 24–28 November 2025.

The mission was facilitated by SPGRC technical officers Ms. Tilabilenji Phiri, Mr. Kasonde Mubanga, and Mr. Ferdinand Mushingi, who provided hands-on guidance to national staff on germplasm collection methodologies, documentation procedures, sampling techniques, and field genebank establishment.

The programme commenced with a full day of theoretical training, followed by joint field activities involving officers from the Crop Research Unit, Tropical Fruit Nursery and Root Crop Unit, Soil and Plant Diagnostic Laboratory, and Extension Services. This capacity-building exercise builds on previous SPGRC support missions aimed at strengthening Seychelles' National Plant Genetic Resources Centre.

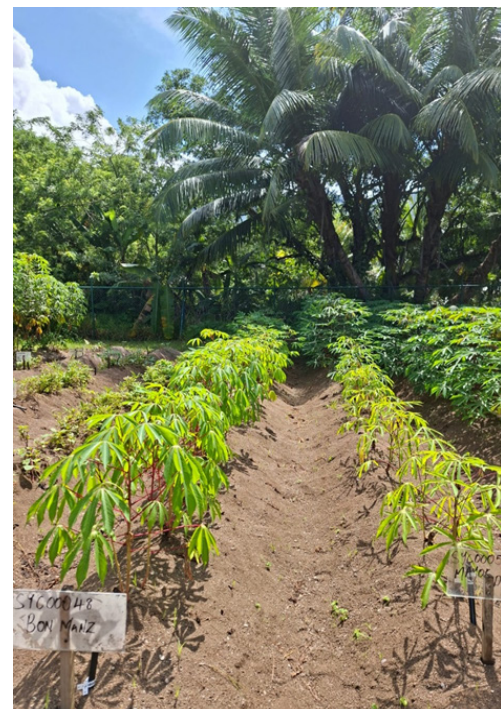
Field collections were conducted in the Val d'Endor region in southern Mahé, where over 50 farmers were visited. Farmers showed strong cooperation and generously shared planting materials for conservation. A total of 23 new accessions—including cassava, sweet potato, yam, and cocoyam—were collected, documented using the SPGRC

Documentation and Information System (SDIS), and established in the Crop Research Station field genebank for conservation and evaluation.

A debriefing session was held at the Soil and Plant Diagnostic Laboratory with senior officials of the Ministry, providing an opportunity to review achievements and outline next steps. The SPGRC team commended the strong collaboration between Crop Research and Extension Services, highlighting the professionalism and efficiency demonstrated by the Seychelles team.

This mission forms part of Seychelles' ongoing national effort to safeguard agricultural biodiversity. With germplasm collection activities already completed on Praslin, La Digue, and southern Mahé, further collection missions are planned for 2026 across additional agricultural zones.

The Agriculture Department expresses sincere appreciation to SPGRC for its continued technical support and to all participating officers and farmers whose contributions are vital to preserving Seychelles' plant genetic resources for future generations.



Established Field Genebank at the

Botanic Gardens (Arboretum) Management at SPGRC

By *Ferdinand Mushinge*,

Introduction

The first botanic garden (Arboretum) was planted approximately 20 years ago (in December 2006), at SADC Plant Genetic Resources Centre and contains about 15 medicinal and wild fruit tree species.

The second botanic garden (Arboretum) was planted approximately 16 years ago (on 10th December 2010), at SADC Plant Genetic Resources Centre and contains about 10 medicinal and wild fruit tree species, inclusive of

herbaceous succulents like Aloe species and African potato species.

The whole purpose of planting or establishing this Botanic Garden was to ascertain whether it's possible to domesticate these wild fruit trees Ex Situ, (away from their natural habitat), successfully. So far, it has been proved that they can be propagated successfully.

Tree species in the SPGRC botanic gardens

List of Medicinal/Wild Fruit trees in the SPGRC Arboretum 1 Planted 20 years ago, in December 2006.

Scientific Name	Common English Name	Function/Uses
1. Moringaceae Moringa oleifera	Drumstick tree/ Horse radish tree	<ul style="list-style-type: none"> • Edible leaves & roots which are said to have medicinal properties. • Leaves are rich in vitamin A (cooked like vegetables). • Pods are also eaten when still fresh (just like green beans).
2. Ebenaceae Diospyros kiirki	Ebony tree	<ul style="list-style-type: none"> • It is a wild fruit tree which has medicinal purposes. • It provides good timber. • It has been used to make canoes, stamping blocks & also suitable for furniture and flooring.
3. Myrtaceae Syzygium guinense	Snake bean tree/ water berry	<ul style="list-style-type: none"> • This is a domesticated fruit tree which produces black berries, which may be used in making jams and juices. • An infusion of the root is used in African medicine to bathe a patient if an illness has been serious. • The bark is also used as a medicine but it is poisonous. • The wood is hard, strong and easy to work with and it is said to be durable. • It has also been used to make dug-out canoes.
4. Fabaceae Tamarindus indica	Tamarind	<ul style="list-style-type: none"> • It is a wild fruit which tastes like lemon. • It is used as a laxative and drink is prepared from it for treating fevers and inflammatory conditions. • The flowers, leaves and seeds can also be eaten and are prepared in variety of dishes. • Fruits can be made into jam, preserves and sweets. • Over-ripe fruits are used to clean and brightening Silver, Copper and Brass. • In Sudan it has been found suitable for general carpentry and boat building.
5. Rhamnaceae Ziziphus mauritiana	Indian plum/Indian cherry	<ul style="list-style-type: none"> • It has edible fruits. • The fruits are used to make 'Kachaso', a primitively distilled spirit of considerable potency.

6. Flacourtiaceae Oncoba spinosa	Fried-egg flower/ snuff-box tree	<ul style="list-style-type: none"> The seed contains a drying oil which would be suitable for varnishes but it is too difficult to extract to be a commercial proposition. Snuff-boxes are made from hard –shelled fruits, which when inside dry, makes amusing rattles for children and anklet and armllet to add rhythm to movement of dancers. Roots provides a remedy in African medicine for treating dysentery and bladder complaints; wood is light brown and takes a good polish but pieces are seldom large enough to be of any value.
7. Bignoniaceae Kigelia africana	Sausage tree	<ul style="list-style-type: none"> The flowers are visited by bats and when they fall to the ground, are eaten by game and stocks. Unripe fruits are said to be poisonous but are taken as a remedy against syphilis and rheumatism. Ripe fruits which are inedible are baked and added to beer, to aid fermentation. In times of food shortage seeds are roasted and eaten. A dressing for ulcers and sores is made from powdered fruits. It is also used to increase lactation and it is rubbed on the body of babies to make them fat.
8. Meliaceae Azadiratha indica	Neem tree	<ul style="list-style-type: none"> It is the most useful traditional medicinal plant in India. Oil and the barks and the leaves extracts have been therapeutically used as folk medicine to control leprosy, intestinal helminthes, respiration disorder, constipation and also as a general health promoters.
9. Hypericaceae Hypericum perforatum	St. John's worts	<ul style="list-style-type: none"> It is a long living, wild growing herb with yellow flowers that has been used for centuries to treat mental disorders as well as nerve pains. In ancient times doctors and herbalists (herb specialists) wrote about St. John's worts as a sedative and anti-malarial agent as well as balm of wounds and insect bite.
10. Liliaceae Aloe species	Burn plant/lily of the desert	<ul style="list-style-type: none"> There is some preliminary evidence Aloe vera extract may be useful in the treatment of wounds, burn healing, minor skin infection, sebaceous cysts, diabetes and elevated blood pressure. Some produces a pulp from leaves which has proved effective in treating x-ray burns. The Zulus burn the dry leaves and use the ash as a snuff. A decoction of the leaf is used to treat round worms.
11. Hypoxidaceae Hypoxis hemerocallidea	African potato	<ul style="list-style-type: none"> Limited evidence from two clinical trials suggests that Hypoxis is efficacious in the treatment of benign prostatic hyperplasia. It has unusual chemical constituents and their efficacy in the treatment of immune system disorders. Researchers have found that the plant sterols and sterolines which are found in high concentration in African potato, increases the functioning of T-cells, which control and regulate the immune system. This increases the body's natural resistance to diseases and help fight illnesses. Reduction in allergy symptoms has also been shown.
12. Meliaceae Toona cillliata	Indian mahogany/ Australian red cedar	<ul style="list-style-type: none"> Leaves are chewed to relieve indigestion and constipation. The root bark is highly toxic.

13. Fabaceae Cassia spectabilis	Spectacular cassia	<ul style="list-style-type: none"> The bark is used by African doctors to chase devils out. The ash from the burnt roots mixed with porridge provides a remedy for stomach pains. Various parts of the tree are used in African medicine as a purgative and to treat fever, gonorrhoea and skin infections. The root bark is given in soup or in milk to dogs injured by the horn of an antelope or to make a lazy hunting dog lean and hungry and so, more eager for the chase.
14. Proteaceae Macadamia Integrifolia	Macadamia nut	<ul style="list-style-type: none"> They are considered by many to be the prime edible nut. Even at the high prices demanded, twice that of cashews, the market remains unfilled. This demand of macadamia nut has spurred a flurry of planting in areas all over the world where macadamia will thrive. There is a limited but significant commercial production of the nut in Southern California.
4. Rhamnaceae Rhamnus indica	Indian hawthorn	
15. Asteraceae Cnicus benedictus	Holy thistle	<ul style="list-style-type: none"> Contains a chemical called cnicin (a bitter crystalline neutral body) and a volatile oil. Its vast medicinal properties include: Brain and nervous system conditions like alleviating dizziness, headaches, strengthens the brain and memory and helps sort out vertigo. A cold infusion helps to increase the appetite and it also helps to solve liver and gall bladder infection.

LIST OF MEDICINAL/WILD FRUIT TREES IN THE SPGRS ARBORETUM – 2 (Planted on 10/12/2010)

Scientific Name	Common English Name	Function/Uses
1. Meliaceae Trichila emetica	Cape mahogany or Red ash	<ul style="list-style-type: none"> The skinned seeds are eaten raw or soaked in water and ground and the resultant liquid is mixed with spinach dishes. The seed coat is extremely poisonous. The leaves are used as an antidote for irritation caused by Buffalo beans. Pieces of bark or powdered bark are soaked in warm water and used as an emetic or enema. The bark is used to treat pneumonia, tapeworms and stomach ulcers.
2. Fabaceae Cassia abreviata	Long pod cassia (Munsokansoka – B)	<ul style="list-style-type: none"> The root decoction is used for treating gastro intestinal disorders, malaria, gonorrhoea, pneumonia, uterus complaints and as a purgative. Smoke of the burnt branches is inhaled to relieve headaches.
3. Fabaceae Afzelia quazensis	Pod mahogany or Lucky bean tree	<ul style="list-style-type: none"> The seeds are used for making necklaces and trinkets and are sold as curios. Wild animals browse the trees' leaves, e.g. Elands, duikers and elephants. The root infusion provides a remedy for bilharzias and for certain eye complaints.
4. Meliaceae Khaya anthotheca	African or White mahogany	<ul style="list-style-type: none"> The bark is boiled to make tea and oils are extracted from the seeds. The bark is used to treat colds and stomach ulcers and the seed's oils are rubbed on the skin to kill insects.
5. Fabaceae Bauhinia purpurea	Purple camel's foot, Butterfly tree or Orchid tree	<ul style="list-style-type: none"> The useful parts of the tree are the roots and leaves. It is used for treating catarrh, infection in children, boils and swellings.

6. Anacardiaceae Sclerocarya birrea	Amarula, Drunkard's plum	<ul style="list-style-type: none"> The astringent bark has a wide range of medicinal properties including treatment of diarrhoea, diabetes, fever and malaria. The ripe fruit is popularly used for beer brewing, jelly, sweets, syrups, and preserves making. The seed kernel, though hard to extract from the seed, is tasty and widely eaten. The oil from the Marula seed makes an excellent component in skin care formulations.
7. Rubiaceae Vangueria infausta	Wild medlar, Afri- can medlar	<ul style="list-style-type: none"> The fruits are eaten raw. The pulp, when mixed with a little sugar and water makes a good substitute for apple sauce. The roots infusion is used for treating malaria, pneumonia, coughing and chest troubles. A roots decoction is used as a purgative and anthelmintic and is also a popular snake bite remedy.
8. Liliaceae Aloe species	Burn plant/lily of the desert	<ul style="list-style-type: none"> There is some preliminary evidence Aloe vera extract may be useful in the treatment of wounds, burn healing, minor skin infection, sebaceous cysts, diabetes and elevated blood pressure. Some produces a pulp from leaves which has proved effective in treating x-ray burns. The Zulus burn the dry leaves and use the ash as a snuff. A decoction of the leaf is used to treat round worms.
9. Hypoxidaceae Hypoxis Hemerocallidea	African potato	<ul style="list-style-type: none"> Limited evidence from two clinical trials suggests that Hypoxis is efficacious in the treatment of benign prostatic hyperplasia. It has unusual chemical constituents and their efficacy in the treatment of immune system disorders. Researchers have found that the plant sterols and sterolines which are found in high concentration in African potato, increases the functioning of T-cells, which control and regulate the immune system. This increases the body's natural resistance to diseases and help fight illnesses. Reduction in allergy symptoms has also been shown.
10. Poaceae Cymbopogon citratus	Lemon grass, Barbed wire grass	<ul style="list-style-type: none"> Lemon grass is commonly used in teas, soups and curries. It is native to India and Tropical Asia. Lemon grass oil is used in pesticides and preservatives and has antifungal properties. As an addition to tea, it is used to cure coughs, colds, and to relieve nasal congestion.

Ex-situ conservation

Ex-situ conservation means literally, "off-site [conservation](#)". It is the process of protecting an [endangered species](#) of plants or animals outside their natural habitat; for example, by removing part of the [population](#) from a threatened [habitat](#) and placing it in a new location, which may be a wild area or within the care of humans. While ex-situ conservation comprises some of the oldest and best known conservation methods, it also involves newer, sometimes controversial laboratory methods.

Colony relocation

The best method of maximizing a species chance of survival (when ex-situ methods are required) is by relocating part of the population to a less threatened location. It is extremely difficult to mimic the environment of the original colony

location given the large number of variables defining the original colony ([microclimate](#), [soils](#), [symbiotic](#) species, absence of severe [predation](#), etc.) It is also technically challenging to uproot (in the case of plants) or trap (in the case of animals) the required [organisms](#) without undue harm.

An example of colony relocation in the wild is the case of the endangered [Santa Cruz Tarweed](#), a new colony of which was discovered during a mid 1980s survey at the site of a proposed shopping center in as western [Contra Costa County](#). Once the city of [Pinole](#) had decided to approve the shopping center, the city relied on a relocation plan developed by Earth Metrics scientists to remove the entire colony to a nearby location immediately east of Interstate Highway 80 within the [Caltrans right-of-way](#)^[1]

Human care methods

[Zoos](#) and [botanical gardens](#) are the most conventional methods of ex-situ conservation, all of which house whole, protected specimens for breeding and reintroduction into the wild when necessary and possible. These facilities provide not only housing and care for specimens of endangered species, but also have an educational value. They inform the public of the threatened status of endangered species and of those factors which cause the threat, with the hope of creating public interest in stopping and reversing those factors which jeopardize a species' survival in the first place. They are the most publicly visited ex-situ conservation sites, with the WZCS (World Zoo Conservation Strategy) estimating that the 1100 organized zoos in the world receive more than 600 million visitors annually.^[citation needed]

Endangered plants may also be preserved in part through [seedbanks](#) or [germplasm](#) banks. The term seedbank sometimes refers to a cryogenic laboratory facility in which the seeds of certain species can be preserved for up to a century or more without losing their fertility. It can also be used to refer to a special type of arboretum where seeds are harvested and the crop is rotated. For plants that cannot be preserved in seedbanks, the only other option for preserving germplasm is [in-vitro](#) storage, where cuttings of plants are kept under strict conditions in glass tubes and vessels.



A tank of [liquid nitrogen](#), used to supply a cryogenic freezer (for storing laboratory samples at a temperature of about $\hat{\sim}$ 150 degrees Celsius).

Endangered animal species are preserved using similar techniques. The genetic information needed in the future to reproduce endangered animal species can be preserved in [genebanks](#), which consist of [cryogenic](#) facilities used to store living [sperm](#), [eggs](#), or [embryos](#). The Zoological Society of San Diego has established a "[Frozen zoo](#)" to store such samples using modern [cryopreservation](#) techniques from more than 355 species, including mammals, reptiles, and birds.

A potential technique for aiding in reproduction of endangered species is [interspecific pregnancy](#), implanting embryos of an endangered species into the womb of a female of a related species, carrying it to term.^[2] It has been carried out for the [Spanish Ibex](#).^[3]

[Showy Indian clover](#), *Trifolium amoenum*, is an example of a species that was thought to be extinct, but was rediscovered in 1993^[4] by Peter Connors in the form of a single plant at a site in western [Sonoma County](#).^[5] Connors harvested seeds and grew specimens of this critically [endangered species](#) in a controlled environment.

The [Wollemi Pine](#) is another example of a plant that is being preserved via ex-situ conservation, as they are being grown in nurseries to be sold to the general public.

Drawbacks

Ex-situ conservation, while helpful in man's efforts to sustain and protect our environment, is rarely enough to save a species from extinction. It is to be used as a last resort, or as a supplement to [in-situ conservation](#) because it cannot recreate the habitat as a whole: the entire [genetic variation](#) of a species, its [symbiotic](#) counterparts, or those elements which, over time, might help a species adapt to its changing surroundings. Instead, ex-situ conservation removes the species from its natural ecological contexts, preserving it under semi-isolated conditions whereby natural evolution and adaptation processes are either temporarily halted or altered by introducing the specimen to an unnatural habitat. In the case of [cryogenic](#) storage methods, the preserved specimen's adaptation processes are frozen altogether. The downside to this is that, when re-released, the species may lack the genetic adaptations and mutations which would allow it to thrive in its ever-changing natural habitat.

Furthermore, ex-situ conservation techniques are often costly, with cryogenic storage being economically infeasible in most cases since species stored in this manner cannot provide a profit but instead slowly drain the financial resources of the government or organization determined to operate them. [Seedbanks](#) are ineffective for certain plant [genera](#) with recalcitrant seeds that do not remain fertile for long periods of time. Diseases and pests foreign to the species, to which the species has no natural defense, may also cripple crops of protected plants in ex-situ plantations and in animals living in ex-situ breeding grounds. These factors, combined with the specific environmental needs of many species, some of which are nearly impossible to recreate by man, make ex-situ conservation impossible for a great number of the world's endangered flora and fauna.

Botanic garden management

When one has to plant out wild fruit trees, medicinal plants or herbaceous succulents like Aloes or African potatoes as is the case at SPGRC, one should target planting them during the rains onset. They get established after 4 months of good rainfall, and during the dry season of their first year of growth, they need to be watered for a good 4 months or so. After that, apart from routine weeding during the rainy season, they don't need intensive management.

When some of the bushy species overgrow in the Botanic garden or Arboretum, they require pruning.

Government and Private Sector Involvement in Botanic garden management at SPGRC

SADC Plant Genetic Resources Centre (SPGRC) is the regional centre for Gene bank management and is inter-linked to 16 SADC member states that provide funding to it. It is interlinked to National Plant Genetic Resources Centres (NPGRCs) of the SADC member states. The Botanic garden which is at SPGRC falls under the In Situ technical wing of SPGRC where funding is directed from, in order to manage the Botanic garden.

SPGRC's Key contributions to Biodiversity Conservation

SADC Plant Genetic Resources Centre (SPGRC) has the mandate of keeping the SADC region's plant genetic resources in form of Seed for food and agriculture. SPGRC keeps orthodox seed in duplicate, for the SADC region's NPGRCs and hence contributes to biodiversity conservation. No recalcitrant seed like mango, avocado, pawpaw etc, is kept as it can dry up in freezers under freezing conditions.

It should be noted here that at SPGRC, there is no Field Gene Bank for keeping vegetatively propagated crops like cassava, sweet potatoes, yams, cocoa yams and bananas, etc. Field Gene banks are only found in member states at National Plant Genetic Resource Centres.

Some challenges faced in managing the Botanic Gardens at SPGRC

Some of the challenges faced in managing the SPGRC arboretums are:

- i) Funding constraints due to a lean budget, hence resulting in labor constraints for weeding and pruning of the botanic species in the arboretums.
- ii) Limited space of land at SPGRC to expand the botanic gardens and hence have a wider species collection.
- iii) Funding constraints to carry out collection missions to rescue endangered species from the bush which are faced with genetic erosion through rapid urbanization, bush fires, rampant charcoal burning, etc. Some species of plants which are facing genetic erosion include herbaceous succulents like the African potato (*Hypoxis* spp.) and Aloe spp. etc.

SPGRC and Lesotho NPGRC conduct Community Seedbank Training Initiative



Workshop Trainers and Trainees

Maseru, Lesotho, 21 to 25 July 2025

In July 2025, the SADC Plant Genetic Resources Centre (SPGRC) and the Lesotho National Plant Genetic Resources Centre supported the Southern Mountains Association for Rural Transformation and Development (SMARTD), a partner organization actively engaged in community-based agrobiodiversity initiatives in Lesotho. SMARTD requested for technical training, through the Lesotho NPGRC, on the establishment and management of Community Seedbanks for their staff and selected farmer groups in Lesotho.

OUTPUTS OF THE MISSION

The training Workshop was opened by the Director SMARTD (Ms. Matlotliso Phooko) who in her welcome remarks, thanked SPGRC and the NPGRC for supporting the organisation through technical backstopping and training, and gave an overview of SMARTD as an NGO supporting and training farmer communities in agroecology.

The Senior Programmes Officer (*In Situ* Conservation) and the Lesotho NPGRC Curator co-facilitated the training sessions which were divided into presentations, group work and discussions on community seedbank establishment, governance and management, Seed Selection and Collec-

tion, documentation. Seed quality and quantity management training included viability, regeneration, multiplication, and characterization. The other training topics included Seed cleaning, drying, packaging and storage. The last training topic was on stakeholder mapping and other discussions followed including climate change, genetic erosion and Sustainable agriculture.



Workshop group discussions

OVERALL EVALUATION OF MISSION



The mission was a success as it has enabled SPGRC to provide technical backstopping through a training workshop to Lesotho enhancing collaboration and partnership with Member States in ensuring the conservation and utilization of plant genetic resources for food and agriculture in the SADC region. The SPGRC in the training also emphasized on PGR conservation and sustainable use to ensure that plant genetic resources are duplicated to the NPGRC National Genebank and SPGRC Regional Gene bank

for long term storage and thereby mitigate against loss of plant diversity needed for the development of sustainable food systems in the SADC region.

BENEFITS OF THE MISSION

SPGRC collaboration with Lesotho NPGRC to train SMARTD, an NGO presents a valuable opportunity to strengthen community-level conservation efforts and enhance **the visibility and impact of regional PGR programmes.**



ESWATINI

EVALUATION OF CUCURBITS ACCESSIONS: A STEP TOWARDS SUSTAINABLE AGRICULTURE



By Simangele Ngwenya, PhD

The Ministry of Agriculture, Eswatini, under the Department of Agricultural Research and Specialist Services (DARSS) made significant strides in strengthening its agricultural biodiversity through a preliminary germplasm collection of Cucurbits, aimed at supporting evaluation trials. This initiative, supported by FAO and COSPE through the framework of the FAO Benefit-Sharing Fund (BSF), focuses on acquiring, multiplying, conserving, and safeguarding diverse plant genetic resources crucial for resilient and sustainable farming systems. On October 27, 2025, at the Lubombo Research Station (LRS) (26°49'S 31° 56'E) in Big bend, Eswatini. Researchers successfully conducted planting trials with selected accessions of three key Cucurbits: melon (*Citrullus amarus*), pumpkin (*Cucurbita pepo*), bottle gourd (*Lagenaria siceraria*). Each crop was represented by 10 accessions (Table1), providing a valuable genetic pool for further evaluation and breeding programs. Seeds for these trials were sourced from the plant Genebank, in the Agricultural Research and specialist services Department, within the Ministry of Agriculture, Eswatini. The LRS soils were sandy loam soil that was classified as alluvial soils (Group, 2018). Field layout for the trial establishment followed a 10 x 3 Randomized Complete Block design (RCBD) with three replicates. In accordance with the recommendations for optimal Cucurbits production derived from soil analysis, the soil was fertilized with the compound fertilizer NPK 2:3:2 (37).

Table 1: Planted Cucurbits and their Accession numbers

Melon (<i>Citrullus amarus</i>)	Pumpkins (<i>Cucurbita pepo</i>)	Bottle gourd (<i>Lagenaria siceraria</i>)
Acc 556	Acc 779	Acc 350
Acc 833	Acc 562	Acc 544
Acc 1062	Acc 1141	Acc 1319
Acc 972	Acc 1311	NKT/880
Acc 1247	Acc 639	NTK/811
Acc 468	Acc 526	NTK/633
Acc 1193	Acc 441	NTK/830
Acc 673	Acc 477	NTK/1055
Acc 308	Acc 449	NTK/1160
Acc 150	Acc 80	NTK/375

This Cucurbits evaluation trial emphasizes the importance of multiplication and safety duplication of germplasm, safeguarding genetic diversity for future generations. These activities are fundamental to building a resilient agricultural sector capable of withstanding climate challenges and ensuring food security. As the evaluation trials progress, Eswatini's commitment to conserving its rich agricultural biodiversity continues to grow, promising a more sustainable and productive future for local farmers and the nation.

The preliminary results: showed that the germination rates across all crops were promising, exceeding 80% in most cases. However, two accessions [melon (Acc 308) and bottle gourd (NKT/1160)] failed to germinate, registering a germination percentage of

zero. This showed that the Cucurbits had strong seed viability and had potential for successful establishment. The days to 50% flowering varied among the crops (Table 2) were all within the expected range, meaning that the developmental timing of this crops was normal.



Table 2: Days to 50% flowering varied among the crops

Cucurbits	Recorded range	Expected range
Melons	47-62	30-60
Pumpkins	51-69	55-60
Bottle gourd	59-69	35-51

The melons vines reached 4.1m while the pumpkins vines stretched up to 5m long (Fig. 2). Below are

images of the harvested fruits of the different accessions that were randomly harvested (Fig.1). In terms of yield, we recorded 10,000 melons per Ha especially in Acc 556 and Acc 308 (Fig.2,A), indicating vigorous growth and productivity, because the expected yield is between 4000 to 11,000 melons per Ha. In addition, we recorded 8,500 pumpkins per Ha (Fig. 2, B), whereas in the country we are expected to get over 10,000 Cucurbita pepo fruits per Ha. This showcased a promising potential for future cultivation in Acc 779.

Figure 1: Fruits harvested from A) melon and B) pumpkin trial.

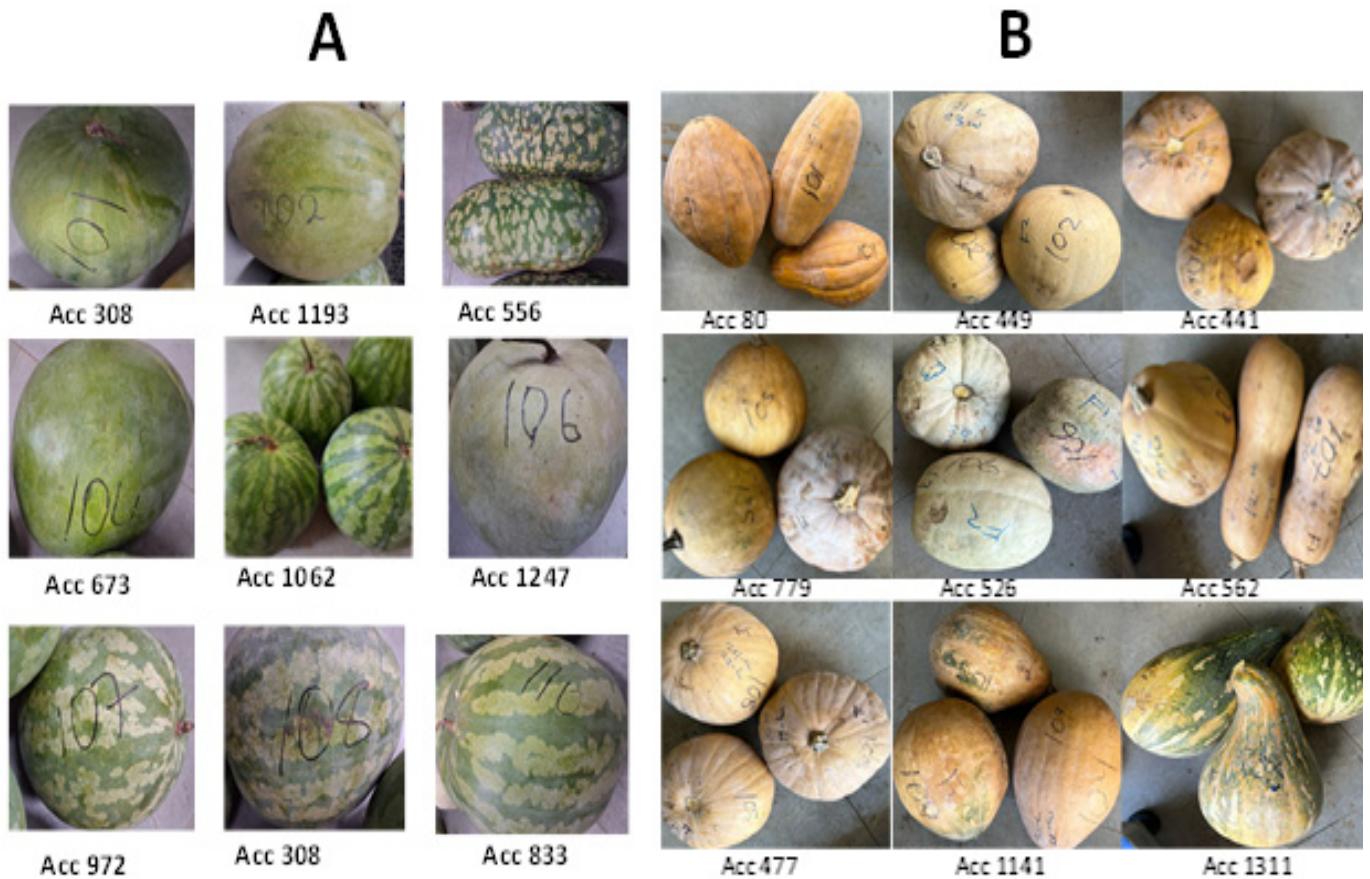
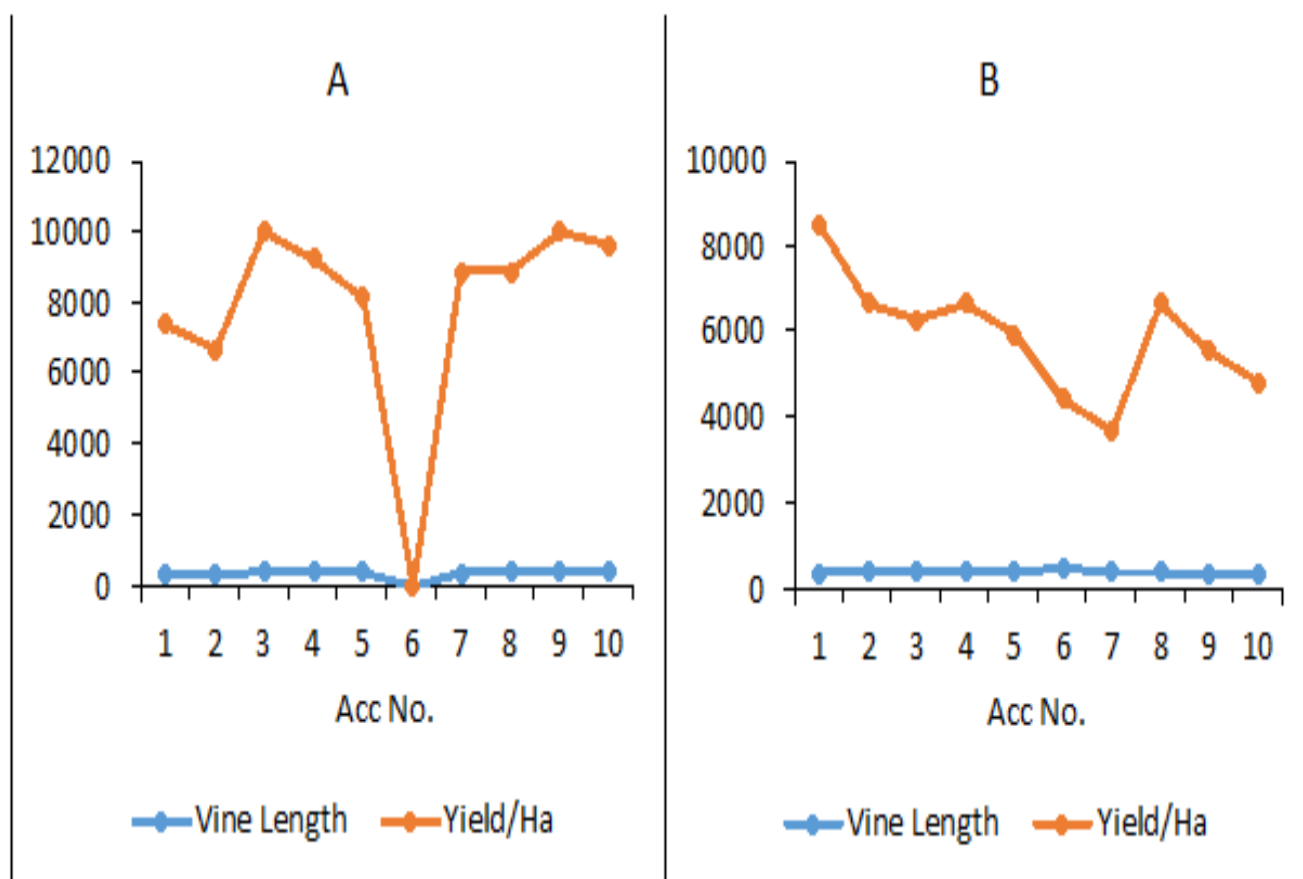


Figure 2: Vine length and number of fruits on A) Melons and B) Pumpkins.



In conclusion, although bottle gourd results still incomplete, this Cucurbits trials showed high germination and proliferation rates in most accessions, confirming their potential for resilient agriculture. Two accessions (melon Acc 308 and bottle gourd NTK/1160) failed to germinate, requiring further attention. The results support Eswatini’s effort to conserve agricultural biodiversity for the improved food security and climate adaptability.

Acknowledgments: The Ministry of Agriculture of Eswatini, DARSS, Gene bank section; TAVI, SAHEE, FAO BSF and the SADC Plant Genetic Resources Centre.

PROMOTING CASSAVA CONSERVATION FOR FOOD SECURITY AND CLIMATE RESILIENCE IN SOUTH AFRICA

By Dr Tshidi Manamela, National Plant Genetic Resources Centre (NPGRC), Directorate: Genetic Resources, Department of Agriculture

Introduction

Cassava (*Manihot esculenta*) is a hardy root crop that feeds more than 500 million people across the world (FAO, 2000; Otekunrin *et al.*, 2024). Although widely grown in Africa, the crop remains underutilised in South Africa—despite its high potential to improve food security, support rural livelihoods, and contribute to industrial and biofuel production (Amelework *et al.*, 2021; Olayemi *et al.*, 2021).

Recognising this gap, the Department of Agriculture (DoA) has increasingly prioritised neglected and underutilised species (NUS)—such as cassava, sweet potato, taro and other food crops—within its Annual Performance Plan (APP). The APP emphasises expanding *ex-situ* conservation, strengthening food and nutrition security and promoting NUS adoption as part of climate-smart agriculture initiatives (Department of Agriculture, Land Reform and Rural Development, 2025).

In line with this mandate, the National Plant Genetic Resources Centre (NPGRC) of the Directorate: Genetic Resources has expanded its collection of cassava and enhanced its efforts in conservation. These steps have been taken to ensure that this important crop remains available for future production, research and climate adaptation programs.

Building the national cassava collection: Safeguarding local diversity

Between 2001 and 2025, the NPGRC collected cassava accessions from farmers' fields in key growing regions:

- **Mpumalanga:** Malelane
- **Limpopo:** Bushbuckridge, Acornhoek
- **KwaZulu-Natal:** Jozini

These areas overlap naturally with South Africa's warm lowveld and subtropical zones where cassava thrives. The collections revealed that South Africa holds unique, locally adapted landraces—an important resource for breeding, climate resilience and future crop improvement. Conserving these landraces ensures that South Africa maintains a secure, diverse base of cassava genetic material.

The importance of cassava in South Africa

For rural and subsistence farmers, cassava is highly drought-tolerant, able to grow in poor soils and reliable during drought years. Its ability to provide stable food during climatic and economic shocks makes it an important safety crop for households (Amelework *et al.*, 2021; Olayemi *et al.*, 2021).

For industry and biofuel, cassava offers opportunities for starch and flour production, animal feed industries, bioethanol manufacturing, food processing and bakery industries. Expanding cassava-based agro-processing can stimulate rural economies and create new value chains.

Strengthening conservation: Lessons from the field

The NPGRC maintains cassava in both **field gene bank** and **greenhouse**. While field conservation supports natural evolution and adaptation, it is exposed to risks such as pest and disease outbreaks, drought, animal damage and uncontrolled veld fires (as in 2024).

The veldfire incident, although not damaging the collection, highlighted the vulnerability of relying solely on field gene banks for crop maintenance. This justified the need for ***in-vitro* conservation as a duplicate safety-backup strategy**, in line with global best practice and APP targets on safeguarding genetic resources.





*Cassava collection maintained in the field gene bank plots (shade house).
Photo credit: Dr Tshidi Manamela*



Mr Andre Neels (Groundsman: Genetic Resources) manually irrigating cassava plants in the greenhouse.

Tissue Culture Investigation: Building a safety backup

To improve and strengthen conservation, the NPGRC investigated tissue culture protocols that allow cassava accessions to be stored under controlled, low-maintenance conditions.

Media Tested

Three types of media were evaluated:

- **M1:** MS hormone-free.
- **M2:** MS + NAA + BAP + GA₃ (low concentrations).
- **M3:** MS with a slightly higher hormonal balance.

Experimental Approach

- Young nodal segments collected from the field gene bank.
- Surface sterilisation and inoculation in test tubes and Magenta jars.
- Incubation at 25°C, 16/8 hr photoperiod in growth chambers.
- Assessments at three (3) and six (6) months after incubation.

Key findings

- M1 supported *slow, stable* growth and maintained viability for up to six (6) months without subculturing.
- M2 resulted in vigorous shoot proliferation and node formation—ideal for micropropagation.
- M3 also enhanced early growth but with less morphological uniformity.

These results demonstrate that hormone-free media (M1) offers an affordable, low-maintenance and genetically stable method for long-term conservation—critical for gene bank operations.

Scientific and policy significance

- Reduces labour and costs associated with frequent subculturing.

- Minimises risks of somaclonal variation and contamination.
- Provides a secure duplication strategy in line with the DoA's APP mandate.
- Supports national obligations under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Development of a Standard Operating Procedure (SOP)

Based on the investigation, the NPGRC developed a Standard Operating Procedure (SOP) for cassava *in-vitro* conservation, now forming part of the centre's official workflow.

SOP outline

1. Explant collection and sterilisation.
2. Media preparation (M1 for conservation; M2 for multiplication).
3. Culture inoculation and growth conditions.
4. Growth monitoring and data recording.
5. Subculturing intervals.

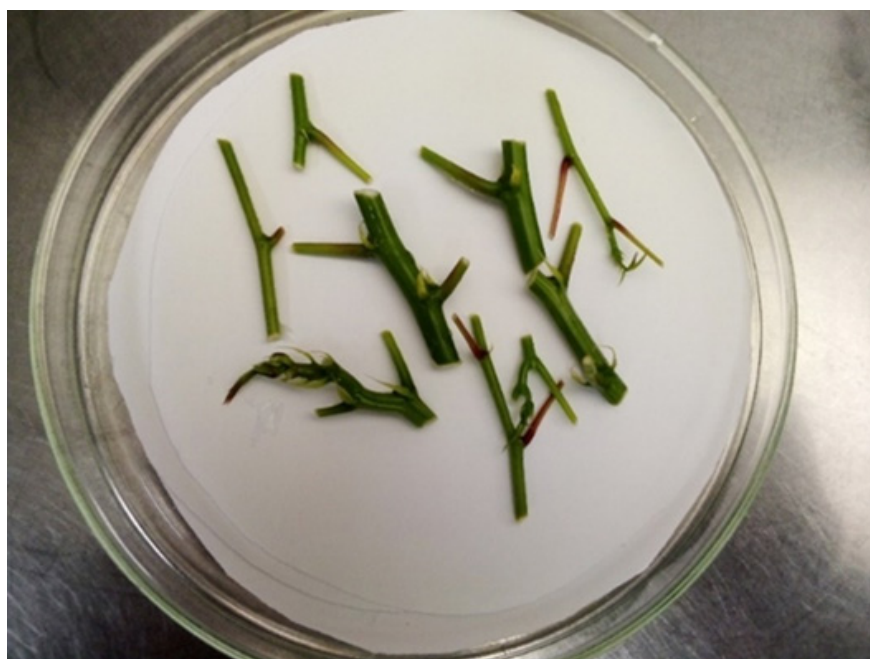
This SOP ensures consistency, genetic stability and effective conservation. Furthermore, this SOP supports the APP's priority on promoting NUS and strengthening biotechnology capacities. It is envisioned that the SOP will be reviewed to incorporate the regeneration and acclimatisation of tissue-cultured plants back in the field. This will help ensure that cassava planting material remains readily available when needed most—especially for restoration efforts in communities affected by disasters such as floods, droughts or fire incidents.

Strengthening cassava for South Africa's agricultural future

Cassava remains one of South Africa's most important yet underutilised crops, with significant potential for rural development, food security and climate resilience.



Storage roots of young cassava plants during transplanting in the greenhouse



Cuttings of young shoots of cassava taken from the plants maintained in the field gene bank, and Dr Tshidi Manamela dissecting cassava nodal segments for inoculation onto media. Photo credit: Ms Mpolokeng Mokoena

The successful field collections, documentation and development of an *in-vitro* conservation protocol align with the APP targets and priorities.

The findings of this investigation demonstrate that:

- South Africa holds unique and locally adapted cassava landraces that must be secured.
- Tissue culture provides a reliable safety-duplication system, reducing vulnerability to climate and environmental risks.
- A hormone-free medium (M1) offers a cost-effective approach, eliminating the need for costly plant hormones.
- The developed SOP provides a standardised and

replicable tool for cassava conservation at the NPGRC.

Cassava holds immense potential to enhance South Africa's food security, climate resilience and economic development. The dedicated efforts of the NPGRC, encompassing field collection, gene bank conservation, tissue culture innovation and the formulation of SOP, have established a solid foundation for conservation of this crucial NUS. This comprehensive approach contributes to the department's commitment to safeguarding these important resources for future generations.



Cassava plantlets upon subsequent culturing on medium M1 in Magenta jars and test tubes, showing vigorous root development. Plantlets in Magenta jars are thicker and have vigorous roots compared with those in test tubes. Photo credit: Dr Tshidi Manamela

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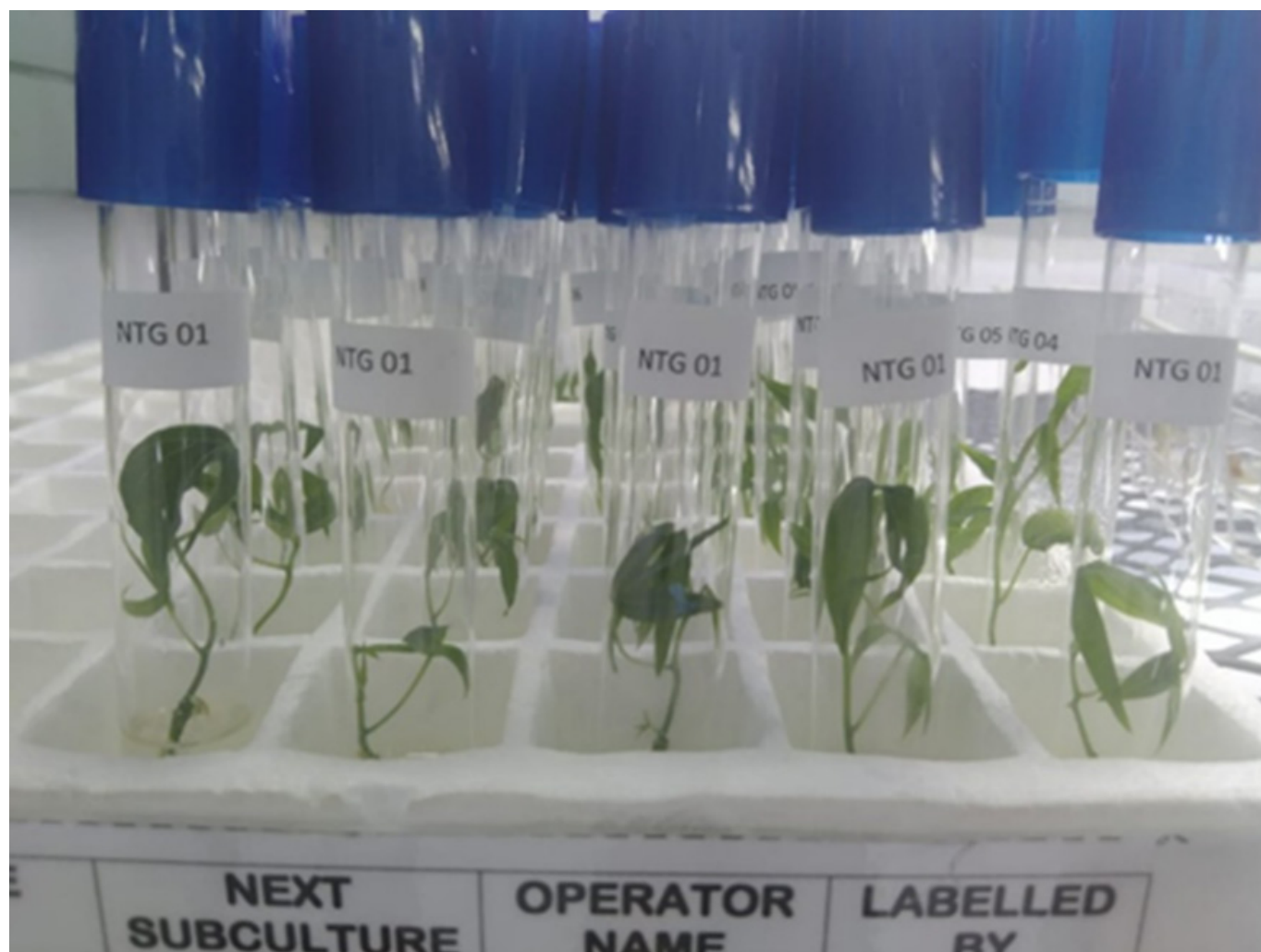
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Cassava accessions (five plants per accession) maintained on M1 in test tubes.



Cassava accessions conserved and maintained in tissue culture media M1 in Magenta jars at the NPGRC. Photo credit: Dr Tshidi Manamela

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