SCIENCE FOR SOUTH AFRICA

Quest

VOLUME 21 | NUMBER 1 | 2025
ISSN 1729 - 830X

Feed the future

Food insecurity and poverty surging in Southern Africa due to drought and aid freeze

Local solutions: inland fisheries, Herding for Health, and using worms for pest control

120 years of agricultural research (*SAJS* special contribution)

Launch of new, local exoplanet-hunting telescope

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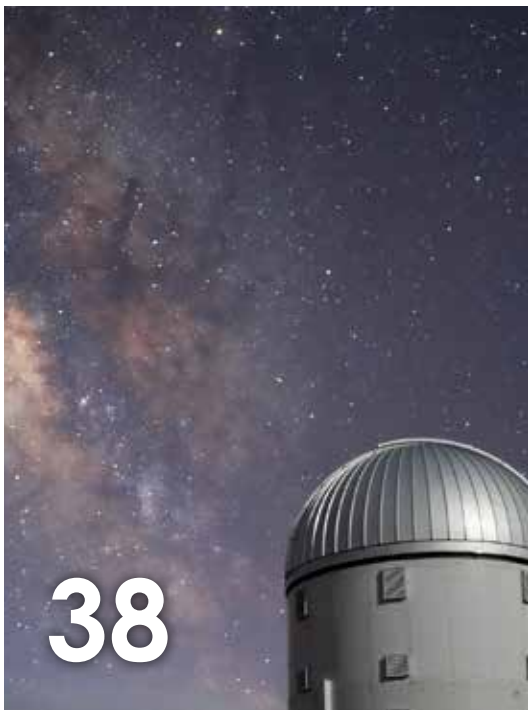

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Published by the
Academy of Science of South Africa (ASSAf)
PO Box 72135, Lynnwood Ridge 0040

Subscription rates
(4 issues and postage)
SA Students/Learners - R80.00
SA Individuals/Institutions - R160.00
SADC Students/Learners - R210.00
SADC Individuals/Institutions - R255.00
Int. Students/Learner - R340.00
Int. Individuals/Institutions - R340.00

Design and layout
Garnett Design Studio

Printing
Lebone Litho

Website and social media
https://questonline.org.za
Twitter: Twitter @Quest_ASSAf
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Cover image
Cover image generated by AI (ChatGPT 4.5) to illustrate this edition's theme - one generation working to feed the next. Only through our efforts in science and technology can we meet challenges like climate change and make food production more efficient and sustainable for future generations.

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Feed the future

I was vaguely aware of the recent devastating drought faced by many countries in southern Africa, but until compiling this issue, I did not realise the severity or the extent of the situation. The drought, coupled with rising poverty due to economic vulnerabilities, and especially since the aid freeze by US president Donald Trump, has caused a true hunger crisis on the continent.

In this edition, we highlight and explore the pressing challenges of food security and poverty, particularly spotlighting the current crisis gripping southern Africa. As climate change intensifies and humanitarian emergencies deepen, the need for sustainable and innovative solutions has never been more critical.

Throughout these pages, we not only highlight the severity of the problems faced but also delve into how science and research are shedding light on innovative food security, conservation and sustainability solutions that can offer practical, impactful responses. From inland fisheries, using worms for pest control, and the legacy of agricultural research to improve crops and citrus, to innovative models for conservation agriculture, we hope to inspire other researchers to join the fight against food insecurity, poverty and hunger.

As climate change deepens, these challenges will likely also grow in intensity. Join us as we examine both the realities of the present and the possibilities that science holds for tomorrow.

Warm regards,

Fanie (RS) van Rooyen (Editor)

Kgaolong ye, re lebelela mathata a poelo ya dijo le bodiidi Afrika, re totobatsa komelelo le mathata a thušo Borwa bja Afrika. Re hlahloba ka moo saense le nyakišišo di ka hlagišago ditharollo tša bohlale le tša go tšwela pele go lwantšha tlala le bodiidi. Go tloga mošomong wa dihlapi ka meetseng a ka gare ga naga, diboko tša go laola dikhunkhwane, le diphatišišo tša temo tšeo di ka thušago go kaonafatša dibjalo, re holofela go tutuetša banya-khutathekniki go tsenela ntwa ya go lwantšha tlala le bodiidi. Ka phetoho ya boso e gola, mathata a a tla oketšega. Tlang re hlahlobe ditiragalo tša lehono le menyetla ya kamoso ka thušo ya saense.

Translated into North Sotho by Prof. Walter Matli

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INSPIRING GREATNESS

A GROWING CRISIS: food insecurity and poverty surging in Southern Africa

Southern Africa faces an unprecedented humanitarian crisis, driven by one of the worst droughts in over a century, leaving millions facing acute hunger and deepening poverty across the region. As climate change tightens its grip, the region's vulnerability has become starkly evident, calling for urgent interventions to address not only immediate needs but also long-term resilience.

Worst drought in a century

According to a recent report by Al Jazeera, southern Africa is grappling with its most severe drought in 100 years. This prolonged dry spell has devastated agriculture, depleted water resources, and crippled food systems. Countries such as Malawi, Zimbabwe, Zambia and Mozambique have been hit hardest, with millions unable to access basic necessities, prompting desperate appeals for international assistance.

In Zimbabwe, maize production—the staple food—has dramatically decreased, pushing nearly half of its rural population into severe food insecurity. Similarly, Malawi has declared a national disaster after its harvests failed, exacerbating already dire socio-economic conditions. The regional impacts of this drought highlight the interconnected nature of food security and poverty, where agricultural failures directly translate into human suffering.

Alarming numbers and a regional emergency

Reuters reports that nearly 68 million people in the Southern African Development Community (SADC) region are suffering due to drought conditions. As food prices soar due to limited supply, vulnerable populations are increasingly unable to afford basic commodities. Water scarcity compounds these difficulties, leading to increased health risks, including malnutrition and water-borne diseases. These intertwined crises are not only humanitarian issues but also pose substantial risks to regional stability and development.

Deepening poverty and vulnerability

The latest Afrobarometer report highlights a troubling rise in poverty across the African continent, with southern Africa being no exception. The report reveals a significant surge in severe lived poverty—defined as frequently lacking sufficient food, clean water, healthcare and cooking fuel—in multiple southern African countries over the past decade. Countries like Malawi, Mozambique

and Zimbabwe have seen marked increases, indicating deep-rooted systemic issues.

This increase is directly linked to climate vulnerability and economic instability. Communities heavily reliant on agriculture for their livelihoods are disproportionately affected by environmental shocks such as droughts. The findings illustrate a cycle where poverty and vulnerability feed into each other, amplifying the humanitarian impacts during crises like the current drought.

Foreign aid crisis

In addition to the challenges posed by the unprecedented drought and rising poverty levels, southern Africa's food security has been further compromised by the withdrawal of international aid. The United States, historically a significant contributor to humanitarian assistance in the region, has under re-elected president Donald Trump recently frozen USAID funding, leading to severe repercussions. According to the Institute for Security Studies (ISS), the decision could push 5.7 million more Africans into extreme poverty next year. *The Guardian* reports that in Malawi, one of the world's most aid-dependent nations, this freeze affects over $350 million in annual aid, constituting more than 13% of the national budget. This sudden shortfall has led to immediate crises, including halted supplies of lifesaving medications and the cessation of educational support for students on US bursaries. The economic ramifications are profound, with increased unemployment and diminished public services exacerbating the already dire situation. This development underscores the vulnerability of southern African nations to external economic shifts and highlights the urgent need for sustainable, internally driven solutions to ensure food security and economic stability.

The immediate priority for governments, non-governmental organisations (NGOs) and international bodies remains emergency relief, including food aid, access to clean water and health services. Yet, experts stress that short-term relief alone is insufficient. Strengthening resilience to climate change through sustainable agricultural practices, better water management, and infrastructure development is crucial.

Investing in drought-resistant crops, improving irrigation systems, and developing regional cooperation mechanisms for disaster preparedness can help mitigate future risks. Governments and international bodies must prioritise funding and resources towards climate adaptation projects to avoid repeated humanitarian emergencies.

Beyond statistics and policy discussions, it is important to remember the human cost of the crisis. Families across southern Africa are facing daily struggles for survival. Children are disproportionately affected, suffering from chronic malnutrition, disrupted education and increased vulnerability to disease.

An urgent call for action

The food security crisis in southern Africa is not merely a consequence of environmental conditions but a reflection of deeper socio-economic vulnerabilities. Immediate humanitarian aid must be paired with robust, long-term strategies addressing poverty alleviation, climate adaptation and regional cooperation. Millions of lives depend on swift, collective action to forge a resilient future.

Article compiled from the various cited sources by the Editor, Fanie van Rooyen, with the aid of ChatGPT 4.5 as an experiment. Let us know what you think (quest-editor@assaf.org.za).

Drought has DEVASTATED southern Africa's CROPS:

why it's happening and what can be learned

Southern Africa's worst drought in years has destroyed crops of the staple food, maize, across the region. Malawi, South Africa, Zambia, Zimbabwe, Botswana, Lesotho and Namibia have all been affected by the drought. Crop failures in South Africa, Zambia and Zimbabwe – the largest maize producers in southern Africa – have destabilised food security in the whole region.

The situation is escalating: the Southern African Development Community (SADC) has now announced that 68 million people need urgent food aid.

The drought is driven by El Niño, an unusual warming of surface waters in the eastern tropical Pacific Ocean that shifts weather patterns. The latest El Niño phase started globally in 2023.

The Conversation Africa has published a number of articles explaining the current drought, its connection to climate change, and what governments can do to avert hunger. Here are five essential reads.

Governments failed to prepare for this year's El Niño drought

The World Meteorological Organization warned in May 2023 that the chance of El Niño developing later in the year was increasing. This meant governments in southern Africa knew in advance that a drought was coming which would decimate staple food crops. But they failed to take the necessary preparatory steps.

Tafadzwanashe Mabhaudhi argues that governments in the region need to set up early warning systems for everyone likely to be affected by El Niño, especially farmers whose crops are at risk. To achieve this, governments and the private sector must prioritise climate action in development plans, and get weather offices up and running.

Smallholder farmers can't continue to survive on rain-fed maize

Malawi has been particularly hard hit by the drought, declaring a state of emergency in March 2024. By August 2024, Malawians in 23 of the country's 28 districts needed food aid to survive.

Maize makes up two-thirds of Malawi's national calorie intake. Nine out of 10 farming households produce maize and devote over 70% of their land to growing it. Over 90% of farming households rely solely on rain to irrigate their maize plants.

This is a recipe for disaster. Joachim De Weerdt, Channing Arndt, James Thurlow, Jan Duchoslav, Joseph Glauber, Liangzhi You and Weston Anderson explain why Malawi must invest in irrigation systems for farmers across the country, to reduce their dependency on rain.

The regional maize supply chain

Elsewhere, Wandile Sihlobo writes that, while restricting exports might seem like a good way for a country to keep some maize for its own citizens, it removes the incentive for production for the next year as farm-level prices are artificially depressed. Governments in southern Africa should therefore avoid export restrictions and maize price caps.

As lakes dry up, income sources dwindle

In April 2024, the government of Zimbabwe declared the El Niño drought a national disaster. Water levels dropped at Lake Kariba, which supports 100,000 people and generates most of Zimbabwe's and Zambia's electricity.

Joshua Matanzima, who grew up at Lake Kariba, explains that the drought laid waste to the local economy. Fishers could no longer catch enough to feed their families, tourist numbers decreased, residents had to walk further to fetch water, and poaching rose as people sought ways to earn money.

Solutions

Tafadzwanashe Mabhaudhi points out that the current agrifood system has not delivered for Africa. The continent cannot continue to rely on wheat, maize and rice as its staple foods. Historically, Africa had 30,000 edible plant species, and 7,000 were traditionally cultivated or foraged for food. Many of these are hardy, drought resistant, nutritious food sources like Bambara groundnut, cowpea, pigeon pea, millet, sorghum and African leafy vegetables such as amaranth and wild mustard. Southern African governments must do more to encourage the production of these crops.

Article written by Anna Weeks, Environment + Energy Editor, The Conversation Africa, and Natasha Joseph, Commissioning Editor. This article is republished from The Conversation under a Creative Commons license. The original article, first published on 21 August 2024, can be found here.

120 YEARS OF SA AGRICULTURE: Highlights from research published in the *SAJS*

Agriculture, an essential pillar of South Africa's economy, has evolved through a century of scientific advancements. In the recently published 120-year celebratory issue of the South African Journal of Science (*SAJS*), *a special review highlighted the significant research contributions that have been made over the last 120 years to the improvement of agriculture in South Africa. The review examined historical challenges and emphasised ongoing issues such as climate change. Modern agricultural practices, including hybrid seeds, genetic modification and advanced irrigation techniques, have transformed crops, enabling increased productivity and global competitiveness. However, the sector faces persistent challenges, including food security concerns. The review also explored future prospects, underscoring the importance of technology adoption and sustainable practices. South Africa's agricultural research, although underfunded compared to developed nations, remains crucial for ensuring the sector's resilience and growth.*

The word 'agriculture' describes the multitude of ways that crops and livestock provide food and other products for the global human population. It is a practice of agroecosystem manipulation. Agricultural science is a multidisciplinary field that focuses on understanding and enhancing the productivity, sustainability and profitability of agriculture. In South Africa, agriculture not only includes the commercial sector but also smallholder and subsistence farmers, who have sustained rural communities and shaped the agricultural landscape for centuries. Agriculture has been, and still is, a pillar of South Africa's economy, contributing 2.83% to the Gross Domestic Product and providing 19.26% of total employment. Agricultural land covers approximately 80% of the country's total area of 1.22 million km^2 of which only 12% is regarded as arable. Agriculture has faced many challenges including, for example, the impact of climate change, pests and diseases, and the complexities of land reform and redistribution issues since 1994. Nonetheless, South African agriculture holds the promise of future growth and development, both locally and internationally, as there is an increasing global demand for food and its sustainable production.

In this review perspective, we present some highlights of the agricultural research that has been conducted over the past 120 years (1905–2023) – the lifespan of the *South African Journal of Science* (*SAJS*) from which most citations were taken. However, when subject-specific journals began to appear, for example, the *Agricultural*

Journal of South Africa in 1915, *Farming in South Africa* in 1927 and the *South African Journal of Agricultural Science* in 1957, authors preferred to publish in these journals, and fewer articles published on agricultural-related topics were published in the *SAJS*. For this reason, we included references from other journals. However, agriculture is such a broad and multidisciplinary topic that the focus of this review will be limited to research conducted on the production of citrus and maize and the challenges faced by these two sectors of the agricultural economy.

Citrus history

Citrus trees, both oranges and lemons, were brought to the Cape from St Helena Island in 1654 and planted in the Cape Gardens. By 1661, 1000 trees had been established, and, for the next 200 years, citrus was grown by small-scale farmers in the Western Cape. At the beginning of the 19th century, early settlers in the Eastern Cape and KwaZulu-Natal provinces planted individual orange and soft citrus trees and, shortly after the Great Trek (1838), citrus trees were planted in the North West province.

As the era of the *SAJS* began at the end of the 19th century, the then Prime Minister of the Cape Colony, Cecil John Rhodes, hired horticulturists, HEV Pickstone and RE Davies from California, to develop the citrus industry in the Cape. Thereafter, citrus trees were grown on a commercial scale using the modern scientific methods known at that time. High-quality citrus fruit was exported to the United Kingdom for the first time in 1906 and "made their debut at the Show of the Royal Horticultural Society in London". The industry flourished thereafter, and between 1906 and 1921, a number of co-operative grower associations formed, the most important of which were the Fruit Growers' Co-operative Exchange (1922), the South African Co-operative Citrus Exchange (SACCE) (1925) and the Citrus Board (1939). Prior to 1941, the distribution and sale of citrus fruit were undertaken by individual producers, but in the year that the South African Citrus Scheme was introduced, sales increased as the fruit was sold in a "more profitable manner". By 1928, more than three million citrus trees had been planted in the Cape. Today, the area occupied by citrus trees of all species and varieties is over 100,000 ha, equating to approximately 55.5 million trees.

According to Fourie *et al.*, the first research officer posts were created by the SACCE in 1953 to undertake work on identified problem areas not adequately investigated by government and other research organisations. Between the 1960s and 1970s, three scientists, trained in California, were appointed by the SACCE in the fields of pre- and post-harvest pathology and horticulture. Their research was undertaken at the Citrus and Subtropical Fruit Institute in Nelspruit, which later became part of the Agricultural Research Council. The Citrus Improvement Programme was established in 1973 and later became known as the South African Citrus Improvement Scheme, managed by Citrus Research International. Scientists from this organisation conduct research on a range of topics relevant to their industry, including pathology, entomology and citriculture.

Maize history

The introduction of maize into southern Africa is a matter of debate among archaeologists. Burtt-Davy suggested that maize seed was exchanged for water, meat or other commodities by the Portuguese *en route* to the East in the mid-1600s. In the latter part of the 19th century, maize was mainly cultivated for local subsistence needs. The market changed with the discovery of diamonds (1866) and gold (1886), and black and white farmers alike supplied maize to the rapidly expanding mining population. "Two agricultures" then emerged: the black smallholder farmers and the white commercial farmers; the production potential of the former was suppressed while the opposite was true for the latter farmers who were supported by substantial investment. Despite this initial division between the maize producers, which changed in the 1990s, South Africa increased its maize production from 328,000 tons in 1904 to 1.68 million tons in 1935 and 15.6 million tons in the 2022/2023 season. This significant increase can be attributed to factors such as the use of hybrid and genetically modified seed, and improved fertiliser programmes and farming practices. Our understanding of plant genetics and the use of biotechnological tools such as marker-assisted selection and genetic engineering, for example, have allowed the industry to produce superior-quality seed and plants resistant to pest infestations.

Maize is the most important crop in South Africa and is used both as animal feed and as a staple human food crop. Today the area planted to maize ranges from 2.5 to 2.8 million hectares annually. The cultivation of maize is restricted by climate. It is considered a dry-land crop, and is mainly grown in the summer rainfall areas such as the North West and Limpopo provinces. In 1923, the "maize triangle" as it became known with Mafikeng (North West), eNtokozweni (Machadodorp) (Mpumalanga) and Zastron (Free State) forming the apices, produced approximately 60% of the total amount (1.5 million tons) grown in the country. The remaining 40% was produced by other provinces (KwaZulu- Natal and the Cape) and subsistence farmers. Today, approximately 14 million tons are produced annually, mainly by commercial farmers, but small-scale farmers also produce a significant proportion of this amount. Approximately 3.2 million tons are exported, mainly to Zimbabwe, South Korea, Japan and Taiwan. The major producers are in the Free State, Mpumalanga and North West provinces.

Yellow and white maize, genetically modified with the Bt toxin, were commercially grown for the first time in the 1998/1999 and 2001/2002 seasons, respectively. South Africa then became the first genetically modified (GM) subsistence crop producer in the world. Food security benefits attributable to GM white maize in South Africa are substantial and "an average of 4.6 million additional white maize rations annually" have been suggested. Thus scientific research has played a pivotal role in the development and widespread adoption of using GM maize in the country.

Challenges

Water availability

Water is scarce in South Africa, and severe droughts have impacted agriculture. Water scarcity has been exacerbated in recent years by erratic rainfall patterns, the needs of industries and cities, and impending climate change. There have been several drought investigations in the past, with the first published in 1914 and the most recent report published in 2020, namely, the National Water Security Framework for South Africa. Over the years, drought-relief plans and management practices were proposed, which included better veld, stock and water management, and improved farm management.

Crop irrigation using flood and furrow methods, as opposed to dryland farming, was first proposed in 1905. Sources of water for irrigation purposes have been, and still are, from various aquifers, catchment areas and rivers. The benefits of irrigation were highlighted in the *SAJS* by van Reenen and Chunnett. Other methods of water delivery and applications such as drip irrigation, developed in the 1900s in Israel, or the use of microsprinklers, were shown to be more water efficient than flood and furrow methods. These more efficient methods are the generally preferred irrigation systems in citrus orchards, as water is directly placed in the root zone and can also be used for fertigation.

In maize, supplementing rainfall during the mid-season drought period positively impacted yield, and this method has been shown to improve and stabilise smallholder farmer maize yields in particular. Centre-pivot

irrigation was first introduced into South Africa in the 1970s to irrigate the farm Soetvelde near Vereeniging. This method enabled commercial farmers to increase the quantities of water applied, and is used in some areas for maize production.

Soil quality

As early as 1923, soil erosion, by wind and/or rain, was recognised as a significant problem in South Africa. Policies were developed to prevent and mitigate erosion in the agricultural sector. In 1939, the Soil Erosion Advisory Council was formed, and the *Soil Conservation Act* was published in 1946. At that time, all these efforts led to the effective control of erosion in some areas of the country. Today, however, over 70% of South Africa is experiencing some form of soil erosion, with the extent of the problem varying by region.

Soil quality is multifaceted. Apart from soil erosion, South African soils have also been subjected to structural decay, subsoil compaction, acidification, salinisation, pollution, nutrient depletion and surface crusting, resulting in reduced water infiltration, increased run-off and erosion. A number of methods can improve and maintain soil quality, including the use of fertilisers. The low quantities of phosphorus in our soils were first recognised in the early 1900s and found to be the main limiting factor in crop production. This led to the development of the first phosphate plant in Durban in 1903. Fertilisers were also imported, with 19,000 tons of fertilisers imported in 1906. By 1962, this amount had grown to 1,385,000 tons, and, in 2023, 2,174,911 tons were imported. South African soils also have low organic matter levels, with about 58% of soils containing less than 0.5% organic carbon and only 4% containing more than 2% organic carbon.

Pests and pathogens

The fields of entomology and plant pathology have a long history in South Africa that dates to the 17th century. Pests and pathogens were, and still are, responsible for significant losses in agriculture, not only during production but also during storage. Initially, the most common method of management was pesticide application. Locusts, for example, were controlled with arsenate of soda, while diseases of grapes were controlled using sulphur, with an amount of 264 tons used in 1916. After 1919, inorganic pesticides were used, including Bordeaux mixture used to prevent numerous fungal diseases. After 1945, numerous synthetic pesticides were developed, many of which are still used today. However, many were detrimental to the environment and to humans. In the 1980s, sustainable farming was encouraged in an attempt to revise the harmful practices of applying increasing amounts of chemicals. Today, management has moved from a reliance on pesticides to environmentally friendly options such as the use of biological control agents.

Crop losses due to pests and pathogens are becoming increasingly common. As pests and pathogens have the capacity to generate new variants containing key pathogenicity, fitness and aggressiveness traits, any new opportunity provided by climate change will be exploited by them. Fluctuations in rainfall, humidity, temperature and carbon dioxide levels may also result in the emergence of pests in the field, an increase in their reproductive rates, shifts in their life cycle and movement from one area to another.

Citrus challenges

Doidge described numerous citrus diseases caused by bacteria and fungi occurring in South Africa between 1919 and 1929. Bacterial, fungal and viral pathogens were, and still are, problematic pre- and post-harvest. Citrus canker, first detected in the country in 1905/1906, was successfully eradicated by 1927, and was the first plant disease to be successfully eradicated in the world. Today, one of the most important citrus diseases is black spot (CBD), discovered in 1922 by Doidge. The disease is not present in the Western Cape, Northern Cape and Free State, and its presence on fruit from KwaZulu-Natal, North West, Mpumalanga and Limpopo has impacted on the export market. The European Union (EU) has strict regulations (zero tolerance) related to the import of fruit from South Africa, both with regard to CBD and the false codling moth, as neither occurs in Europe. To improve risk assessment and CBD management, spore release prediction models have been developed. The presence of viruses has also hampered citrus production. The earliest recorded evidence of a virus causing significant damage was the citrus tristeza virus in 1896, which led to the abandonment of sour orange as a rootstock in South Africa. The identification of the causal agent was, however, only confirmed in 1947.

Entomological problems of citrus described in 1934 included red scale, citrus aphid, fruit fly, mealy bugs and thrips. Today, many of these insects are still problematic. An additional problem with some pests is their ability to vector plant pathogens, for example, the citrus psyllid, which vectors the citrus greening pathogen. Although insecticides have been used for many years, an integrated pest management approach is more widely accepted today.

Maize challenges

Maize has been plagued by many pests and pathogens over the past century. In 1911, cutworm, stalk borer, the striped earworm and a leaf disease of unknown cause were problematic. The number of new incursions of pests and pathogens steadily increased, with the fall armyworm making an appearance in 2017. Pathogens such as those causing cob and stalk rot and storage rot produce mycotoxins and threaten the health of humans and domestic stock. Leaf blight diseases include Northern and Southern leaf blights, grey leaf spot, common rust and maize streak virus, and may cause substantial losses each year.

The development of Bt maize, engineered to contain toxins from *Bacillus thuringiensis*, has provided resistance in South African maize to important insect pests such as the European corn borer and other lepidopteran species. In South Africa, Bt maize makes up more than 90% of the maize planted and has resulted in a significant reduction in pesticide usage, crop damage and attack by fungal pathogens.

Climate change

A number of researchers have modelled climate change and the effects thereof on agriculture in southern Africa. 'According to the report of the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Working Group II, climate change has increased the mean annual surface temperature of the Earth by 1.2°C, relative to 1850–1900, with the six hottest years ever recorded having occurred in the last decade. According to Blignaut *et al*., South Africa became 2% hotter and at least 6% drier in the period 1997 to 2006 compared to the 1970s. During the same period, the use of water also increased significantly, with irrigation agriculture using 60% of total consumption. An increase in temperature and a decrease in rainfall are not the only consequences of climate change; there are increases in extreme weather events, heatwave intensity and frequency, severe droughts and flooding after torrential rains. The average rainfall across South Africa has also decreased in all areas except the northwest and, despite an overall trend in aridity, the intensity and frequency of heavy rainfall events have also increased. In addition to these abiotic factors, biotic stresses, such as an increase in pest and pathogen populations, and increased weed growth have had negative impacts on agriculture.

Climate change will impact both citrus and maize production, leading to possible decreases in yield. In citrus, the effect will be physiological, resulting in a loss of productivity and fruit quality. Adaptation strategies such as canopy management, top netting, soil fertility management and water-saving approaches could be used. Maize production by both commercial and smallholder farming systems is predicted to decrease by between 10% and 16% because of the projected climatic impacts. One method of overcoming this

challenge is to create new varieties, and in the case of citrus, new rootstocks, that can adapt to the predicted environmental conditions.

Johnston *et al.* – in a report entitled 'Climate change impacts in South Africa: what climate change means for a country and its people' – recorded that commercial, small-scale and subsistence farmers have implemented various climate change adaptation strategies. Conservation agriculture, which focuses on retaining soil carbon to enhance drought resilience, has become more important in dryland farming regions. Notably, improvements in irrigation efficiency, coupled with practical drought-tolerant crop and cultivar selection, have become standard practices. In addition, there has been a noticeable decrease in reliance on chemical inputs. Access to medium- and short-term weather forecasts has been enhanced, empowering farmers to proactively prepare for extreme weather events. This includes leveraging indigenous and local knowledge of weather and climate patterns, as well as implementing water resource management techniques. For instance, some farmers now harvest rainwater to sustain agricultural activities during dry periods, thereby prolonging the growing season. Due to these adaptations, the sector's economic sustainability has largely remained intact. Nevertheless, the escalating temperatures and the intensification of extreme weather phenomena pose difficult challenges to farmers' adaptive capacity. As such, ongoing efforts to innovate and implement resilient agricultural practices by both smallholder and commercial farmers will be essential in navigating the evolving climate landscape.

Food security

The term 'food security' was coined in the 1970s. Food supplies are deemed secure when every member of the population has access to sufficient food for living an active, healthy life. There are four elements to the term: food availability, food access, food utilisation and stability.

Despite the constitutional right of every South African citizen to sufficient food and water, food provision is complex and determined by various environmental, health, economic, socio-political and agro-food-related issues. Over 20% of South Africans are food insecure, that is one in five members of the population, mostly from the lowest socio-economic groups, with about 55% of the population unable to pay for food and other basic needs. Widespread poverty, unemployment and inequality have exacerbated food insecurity. This has led to health issues such as obesity and hypertension. One in four children have stunted growth because of poor nutrition. There is an urgent need for significant investment in sustainable agriculture, the development of infrastructure, and poverty alleviation strategies to improve food security for all South Africans.

Future perspectives

Despite all the challenges, agriculture remains a cornerstone of South Africa's economy, contributing 2.83% to the GDP. Over the past 120 years – the life of the *SAJS* – food production has increased due to genetic crop improvements, including the contentious use of genetically modified organisms (GMOs) and cropping practices, notably irrigation and fertilisers. Key issues that are likely to shape the agricultural future include the adaptation of technology; adaption to climate change; sustainable production strategies; production of less studied, locally adapted plant species used in rural communities as food; and education. Technology, such as the use of genetic methodologies like genome editing, artificial intelligence, precision agriculture, drones and satellite imaging for monitoring, and apps for decision-making, have the potential to increase both efficiency and productivity in agriculture. In the case of maize, there is a need to breed new varieties that are drought tolerant, and in citrus, rootstocks and scions that maintain production and fruit quality in the face of climate change. Integrated pest management strategies, including the sensible use of pesticides and the adoption of biological control strategies, will be crucial for managing pests and pathogens while at the same time minimising their environmental impact. Under-utilised agricultural crops, or orphan crops, such as moringa and *Plectranthus aeculentus*, can also contribute to food security. As agriculture will become more technology-intensive, at least in the commercial sector, skilled workers will need to be educated in fields such as data analysis and agricultural engineering. However, low capacity for adaptation, widespread poverty and low technology uptake might hamper agricultural productivity in South Africa.

In conclusion, South Africa's research focus areas are similar to those in the developed world, especially in terms of technology and infrastructure. The research conducted ranges from cutting-edge molecular studies to system modelling approaches. This is despite the fact that expenditure on research, estimated at 1.04% of the agriculture GDP, is significantly less than that of Europe (2.06%), the USA (3.7%) and Australia (4.02%). South Africa's expenditure is however, comparable to that of other developing countries. Since 2008, the government has recognised that South Africa needs to progress to a "developed state of agriculture and agroprocessing", especially in terms of technological innovation, so that wealth generation and socio-economic development within this sector can be achieved within the next 20 years.

Article compiled from: Coutinho, TA, Van Der Waals, JE. 2024. Historical perspective on 120 years of agriculture: Highlights from research published in the SAJS. S Afr J Sci. *2024;120 (Special issue: Celebrating 120 years), Art. #18965. https://doi.org/10.17159/sajs.2024/18965*

WORMS FOR PEST CONTROL?

Dr Tiisetso Lephoto's fight to protect SA's crops

South African farmers and the agricultural sector are increasingly struggling with insect pest control due to the growing problem of pesticide resistance. But Dr Tiisetso Lephoto has a plan – worms.

According to the Food for Mzansi website, farmers are facing a growing problem – pests are becoming resistant to pesticides. PreventionWeb reports that the challenge of insect pest control poses a threat to food security. "Insect pests could cut crop production by 25–40%, if not well managed. Climate change is fuelling an upsurge of crop pests in Sub-Saharan Africa". This challenge threatens crop production, forcing farmers to adopt new solutions such as Integrated Pest Management (IPM) strategies. According to the United States Environmental Protection Agency website, IPM is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. "IPM programmes use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment".

Dr Tiisetso Lephoto is passionate about science, agriculture and innovation. She has expertise in insect pest control and management on farms and in agricultural industries. Lephoto discovered indigenous microscopic worms that can infect and kill problematic soil-dwelling insects within 24–48 hours of invasion.

She is a multi-award-winning, trailblazing scientist with published papers in national and international journals. She has successfully supervised over 30 postgraduate (PhD, MSc and BSc Honours) students in the School of Molecular and Cell Biology at the University of the Witwatersrand (Wits). Through her Nematech Biosciences Foundation, and with the support of the Department of Science, Technology and Innovation (DSTI), she assists in the mentorship of more than 200 graduates.

Lephoto is a Lecturer and Principal Researcher and received the prestigious 2024 TW Kambule-NSTF Award: Emerging Researcher in the NSTF-South32 Awards, known as the 'Science Oscars' of South Africa.

She harnesses the power of entomopathogenic nematodes – microscopic worms with a lethal talent for dispatching insect pests. Her work is at the forefront of a global shift towards sustainable, environmentally friendly pest control methods, namely biological control agents (natural enemies for pests), which promise to

NSTF

Dr Tiisetso Lephoto (right) holding her award, which was proudly handed to her by Minister of Science, Technology and Innovation, Dr Blade Nzimande (left).

reshape agricultural practices across South Africa and beyond. By applying cutting-edge techniques, like whole genome sequencing and transcriptome analysis, Lephoto is unlocking the genetic secrets behind these nematodes' remarkable abilities.

Lephoto was born and raised in Soweto, and her parents supported her when, at just five years old, she expressed a desire to grow her own fruit and vegetables. "I watched my crops grow with great excitement, but soon experienced a problem with pests," she recalls. "I became determined to be a scientist, for the sake of my garden, my community and the world."

Lephoto hopes her winning of the NSTF-South32 Award will encourage aspiring young scientists to persevere and reach their dreams.

"There may be people who tell you that you are too ambitious, you're not capable and you won't make it. Believe in the power of your potential and remember why you started. Ignore the noise and focus on what matters — yourself, and your contribution to science."

For more information on careers in science, technology, engineering and mathematics (STEM), refer to the STEMulator.org and the STEMulator Career Booklet. If you are interested in food and agricultural sciences, have a look at: Agronomist (p5); Biologist (p10); Botanist (p11); Chemical Engineer (p12); Geneticist (p23); Microbiologist (p30); Nematologist (p31); and Zoologist (p46).

Article written by Barnard Manne, Media Liaison and Communications Manager at the National Science and Technology Forum (NSTF).

Balemi ba Afrika Borwa le lefapha la temo ba lebane le mathata a go laola dikhunkhwane ka lebaka la go se sa šoma ga dihlare tša di-pesticide. Eupša Dr. Tiisetso Lephoto o na le leano—diboko tše dinnyane. O šomiša matla a tšona go fediša dikhunkhwane ka tsela ya tlhago.

Translated into North Sotho by Prof. Walter Matli

Tackling **food insecurity** through **inland fisheries in Limpopo**

SAAB/DFFE

The Glen Alpine Dam during November 2024. The low water levels coincided with a fish kill, which led to a significant decline is fish abundance and diversity.

In Limpopo province, poverty and unemployment continue to challenge rural communities, but a new project is exploring how local inland dams might provide a sustainable solution. Flag Boshielo and Glen Alpine dams are at the heart of pilot research to inform South Africa's national strategy on freshwater fisheries. Could small-scale inland fishing be the key to alleviating hunger, boosting local economies and transforming rural livelihoods?

Limpopo province faces significant challenges, including poverty and unemployment. To address these, the South African government, through the Department of Forestry, Fisheries and the Environment (DFFE), has identified inland fisheries as a sector with great potential to reduce poverty and food insecurity, particularly for rural communities near dams. However, the current state of South Africa's inland fisheries demands urgent, targeted action.

Constraints affecting Limpopo's inland fisheries mainly stem from limited data on catch and effort, life-history traits of target species, usage patterns by local fishers, and an absence of clear legislation. Without proper regulation, inland fisheries remain largely informal and subsistence-driven. To transition these fisheries into sustainable, formal operations, scientific research tailored to specific sites is crucial.

This project aims to assess:

- The exploitation potential of inland fisheries resources
- Health risks of consuming fish from local water bodies
- Effects of water-level changes on fish production
- Current patterns of inland fisheries utilization
- Associated value chains
- Pilot initiatives supporting the National Freshwater Wild Capture Fisheries Policy.

Four field surveys were conducted in May, August and November 2024, and January 2025. Researchers measured water quality at three random sites per dam (inflow, mid-dam, dam wall) using handheld multiparameter meters. Fish sampling involved gillnets of various mesh sizes, fyke nets and cast nets, allowing calculation of catch-per-unit-effort (CPUE). Concurrently, surveys examined socio-economic aspects such as fisher demographics, motivations (sale, recreation, subsistence), transportation methods, employment status, gear types and catch sizes.

Fish diversity and abundance varied notably at Flag Boshielo Dam and showed significant seasonal fluctuations at Glen Alpine Dam, raising concerns about sustainability and highlighting impacts from mismanagement, overfishing, environmental changes, and habitat preferences. Regular monitoring of both fish populations and environmental parameters is vital.

Future management should prioritise periodic biomass assessments and continuous environmental monitoring. Adaptive management strategies, including flexible

SAIAB/DFFE

A view from the dam wall of the Glen Alpine Dam wall in January 2025. This rapid increase in water levels facilitated the recovery of fishery resources with a marked increase in species abundance and diversity.

SAIAB/DFFE

Figure 4: Preparation for the placing of the gill nets.

fishing regulations based on real-time data and closed fishing seasons during breeding periods, will be essential to sustaining fish populations.

Community involvement is crucial for conservation success. Educational programmes promoting sustainable fishing can reduce overfishing pressures and enhance stewardship. Partnerships with local fishermen can facilitate knowledge sharing about ecological best practices.

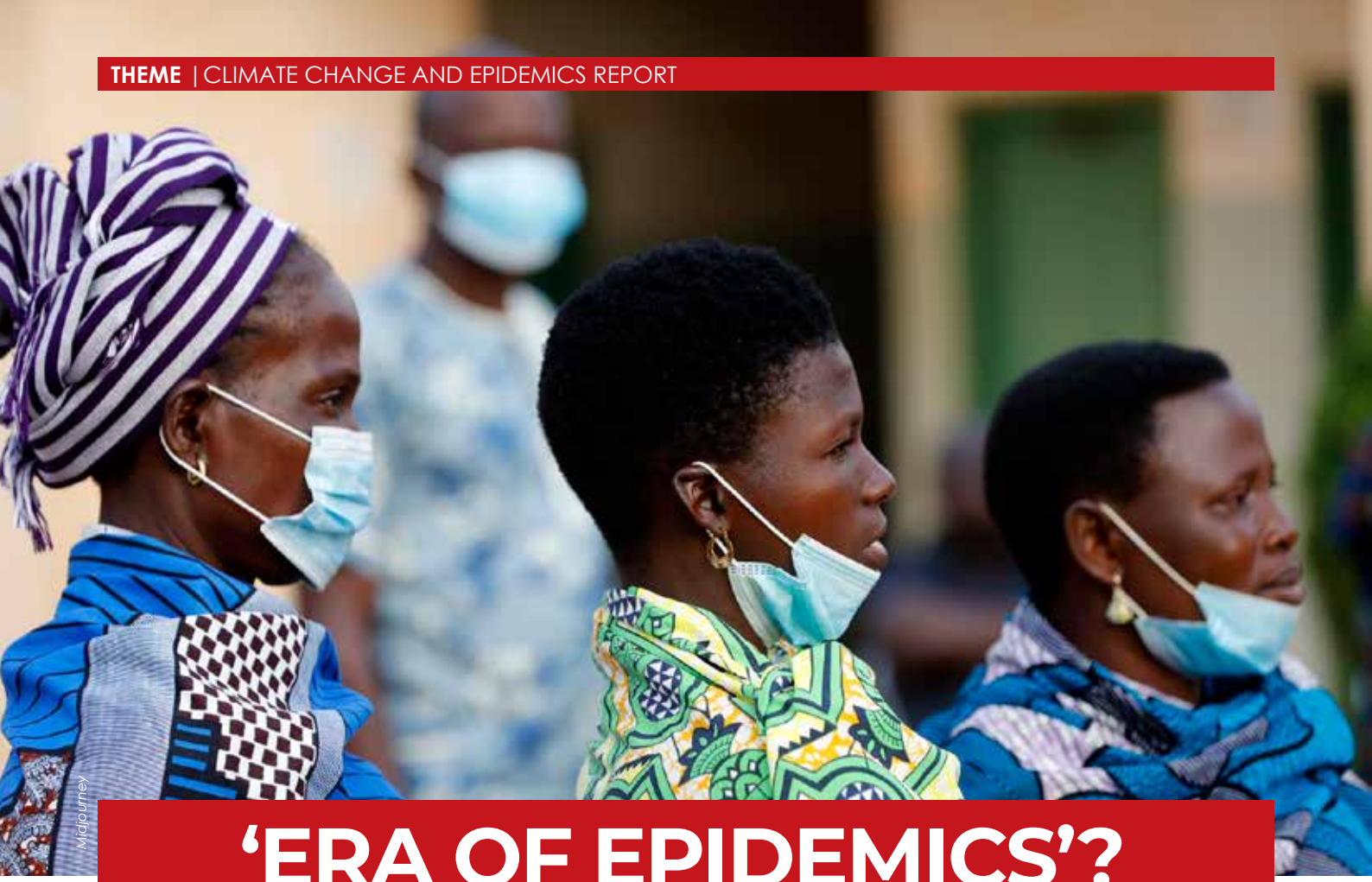
Future research should emphasise integrated fisheries management, merging scientific findings, community engagement and policy input. Such an approach will reconcile diverse stakeholder interests, supporting ecological sustainability and community well-being.

Currently, small-scale fisheries at both Flag Boshielo and Glen Alpine dams lack appropriate regulation and management, causing sustainability concerns and social conflicts. The absence of national legislation and outdated provincial laws creates uncertainty regarding responsibility. The DFFE must engage transparently with provinces and stakeholders to develop interim solutions.

Article written by Archiebold Hlungwani of the Department of Forestry, Fisheries and the Environment (DFFE) and the South African Institute for Aquatic Biodiversity (SAIAB), Mandla Magoro, Lubabalo Mofu and Phumza Ndaleni, also from SAIAB, and Dumisani Khosa from South African National Parks (SANParks).

Profenseng ya Limpopo, bodiidi le tlhokego ya mešomo di tšwela pele go tšhwenya diphitlhelelo tša mahae. Morero o moswa o hlahloba kamoo matamo a selegae a ka neago tharollo e tswelelelago. Matamo a Flag Boshielo le Glen Alpine a bohlokwa nyakišišong ya go hlama leano la naga la dihlapi tša meetse a a hlwekilego. Na go swara dihlapi ka tekanyo e nyenyane go ka fokotša tlala, tsenya tšweletšo moruong wa selegae, le kaonafatša maphelo a setšhaba?

Translated into North Sotho by Prof. Walter Matli



Midjourney

'ERA OF EPIDEMICS'?

Report reveals accelerating global health crisis linked to climate change

According to a report released at the end of last year at the 2024 United Nations Climate Change Conference (COP29), pathogens are spreading faster across borders as global warming accelerates, threatening global health and creating fears of more COVID-19-like epidemics.

The *Climate Change and Epidemics 2024* report was officially launched at COP29 in Baku, Azerbaijan, at the WHO Pavilion on 21 November 2024, with a presentation and interactive discussion with key report authors. Prof. Tulio de Oliveira, renowned global health researcher affiliated with Stellenbosch University and director of the Centre for Epidemic Response and Innovation (CERI), was the report's lead author. The comprehensive study highlights the growing intersection of climate change and infectious disease outbreaks, with 2024 marking a record year for new and amplified epidemics.

In particular, the report underscores the alarming acceleration of pathogen spread that is driven by climate change. In 2024 alone, the world witnessed the highest number of Dengue virus cases ever recorded, with over 13 million diagnosed cases globally.

Additionally, 2024 saw an unprecedented spread of the West Nile virus, with 19 European countries reporting cases. In East Africa, alarming spikes in antimicrobial resistance related to Malaria have been observed, while a new pathogen, Oropouche, emerged in South America.

De Oliveira warned: "We are heading into an era of epidemics, where the amplification cycle between global warming and pathogens is accelerating. In the coming years, it will become clear that without significant reductions in carbon emissions, we, along with future generations, will face more frequent and unusual diseases."

The report identifies three primary factors through which climate change is exacerbating the spread of infectious diseases:

1. **Gradual temperature rise:** The continual increase in global temperatures is creating more hospitable environments for disease vectors, including mosquitoes, rodents and ticks.
2. **Extreme climate events:** More frequent and severe extreme weather events such as floods, hurricanes and droughts are further driving the spread of disease.
3. **Climate migration:** Shifting patterns of temperature and rainfall are affecting food and water availability, which, in turn, forces population displacement, creating new vectors for disease transmission.

The report highlights the devastating impact of extreme weather events. Heatwaves, droughts, floods and cyclones not only result in direct fatalities but also facilitate outbreaks of bacterial diseases like *Vibrio cholera*. In 2023 and 2024, the world saw the largest cholera outbreaks in recent history, with 17 African nations and Haiti (which had been cholera-free for five years) grappling with large-scale outbreaks.

In response to these accelerating threats, the *Climate Change and Epidemics 2024* report outlines actionable recommendations for governments, public health organisations, and the private sector. The key calls to action include:

- **Timely and transparent outbreak reporting**: Governments and health organisations must prioritise prompt and open reporting of outbreaks to facilitate global preparedness and response efforts.
- **Enhanced genomic surveillance**: Increased investment in genomic surveillance systems is essential for tracking the evolution and spread of pathogens, enabling early intervention and prevention.
- **Prioritising vulnerable populations**: Efforts must be focused on protecting the most vulnerable communities, with investments in healthcare infrastructure, disaster preparedness and resilience against climate-induced health threats.
- **Promoting climate-resilient healthcare systems**: Collaboration between academic institutions, industries and governments is needed to design healthcare infrastructure that can withstand extreme weather events and ensure continued access to essential medical supplies during crises.
- **Sustainable funding for research and preparedness**: Governments, private companies and health organisations must commit to sustained funding for research on climate-related diseases, strengthening health systems, and promoting global coordination in response to climate-driven health crises.

Stellenbosch University

Prof. Tulio de Oliveira, the report's lead author, is a renowned global health researcher and director of the Centre for Epidemic Response and Innovation (CERI).

Prof. Luiz Carlos Alcantara from Brazil's FioCruz Foundation, a co-author of the report, noted, "Brazilian scientists and government responded quickly to the *Oropouche* virus, enabling rapid diagnostics and containment. This is a model for how swift action can mitigate the impact of emerging diseases."

De Oliveira emphasised the need for greater transparency in addressing disease outbreaks, citing the ongoing Influenza H5N1 outbreak in animals in the United States.

"As this outbreak spreads through livestock and now swine, it raises the risk of a pandemic. The US must provide full transparency, report cases, and conduct real-time genomic surveillance to facilitate the development of vaccines and therapeutics."

Article compiled from press materials provided by Stellenbosch University. Access the full report, summary presentation and an introductory video at https://climade.health/climade-cop29-report/

HERDING FOR HEALTH

A unique solution that's working

Peace Parks Foundation

Professional herder Vera Kahundu Mwalye stands ready to close the curtain once the cattle are inside the mobile boma, which ensures rotational grazing and avoids land degradation. Her personal success as a professional herder has inspired three young women to volunteer for the programme and follow in her footsteps.

Africa has the greatest potential for environmental restoration of any continent, offering a key solution to global challenges. The Herding for Health programme taps into this potential, sparking meaningful and transformative change. It is a unique community-based initiative that integrates sustainable livestock management and conservation practices to improve ecological health, support livelihoods, and promote coexistence between people, wildlife and livestock in rural areas – while increasing food security and alleviating poverty as additional benefits.

- Herding for Health is currently implemented across 865,414 hectares in 7 countries
- 3,362 pastoralists are currently practising Herding for Health
- 39,157 cattle, and 5,633 goats and sheep are part of the programme
- 5,533 farmers have gained market access resulting in revenues of over USD 6.2 million
- 15,430 people are directly benefiting from Herding for Health
- 2,092 green jobs has been created
- 77,150 people benefit from better herd health management, market access opportunities, micro-enterprises to support the programme with seeding, fodder harvesting, boma repairs etc.
- USD 150 m grant finance has been raised

In Africa, degradation of nature is occurring at twice the rate of anywhere else on Earth. African rangelands are especially vulnerable because of intense use and the effects of climate change, particularly droughts. The African Union estimates that Africa has 268 million pastoralists, with up to 55% living in extreme poverty.

Historically, pastoralists have been amongst the poorest and most marginalised – especially for those located in and around protected areas where diseases can easily be transmitted between livestock and wildlife. A total of approximately 700 million hectares, or half of Africa's rangelands, are degraded due to climate

change, economic needs that prioritise short-term benefits, urbanisation and overgrazing. As a result, for these communities, poverty, desertification, food and water insecurity and biodiversity loss are on the rise. Data show a 65% decrease in wildlife populations across Africa between 1970 and 2016 because of increased poverty, and encroachment in areas of high biodiversity importance, resulting in human–wildlife conflict.

Africa has the largest restoration opportunity of any continent in the world and can play a significant part in solving global challenges at the required scale. This calls for simple, innovative solutions that can be replicated widely. Herding for Health is one such solution that reverses current degradation trends to restore the ecological resilience of landscapes, restores biodiversity loss and cultivates resilient livelihoods for local communities. Herding for Health is an inspirational solution that has proved to be highly successful in co-creating impact on the ground by integrating indigenous knowledge and robust scientific research into livestock management.

How it all began

In 2014, a community leader from the Amashangaan tribal area outside of South Africa's Kruger National Park succinctly captured a central tension between poverty and nature conservation:

"Help us look after our cattle, and we will look after our rhino as well."

These words ignited a partnership between two organisations, Conservation International and the Peace Parks Foundation, that joined hands and met with cattle owners and herders to understand their underlying challenges when trying to provide for families. Using this indigenous knowledge, Herding for Health was established and rolled out to communities. By adapting the herding model to various landscapes, the two organisations discovered a multitude of issues that resulted in a compounding impact on landscapes, human well-being and animal health.

The Herding for Health model was initially developed to address various challenges in nature conservation and community development in areas of high biodiversity importance. Some Herding for Health sites started with the aim of developing a mechanism to address human–wildlife conflict, especially the retaliation killings of large predators that preyed on livestock. Other sites evolved more around the challenging trade barriers that hindered economic opportunities for communities living next to protected areas where, for instance, Foot and Mouth Disease transmitting from wildlife to livestock is an eminent risk. In addition to addressing site-specific issues, the core of the Herding for Health model aims to support both people and wildlife to thrive through strategic livestock management in a way that restores ecosystem function and halts land degradation.

Rangeland challenges in a nutshell

Livestock ownership forms an important pillar of local culture and is considered a key approach to 'save for a rainy day'. The cattle herd is a family's savings account to be tapped into when there is a need for cash. Traditional livestock ownership may not have evolved in line with market dynamics, however. Farmers tend to hang on to livestock beyond their prime, increasing the age and vulnerability of the herd. When they then do sell the animals, they generate only a fraction of the premium market price.

Deteriorating environments and a lack of care provided to livestock have resulted in poor animal health, increased mortality rates, decreased fertility, faster disease transmissions, and increased herd vulnerability to drought and flood incidents. In addition to the increased pressure on the communal rangelands and disease burdens, community encroachment and habitat loss cause a rise in the predation of cattle by lions, leopards and cheetahs. Predators usually strike at night and cause substantial losses for cattle herders, but due to the provision of so-called 'mobile bomas', communities whose livestock are in these enclosures do not experience such losses.

Building solutions

The Herding for Health partnership embodies creativity, excellence, grit and hope, operating on the ground with the most vulnerable communities in Africa – exactly where change needs to happen. The Peace Parks Foundation is working throughout southern Africa to unlock the potential of rangelands to support economic growth, resilient livelihoods, the availability of freshwater, and wildlife conservation — while also storing carbon.

Based on scientific and traditional knowledge, and together with community elders and herders, a rotational grazing plan is developed for the area that allows soils to rest and rangelands to recuperate. Herders are trained in reading the landscape and its soil characteristics, applying controlled burning, focusing on spring protection and water retention, and regenerating soil and biodiversity.

As part of the Herding for Health programme, ample attention is paid to the herder's understanding of animal health, optimising animal genetics and record keeping. Animals are vaccinated, dewormed and monitored. As a result, fertility rates rapidly increase, and disease transmissions go down, creating strong, healthy herds that produce high-quality and nutrient-rich meat. This helps improve local diets and provides an opportunity to access premium market prices as well.

Peace Parks Foundation

Her motorbike at the ready, team leader Nawelwa Christine Muyunda prepares to supervise the driving of a herd of cattle across the rangelands for the night, in Simalaha Community Conservancy in Zambia's Western Province.

A cultural shift was required to make herders feel comfortable with selling off premium, healthy cattle. This was enabled and made attractive by creating savings plans and banking options. Collaboration with a mobile abattoir ensures that the slaughtering of animals happens according to health and safety standards, enabling access to premium markets and creating even more savings.

Possibly the simplest yet most effective solution in the Herding For Health toolbox is the deployment of mobile bomas. These two-metre-tall mobile tent cloth enclosures are easy to erect and can hold about 600 cattle at a time. At night, cattle are led into the mobile bomas where they are guarded by a group of trained herders. Lion, leopard and cheetah will still roam around, smelling and hearing the cattle, but never risk jumping into a boma as they do not know what awaits them on the other side. Since the deployment of mobile bomas, not a single head of cattle that was inside one has been lost to predation.

The bomas have an additional function in the landscape. Since they are mobile, they are moved every week, leaving a well-fertilised and trampled spot behind. The soils are subsequently seeded with harvested seeds from recovered grasslands, turning the prior boma spot into a floral biodiversity bank and a force for more rapid rangeland regeneration.

In addition to creating community training and livelihood options, Herding for Health increasingly focuses on job creation and enterprise development. This includes creating cash-for-work programmes that optimise landscape regeneration – by removing harmful invasive species, for instance – or developing value chains from by products such as wool and leather.

Recognising that herding is mostly a male occupation, the Herding For Health programme expanded its operations to include sheep and goat herding. Since the latter is dominated by female herders, the programme now equally targets men and women in the rangelands.

The women herders and leaders who are inspiring a new generation in Zambia

In many communities in southern Africa, looking after the family's prized cattle is the preserve of men, while women tend to be responsible for growing crops and raising children.

Thanks to opportunities offered by the Herding for Health programme, more women are stepping into this traditionally male-dominated arena. Having recently

celebrated International Women's Day, Peace Parks highlighted the inspirational achievements of two young women who are proving their mettle in animal husbandry and leadership.

Nawelwa Christine Muyunda

Riding a motorbike across Simalaha Community Conservancy's rangelands, Nawelwa Christine Muyunda knows she is an anomaly. At 32, she has risen to the rank of team leader for Herding for Health at Simalaha, where she fosters animal health in the community through planned grazing and rangeland management.

Her career and personal success as a farmer and cattle owner, while raising two young children, have earned her the respect of the local community – including male farmers. She and her husband own a house in nearby Mwandi village, which they rent out to two families for extra income. They also have a few head of cattle, which she has enrolled in the Herding for Health programme. Despite her evident commitment to the programme, working in a male-dominated area has not been plain sailing: "Being a supervisor is a little hard. Some men […] say, this woman cannot lead us," she says.
Her work has taught her about the prevailing mindsets and how to handle them within her team. With encouragement from her supervisor, she learned to ride a motorbike, gaining a mobility few women in her community enjoy. And instead of waiting for herders to do the more difficult tasks like vaccinating cows, she chooses to tackle them herself.
Her willingness to lead by example has earned her the title of 'cow lady' – one that she hopes to share with others soon. "I am expecting more ladies to participate in the programme because they see me as an example," she says with a grin.
Watch Nawelwa Christine Muyunda's story here: https://youtu.be/YqnhK6xCNe4

Vera Kahundu Mwalye

When women – like professional herder Vera Kahundu Mwalye – are empowered with knowledge and opportunities by programmes such as this one, communities thrive. Through her involvement with Herding for Health, this young woman has been able to place her children in school, buy livestock and secure a plot for her first home in Mwandi.

It's an impressive feat for a single mother-of-two who dropped out of high school due to early pregnancy, and against the odds returned to complete her education. Through Herding for Health, she became a professional herder as a member of the Makanga Village Action Group in 2022, bucking another trend.

"Most of the men were happy when I joined [the communal herd]. Of course, there were some who doubted me. They thought I wouldn't manage but they have changed their minds," she says. "They have seen that I'm just as capable as they are, and they know that I am better than some of them."

By using sustainable agricultural practices, Mwalye is helping degraded grazing areas in Simalaha to recover, which improves local farmers' livelihoods. In addition, a mobile boma supplied by the programme for kraaling cattle on a rotational basis prevents overgrazing, which ensures healthy rangelands, and keeps them safe from predators like leopard and hyena.

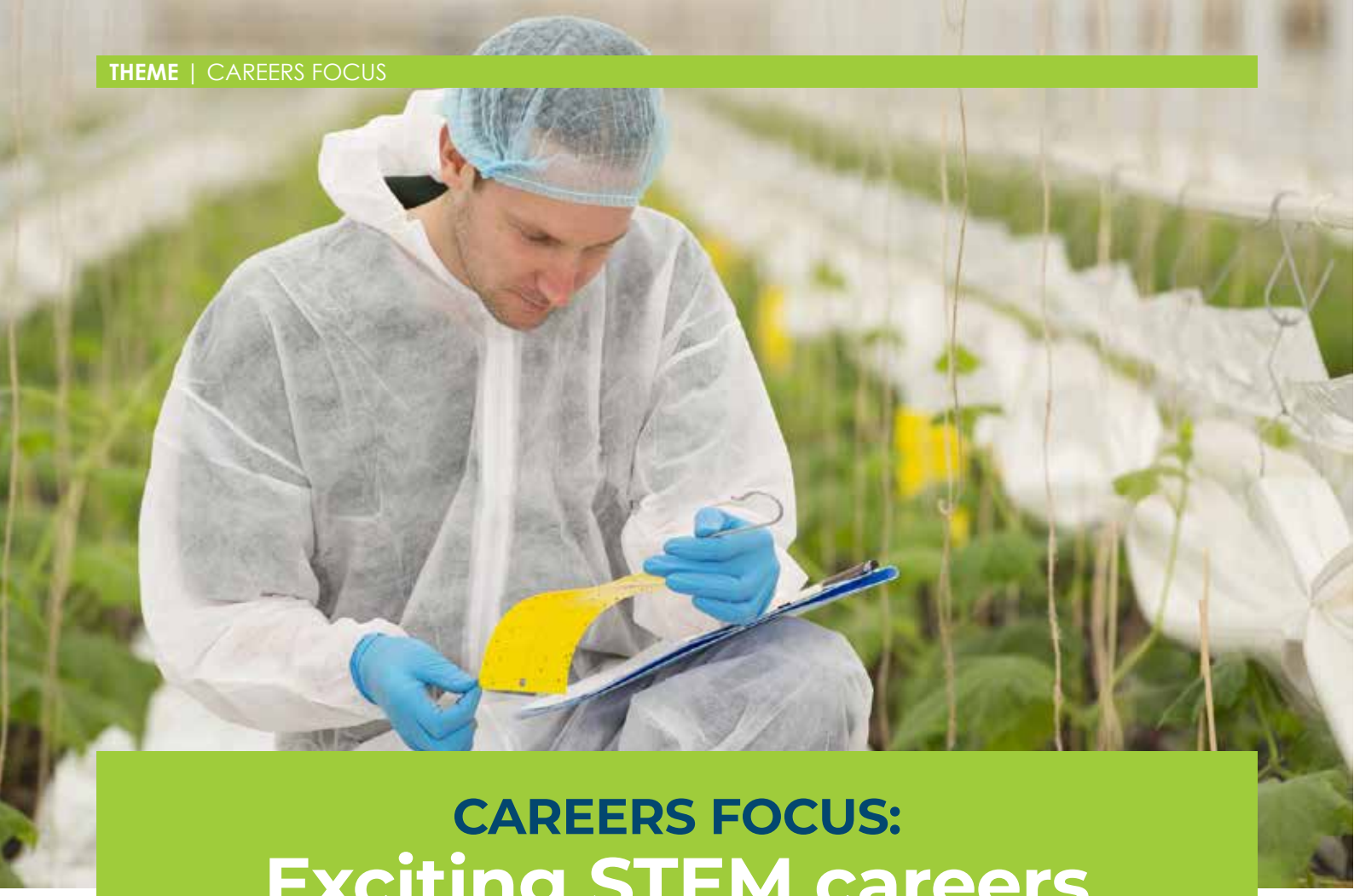
Her family stands firmly behind her choice of career. "They're happy with my job because I support them. Herding for Health has helped me because I never really had my [own] property. It has changed my life," she says. Today, she owns livestock – five goats and three cows – placing her in a league beyond most young women, especially single ones, to whom she is a source of inspiration. "Three female volunteer herders joined (the communal herd) after seeing me in my role," she says.

Watch Vera Kahundu Mwalye's story here: https://youtu.be/fiC_S5C97VE

Article compiled from press material provided by the Peace Parks Foundation. Be a part of Herding for Health and help unlock Africa's vast potential for restoration: https://www.peaceparks.org/h4h/

Lenaneo la Herding for Health ke leano le le ikgethileng la setšhaba le kopanyang tsamaiso e e siameng ya diruiwa le diphetogo tsa tikologo. Le thusa go tokafatsa botsogo jwa tikologo, go tshegetsa matshelo a batho, le go rotloetsa phedisano magareng ga batho, diphologolo tsa naga, le diruiwa mo metseng. Gape, le oketsa polokakapa ya dijo le go fokotsa bobotlana.

Translated into North Sotho by Prof. Walter Matli



CAREERS FOCUS:
Exciting STEM careers to tackle food security challenges

South Africa and other countries of the Southern African Development Community (SADC) have faced numerous challenges regarding food security. These issues pose a significant threat to the already struggling agricultural industry. Climate change and drought in South Africa have further exacerbated these challenges. Artificial intelligence and technological advancements have been identified as potential solutions to some of the agricultural issues we are facing. The government has also encouraged the youth to explore agricultural careers as a way to address these challenges. Read on if you are interested in a career in food, biological or agricultural sciences.

The responsibility for the future of our food now lies with the youth. For high school learners, particularly those in Grade 12 who are interested in science, technology, engineering, and mathematics (STEM), particularly a career in the food, biological or agricultural sciences, here is a list of career options available at various South African public universities and accredited private colleges:

Agronomist: Agronomy is the science of the successful growing of certain land crops, whether under dryland conditions or irrigation. The crops include corn, maize, grain sorghum, peanuts, sunflower, cotton, sugarcane, forage crops and fruit. Agronomists develop and implement production systems so that economical production is maximised without harming the environment. They investigate field crop problems and develop new and improved growing methods for higher yields or better quality.

Biologist: Biology is a basic science. Biologists study humans, plants, animals and the environment. They investigate the world by looking at how life begins and develops, as well as the structure and function of life, collecting specimens from the natural environment where the plant, animal or insect lives. These collected specimens are then carefully examined, named and classified (if it is a new discovery). The findings are recorded and finally written up in reports or academic journals. Many biologists specialise in a specific field of study, such as zoology (animal life); botany (plant life); microbiology (microscopic plant and animal life); entomology (insect life) etc.

Chemical engineer: Chemical engineers use their knowledge of chemistry to solve practical problems concerned with turning raw materials into valuable products, and perform chemical plant design and construction. They may also invent new ways of doing things. Chemical engineers have contributed to the fields of atomic science, manufacturing, mineral processing, paper, dyes, medication, plastics, fertiliser, foods, environmental protection and fuel.

Ecologist: An ecologist is a scientist who studies how organisms (animals, plants, microbes, etc.) interact with their environment and one other. Ecologists investigate ecosystems, including the relationship between living organisms (such as plants and animals) and their physical surroundings (such as soil, water, climate, etc). Ecologists often do field research to gather data. They analyse the information to learn more about the patterns and processes that shape ecosystems. Ecologists may specialise in various sub-disciplines such as marine ecology, terrestrial ecology and conservation ecology. Their work is essential for understanding the natural world and the impact of our activities on the environment.

Environmental chemist: Environmental chemists are responsible for analysing the effects of chemicals on soil, air and water environments. They are also responsible for devising solutions to environmental problems. Their main aim is to locate and neutralise threats of pollution to people, animals and plants, using their knowledge of chemical properties and reactions.

Geneticist: Genetics is the study of genes, DNA, heredity and genetic variation in living organisms. Geneticists research the genetic causes of and possible gene therapies for diseases and disorders that result from a single genetic mutation or a combination of genetic traits. Some geneticists focus on isolating the gene or genes responsible for certain diseases and conditions in which the causes are not fully determined or understood.

Microbiologist: Microbiologists investigate the growth, structure, development and other characteristics of microscopic organisms, which are tiny living organisms that are too small to be seen with the naked eye. Microorganisms include bacteria, algae, viruses and fungi. Microbiologists work in a wide variety of settings, although most of the work is laboratory-based. Microbiologists isolate and make cultures of microorganisms, identify their characteristics, and observe their reactions to chemicals and other kinds of stimuli. They also study how microorganisms develop and reproduce, as well as their distribution in nature. Many microbiologists work for universities, where they teach and do research. Others work at medical centres, in private industry, or for government agencies. Their work helps us understand how microorganisms influence our lives, from causing diseases to offering solutions to challenges in medicine, agriculture and environmental management.

Nematologist: Nematologists are scientists that study nematodes, which are also called roundworms. They research various aspects of nematodes, including their biology, ecology, behaviour, and their interactions with other organisms and the environment. Some nematologists identify and study nematodes in the soil to help farmers grow enough healthy food for everyone. Plant and soil nematologists extract nematodes from samples they take from different environments. Nematologists use microscopes and can identify and count the nematodes found in soil and plant material. Nematologists are important for understanding the role of nematodes in ecosystems, agriculture, and human and animal health.

Zoologist: Zoology is a basic science. It is the scientific study of animals (living organisms excluding plants, fungi, viruses and bacteria) and their relationship with their habitats (environments). Zoologists are biologists who study the origin, classification, characteristics, structure, growth and development of animals. Zoologists are sometimes known as animal scientists or animal biologists. Like botany and microbiology, zoology is a major division of biology. As this field is so broad, zoologists usually specialise in a particular type of animal or animal family, or in certain aspects of animal life such as genetics or animal classification.

Are you unsure about your next career move? The National Science and Technology Forum (NSTF) has produced a science-based career booklet that exposes youth to a variety of careers in science, engineering, technology (SET). And it also produces career talk videos by professionals that are NSTF-South32 Award winners, which are available on the NSTF YouTube channel.

Below are the award winners whose work is contributing to the theme **"Feed the future"**:

Dr Daniel Hart, Translational evolutionary biologist: University of Pretoria
Dr Helen Dallas, Freshwater ecologist: Freshwater Research Centre (FRC) and Freshwater Biodiversity Information System (FBIS)
Prof Evans Chirwa, Water engineer: University of Pretoria
Dr Wynand Goosen, Molecular biologist: Stellenbosch University
Prof Guy Midgley, Earth scientist: Stellenbosch University
Dr Boitumelo Semete-Makokotlelav, Biochemist: South African Health Products Regulatory Authority (SAPHRA)
Prof Paul Oberholster, Limnologist: University of the Free State
Prof Tamiru Abiye, Hydrogeologist: University of the Witwatersrand

Article compiled by Itumeleng Ndlovu, Youth Outreach Officer at the National Science and Technology Forum (NSTF).

TELLING STORIES THAT BRING SCIENCE TO LIFE

Even as a little girl, I've always been fascinated by wildlife. Here, I'm watching a female bushbuck in Satara, Kruger National Park.

Dr Mariette van der Walt of the Wilderness organisation shared how she brings science to life with stories.

In November last year, Stellenbosch University's Centre for Research on Evaluation, Science and Technology (CREST) organised the Communicating Discovery Science Symposium. Sponsored by the Kavli Foundation, the symposium aimed to deepen understanding of effective public engagement with foundational science. Despite its vital role in advancing knowledge, basic science has historically been overlooked in science communication and public engagement, which tend to focus on applied research, emerging technologies or controversial topics. To bridge this gap, the symposium brought together scientists and science communication experts to discuss the nuances of communicating basic science. One of the speakers at the symposium was Dr Mariette van der Walt, experienced science communicator, bat expert and biodiversity coordinator for the Wilderness organisation. *Quest* asked her to tell us how she brings science to life with stories.

When I was a little girl, I was lucky enough to regularly visit the Kruger National Park for holidays with my parents. I'll never forget the moment that a huge male lion came strolling past our car while I sat fascinated in my little kid's chair. For a moment, our eyes met, his deep amber ones and my wide blue ones, and I felt a shiver of both fear and wonder.

Since then, every visit to the Park deepened my fascination with nature and sparked a dream: One day, I would don a khaki uniform, drive around in a Land Rover, and "protect the animals." I didn't know how I'd do it, but I had all the hope of a child who believes anything is possible.

At school, my curiosity was fuelled by every wildlife documentary I could find on television. Afternoons spent watching Animal Planet and Sir David Attenborough felt like windows into an incredible world that I was itching to be part of. By the time I reached university, the path seemed clear: I would study Zoology and dedicate my life to wildlife and conservation.

University was thrilling. Learning about ecosystems, species interactions and all the hidden wonders of our African wildlife filled me with a sense of purpose. My

Working with bats as a postdoctoral fellow at the Centre for Viral Zoonoses, University of Pretoria.

studies led to a PhD and eventually a postdoctoral fellowship focusing on bats. I'd clamber through huge caves, catching bats and collecting data on their biology, behaviour and health to better understand how to protect them. During this time, I authored several scientific papers about bats and their conservation.

Although I loved this work, I'd soon realised that somewhere along the way, I lost something. The stories that first sparked my love for nature had faded into piles of academic papers, statistics and technical jargon. The wonder I once felt was being smothered under the weight of my academic duties.

Everything changed when, on a whim, I applied for a filmmaking and storytelling fellowship. That experience reignited my passion for wildlife, not just as a scientist but also as a storyteller. I had an 'aha' moment when I realised that data alone can't inspire people to care about conservation. Only stories can.

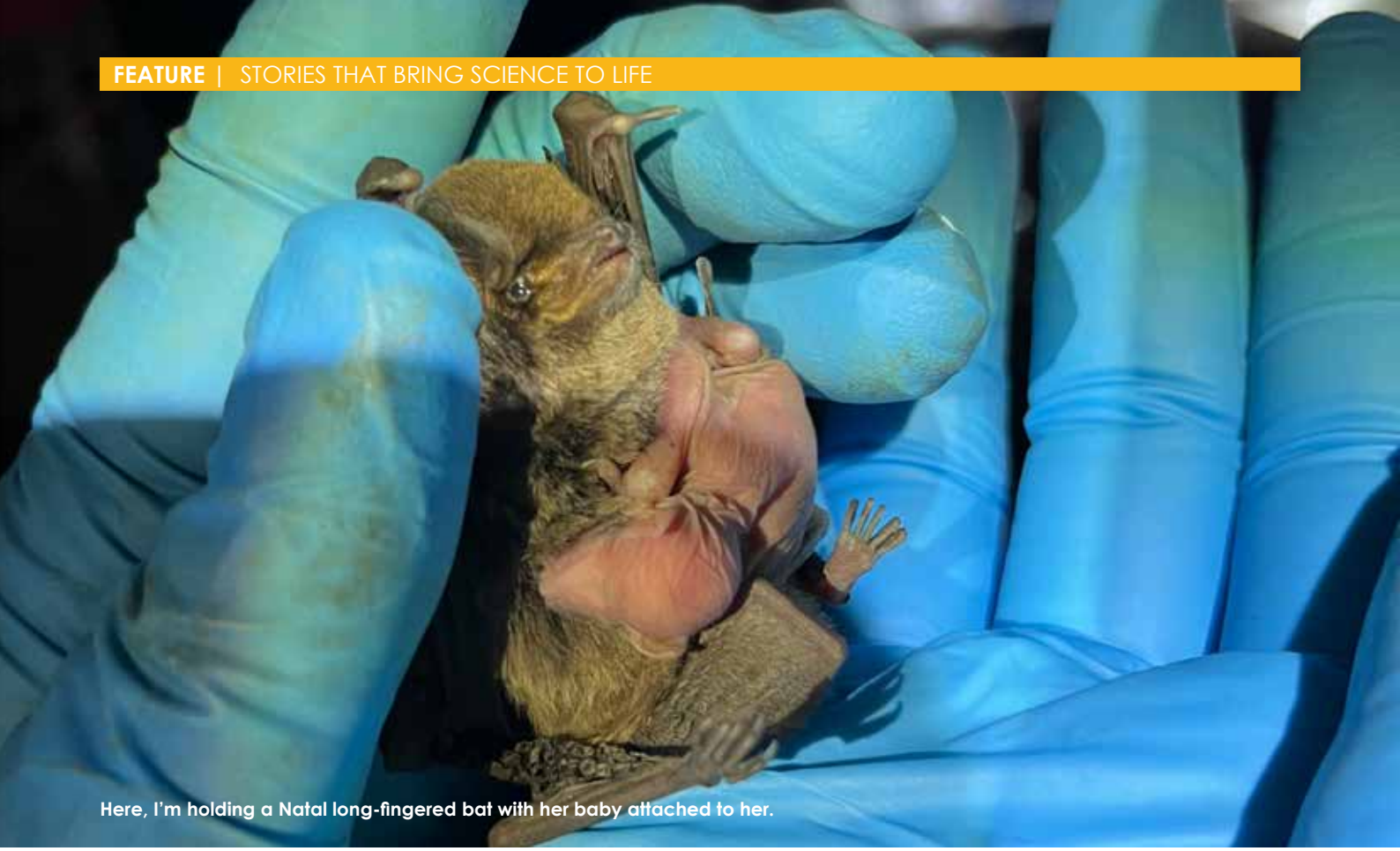
Driven by this realisation, I took a leap of faith. I left academia and threw myself into the world of science communication. It was a scary decision, especially in South Africa, where science communication is still an emerging field and jobs are scarce, but I trusted that my passion for storytelling, and my determination to succeed, would win out.

Until recently I was science communications officer for Genus Palaeosciences, where I got to combine my scientific training with my love of creativity. Through writing, photography and filmmaking, I learned to share stories about science and nature to help others feel the same sense of wonder and to demystify jargon and science for everyone.

One of the most powerful tools I've discovered is photographs. During my years as a bat ecologist, I'd often hear negative reactions when I mentioned my research. "Bats are creepy!" some would say, or "Don't they get stuck in your hair?" (They don't, by the way.) It wasn't until I started showing people photos of bats, especially baby bats, that their attitudes began to shift. Instead of fear, I'd see fascination. That's the power of a single image: it can challenge perceptions and spark conversations.

If you're passionate about wildlife or science and want to share your stories, here are some of my tips to get started:

1. **Follow your curiosity** – Don't limit yourself to just one area of study. Take advantage of workshops, fellowships, talks or any creative opportunities outside your chosen field. For me, it was a filmmaking fellowship that opened a whole new world. You never know what might spark your next adventure.



Here, I'm holding a Natal long-fingered bat with her baby attached to her.

2. **Start small** – You don't need fancy equipment or a lot of money to make an impact. Most of us carry smartphones, which are perfect for photography. Start by capturing small moments. You never know where these pictures might come in useful, and it gives you the opportunity to practise your skills. The more you practise, the more comfortable you'll become.
3. **Forget perfection** – It's easy to get caught up in wanting everything to be flawless, but perfection isn't the goal. Authenticity matters more. Share what you have, even if it's rough around the edges. The important thing is to tell your story.

One of the questions I often get is, "How do you find time to capture photos and videos when you're busy with research?" My answer is simple: I treat it as part of the process, not an extra task. Snapping a quick photo doesn't take much time but adds incredible value later, for presentations, social media, or just sharing your work with friends and family at a party. Once you make it a habit, it feels natural and doesn't disrupt your work.

As a science communicator, I've also learned that the value of storytelling isn't measured in likes or views. Real impact is harder to quantify. Can your story inspire a young learner to pursue a career in science? Can it teach someone something new or make them care about an issue they'd never thought about before?

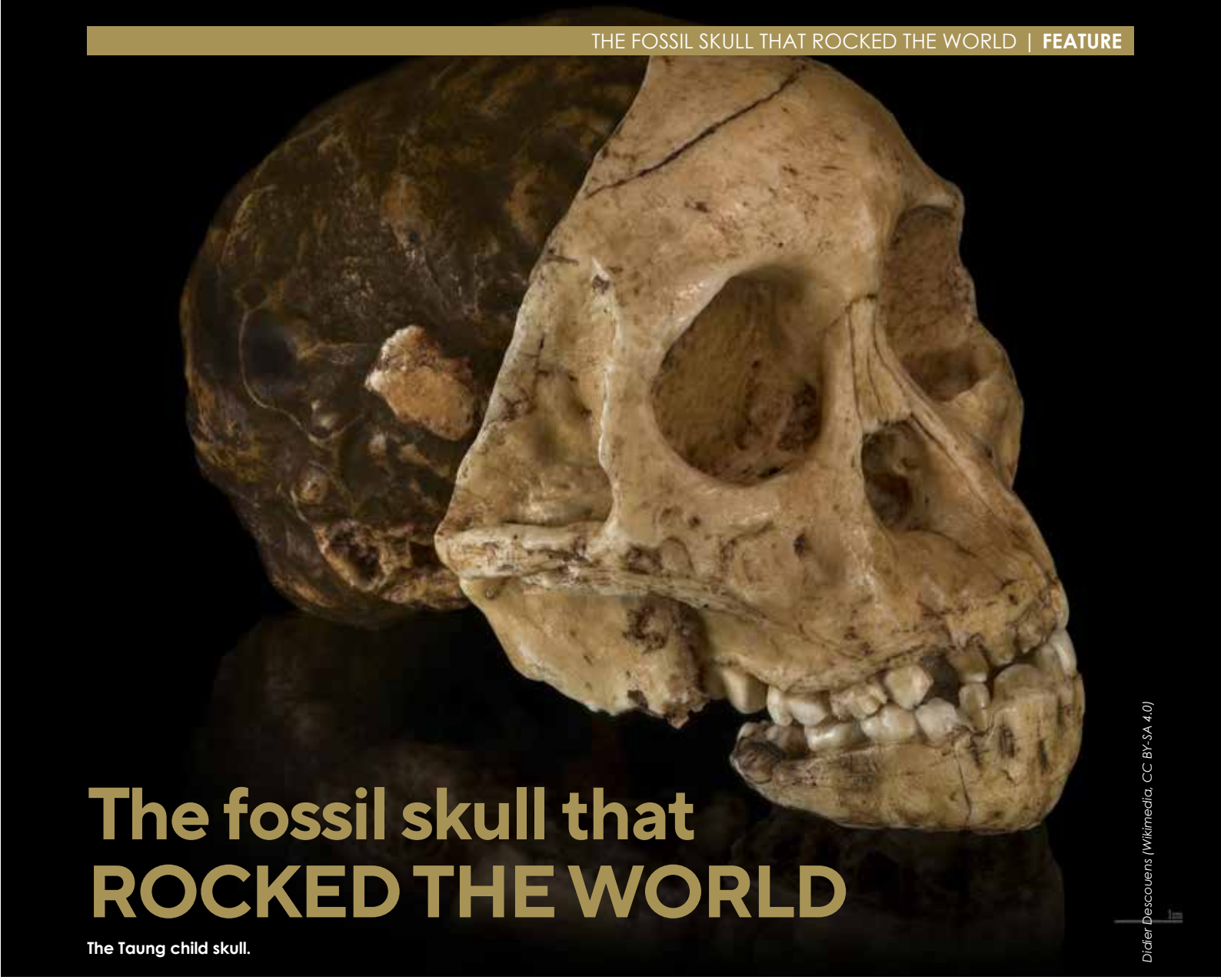
Those moments of connection are what make it all worthwhile. By sharing our work through stories, we can inspire everyone and create a deeper appreciation for the natural world, and that's where the change, and conservation, will start.

I often think back to that little girl sitting in her chair, watching the lion pass by. That moment was a spark for everything I've done since. Now, through storytelling, I hope to pass that spark of inspiration on to everyone else.

Article written by Mariette van der Walt, Biodiversity Coordinator at Wilderness.

Ka Ngwaga wa go feta ka Ngwaga, Seteišenare sa Dipatlisiso tša Tekolo, Saense le Theknolotši (CREST) sa Yunibesithi ya Stellenbosch se be se rulagantše Simposiumo ya Go Bolela ka Saense ya Dikutollo.O mongwe wa diboledi e be e le Dr. Mariette van der Walt, setsebi sa phetisetšo ya saense, setsebi sa dinonyana tša maphemelana, le molamodi wa phapamollo ya tlhago mokgatlong wa Wilderness.

Translated into North Sotho by Prof. Walter Matli



The fossil skull that ROCKED THE WORLD

The Taung child skull.

Didier Descouens (Wikimedia, CC BY-SA 4.0)

100 years later, scientists are grappling with the complex colonial legacy of the Taung Child find.

Here's how the story of the Taung Child is usually told:

In 1924 an Australian anthropologist and anatomist, Raymond Dart, acquired a block of calcified sediment from a limestone quarry in South Africa. He painstakingly removed a fossil skull from this material.

A few months later, on 7 February 1925, he published his description of what he argued was a new hominin species, *Australopithecus africanus*, in the journal *Nature*. It was nicknamed the Taung Child, a reference to the discovery site and its young age.

The international scientific community rebuffed this hypothesis. They were looking outside Africa for human origins and argued that the skull more likely belonged to a non-human primate. Dart was vindicated decades later after subsequent similar fossil discoveries elsewhere in Africa.

Dart is portrayed as prescient in most retellings. He's hailed for elevating the importance of Africa in the narrative of human origins.

But is this a biased and simplified narrative? The discovery played out during a period marked by colonialism, racism, and racial segregation and apartheid in South Africa. The history of human origins research is, therefore, intertwined with inequality, exclusion and scientifically unsound ideas.

Viewed against this backdrop, and with a contemporary lens, the figure of Dart, and palaeoanthropology on the African continent more broadly, is complex and worthy of reflection.

The *South African Journal of Science* has published a special issue to mark the centenary of Dart's original paper.

A group of African researchers and international collaborators, ourselves among them, contributed papers offering perspectives on the science, history and legacy of palaeoanthropology in South Africa and beyond.

We were particularly interested in exploring how the history of the discovery of early hominins in South Africa influenced the scientific field of palaeoanthropology. Did it promote or limit scientific enquiry? In what ways? What were its cultural effects? And how do they play out now, a century later?

The papers in the special issue unpack a number of issues and highlight ongoing debates in the field of human evolution research in Africa and beyond.

Our goal is to celebrate the remarkable science that the discovery of *A. africanus* enabled. At the same time we are probing disciplinary legacies through a critical lens that challenges researchers to do science better.

The marginalisation and erasure of voices

Several key themes run through the contributions in the special issue.

One is the unheard voices. The colonial framework in which most palaeoanthropological research in South Africa took place excluded all but a few groups. This is particularly true for Indigenous voices. As a legacy, few African researchers in palaeoanthropology are first authors on prominent research or leading international research teams.

Too often, African palaeoanthropological heritage is the domain of international teams that conduct research on the continent with little meaningful collaboration from local African researchers. This is "helicopter science". More diverse teams will produce better future work, and those of us in the discipline must actively drive this process.

The dominance of Western male viewpoints is part of the colonial framework. This theme, too, threads through most of the work in the special issue.

In a bid to redress some of the imbalances, a majority of the authors in the special issue were women, especially African women, and Black Africans more broadly. Many of the papers call for a more considered and equitable approach to the inclusion of African researchers, technicians and excavators in the future: in workshops and seminars, on professional bodies, as collaborators and knowledge creators, and in authorship practices.

Community and practice

Colonial legacies also manifest in a lack of social responsiveness – the use of professional expertise for a public purpose or benefit. This is another theme in the special edition. For example, Gaokgatlhe Mirriam Tawane, Dipuo Kgotleng and Bando Baven consider the broader effects of the Taung Child discovery on the Taung community.

Tawane is a palaeoanthropologist and grew up in the Taung municipality. She and her co-authors argue that, a century after the discovery of the fossil, there is little (if any) reason for the local community to celebrate it. They argue that more must be done not only to give back to the community, which is beset by socio-economic struggles, but also to build trust in science and between communities and scientists.

Researchers need to understand that there is value in engaging with people beyond academia. This is not merely to disseminate scientific knowledge. It can also enrich communities and co-create a scholarship that is more nuanced, ethical and relevant. Researchers must become more socially responsive, and institutions must hold researchers to higher standards of practice.

Resourcing

Another theme that emerges from this special issue is the value of and the need for excellent local laboratory facilities in which to undertake research based on the fossils and deposits associated with them.

Increased investment in local laboratory facilities and capacity development can create a shift towards local work on the content being led by Africans. It can also increase pan-African collaboration, dismantling the currently common practice of African researchers being drawn into separate international networks.

It is important for international funding bodies to increase investment within African palaeoanthropology. This will facilitate internal growth and local collaborative networks. International and South African investment is also needed to grow local research capacity. Fossil heritage is a national asset.

Article written by Rebecca Ackermann, Professor, Department of Archaeology and Human Evolution Research Institute, University of Cape Town; Lauren Schroeder Associate Professor in Evolutionary Anthropology, University of Toronto; and Robyn Pickering, Senior lecturer, University of Cape Town. This is an edited version of an article in the South African Journal of Science. *Yonatan Sahle, Department of Archaeology, University of Cape Town, South Africa and Department of History and Heritage Management, Arba Minch University, Ethiopia, co-authored the academic article. This edited article is republished from The Conversation under a Creative Commons license, where it was first published on 7 February 2025. It can be found here.*

It's the biggest Egyptian tomb discovery in a century. Who was Thutmose II?

Karnak was one of the most important religious centres in ancient Egypt.

Katarzyna Kapiec

Archaeologists in Egypt have made an exciting discovery: the tomb of Pharaoh Thutmose II, a ruler who has long been overshadowed by his famous wife and half-sister, Queen Hatshepsut. Thutmose II's tomb has been labelled the first, and biggest, discovery of a royal tomb since Tutankhamun's tomb was found just over 100 years ago.

The remarkable new tomb find is located in the Western Valley (a burial ground for queens rather than kings), near the complex of Deir el-Bahari, which houses the funerary temple of Hatshepsut. We worked together as archaeologists at this spectacular site some 15 years ago.

Despite the tomb being found totally empty, it's a crucial element in further understanding a transformative period in ancient Egyptian history.

Hatshepsut's forgotten brother and husband

Thutmose II (also called Akheperenre) reigned in the first half of the 15th century BCE. This made him the fourth ruler of the 18th Egyptian Dynasty, which marked the beginning of the New Kingdom period.

Thutmose II likely ruled for a little over ten years, although some scholars believe his reign may have lasted only three years.

EPA/Ministry of Tourism and Antiquities

The tomb of King Thutmose II was recently discovered by a joint British-Egyptian archaeological mission.

Wikimedia

Thutmose II's mummy was discovered in 1881 but his original tomb was unknown until now.

He was the son of the great pharaoh Thutmose I and his lesser wife, Mutnofret. He married his half-sister Queen Hatshepsut according to the royal custom, to solidify the rule and bloodline. Together they had a daughter named Nefrure.

Upon his death, his wife Hatshepsut became the sixth pharaoh of the 18th Dynasty – and arguably one of the most famous and successful female rulers of all time.

Military activities

As the successor of Thutmose I, Thutmose II continued his father's military policy in the southern regions of Egypt.

According to preserved inscriptions, he ordered the brutal suppression of a rebellion against Egyptian rule in the land of Kush (in present-day northern Sudan). As a result, a significant number of prisoners were brought to Egypt – possibly as part of a campaign.

But Thutmose II's military campaigns were minor in comparison with the grand conquests of his predecessors and successors. Most historians believe he was a weak ruler and that Hatshepsut had a major role in governing the country, even long before his death. However, others contest this.

Thutmose II's short reign left modest traces of building activity in Karnak, one of the largest religious centres in ancient Egypt, located at present-day Luxor.

A monument structure, of which only fragments survive, features a unique decoration depicting Thutmose II, Hatshepsut as his royal wife before she became a ruler, and their daughter Nefrure. The origins of the monument are uncertain. It's possible Thutmose II started it and Hatshepsut finished it.

The monument was reconstructed by French researchers and can now be admired at the Open Air Museum in Karnak.

Other monuments to Thutmose II were found in the southern regions of Egypt, such as in Elephantine, in the city of Aswan, and in northern Sudan (likely connected to his military campaigns).

Wikimedia

An example of Hatshepsut's 'damnatio memoriae' at Deir el-Bahari. Hatshepsut's cartouches (left) were defaced, while Thutmose III's (right) remained untouched.

Katarzyna Kapiec

View of the temple of Hatshepsut at Deir el-Bahari at dawn.

The condemnation of Hatshepsut's memory

Interestingly, the name of Thutmose II became strongly associated with many of Hatshepsut's constructions due to the actions of Thutmose III.

Regarded as one of the greatest warriors, military commanders and military strategists of all time, Thutmose III was the nephew and stepson of Hatshepsut, and co-ruled with her as a regent.

At the end of Thutmose III's reign, some 20 years after Hatshepsut's death, he carried out a large-scale campaign to remove or alter Hatshepsut's names and images. Scholars call this 'damnatio memoriae', or condemnation of the memory.

This was likely due to concerns about securing the throne for his successor, Amenhotep II, by linking him to his male ancestors.

In many cases, Hatshepsut's name was replaced with that of Thutmose II, making him the principal celebrant in temples built by Hatshepsut, such as at Deir el-Bahari.

Wikimedia

An 1881 photograph of some of the coffins and mummies found in DB320, taken before the mummies were unwrapped.

What does Thutmose II's empty tomb tell us?

The newly discovered tomb reveals fresh details about the status of Thutmose II and his role in the sociopolitical structure of 15th century BCE Egypt – a period of territorial expansion, wealth and political intrigue. It also sheds light on perceptions of his rule at the time.

Thutmose II has been painted as an ineffectual ruler. And the latest findings don't contradict this.

Unlike his father Thutmose I, who expanded Egypt's reign through military strength, or his stepson Thutmose III, who became one of the most famous Egyptian warrior-kings, Thutmose II's modest tomb suggests his legacy may not have been as widely celebrated as that of others in his dynasty.

The tomb's location is also intriguing, as it is near the tombs of royal wives, including the cliff tomb of Hatshepsut, which was prepared for her when she was still a royal wife.

Thutmose II's mummy was discovered in the so-called Royal Cache in Deir el-Bahari in 1881, alongside other royal mummies. Many royal mummies were relocated here for protection from flooding and during the uncertain times of the 21st Dynasty (circa 1077–950 BCE), some 400–500 years after Thutmose II's original burial.

However, experts suspect Thutmose II's tomb might have been emptied even earlier due to flooding from a waterfall above it.

We speculate that another tomb may have been built for him, and is still awaiting discovery.

Ultimately, Thutmose II's reign remains shrouded in mystery due to the lack of available records. The search for his tomb – from the Western Valley, through the Valley of the Kings, all the way to Deir el-Bahari – spanned centuries.

Despite its poorly preserved state, and its modesty compared with Tutankhamun's splendorous tomb, this discovery will expand our understanding of the overlooked figure of Thutmose II, and the role he played in setting up the reign of Hatshepsut – arguably the most successful of the four female pharaohs.

In fact, paving the way for the ascent of Hatshepsut may have been his greatest contribution.

Article written by Anna Kotarba-Morley, Senior Lecturer in Museum and Curatorial Studies / Research Fellow, University of Adelaide, and Katarzyna Kapiec, Institute of Mediterranean and Oriental Cultures, Assistant Professor, Polish Academy of Sciences. *This article is republished from The Conversation under a Creative Commons license. The original article, first published 21 February 21 2025, can be found here.*

FORESTRY SECTOR marks International Day of **Women and Girls in Science**

Despite progress, women remain underrepresented in science, technology, engineering and mathematics (STEM) fields, making up just 23% the STEM workforce in South Africa. In the forestry sector, where science and innovation play a key role in sustainability, Forestry South Africa (FSA) is calling for greater support to bridge this gender gap and unlock new opportunities for women in the industry. As the world marked the International Day of Women and Girls in Science on 11 February, FSA highlighted the urgent need for mentorship and role models to inspire young women to enter STEM careers.

Key statistics on women in STEM fields

- As of 2023, women represent approximately 40% of the global STEM workforce, with significant variations across countries.
- Globally, women constitute about 35% of students enrolled in STEM-related fields in higher education, a figure that has remained unchanged for a decade.

While progress has been made in promoting gender equality, women remain significantly underrepresented globally in STEM fields, says Forestry South Africa (FSA)'s Dr Katy Johnson, Communications Consultant.

"Young women, especially in rural areas, face unique challenges that often discourage them from considering opportunities in STEM sectors."

The theme for this International Day emphasises the vital role of mentorship in fostering a diverse and inclusive workforce. Mentors can provide essential guidance, support and encouragement to young women, helping them navigate the complexities of STEM education and careers.

"Initiatives like the 'She is Forestry' Role Model campaign have illustrated the power of introducing high school learners to relatable women—often from similar backgrounds—who are excelling in a variety of forestry career paths. FSA plans to do something similar with STEM. By creating a series of short clips featuring young women thriving in STEM careers, we hope to inspire others," notes Johnson, adding that this can help nurture future potential and talent.

She Is Forestry South Africa (SIFSA) is an empowering initiative dedicated to promoting gender equality and supporting women in the forestry sector.

One such story is that of forestry PhD student Shae Swanepoel. "My mother taught me that education is something that nobody can take away from you, and these words have encouraged me throughout my life to achieve my academic goals. I want to encourage other young women and girls with a passion for science to follow their dreams and remind them that their potential is limitless," says Swanepoel.

Stories with inspiration and impact

"We have personally witnessed how role models shape the ambitions of young women. When they see successful female scientists, engineers and technologists, they can envision themselves following a similar path," shares Johnson.

Through FSA's STEM campaign, we aim to inspire the next generation with role models like Dr Myriam Solis Garcia. Her passion for science was ignited in childhood by a teacher who revealed STEM's potential to solve global challenges. "I wanted to be part of that legacy, solving significant problems through science," she says. "Women and girls must know that STEM careers let them 'dream big' and change the world. With drive, determination and passion, nothing is insurmountable - gender should never be a barrier."

Forestry master's student Ntsako Mtenjane overcame gender-related fears, realising they were her own misconceptions about her potential. This insight drove her personal growth and inspired her to guide others. "This realisation profoundly impacted me – I've grown personally and am now driven to mentor, sharing my knowledge to support others," she says.

Michelle Jordaan, a master's graduate and Mondi forester-in-training, shares this view. She urges women to recognise and overcome self-imposed gender stereotypes. "Believe in yourself," she advises. "We are equally capable, and our unique skills and perspectives add value, bringing fresh solutions to society's challenges."

"This year, FSA will amplify its campaign through its website to highlight the STEM opportunities in forestry and the dynamic women in these fields," says Johnson.

A call to action

This International Day of Women and Girls in Science is a powerful call to action – mentorship and role models are vital in shaping the future of STEM in South Africa.

"This is why we call upon private sector role players to actively acknowledge women in STEM within their organisations by providing platforms for them to inspire, mentor and motivate women and girls," says Johnson. "By championing and empowering women, we unlock a wealth of talent, foster innovation, and drive meaningful progress for generations to come."

Article compiled from press material provided by Forestry South Africa.

South African astronomy research in its 'PRIME'

South Africa has made significant strides in astronomy research and infrastructure, the most recent being the launch of the new exoplanet-hunting telescope, called the Prime-focus Infrared Microlensing Experiment (PRIME) in Sutherland, Northern Cape, on 31 January 2025.

The launch of the new PRIME telescope, at the National Research Foundation-South African Astronomical Observatory (NRF-SAAO) in Sutherland, is another milestone in realising the country's vision of establishing itself as a global hub for astronomical sciences and facilities, as outlined in the Department of Science, Technology and Innovation's (DSTI) *National Strategy for Multiwavelength Astronomy*.

Delivering the keynote address at the opening ceremony, Imraan Patel, Deputy Director-General for Research, Development and Support at the DSTI, said that the PRIME telescope strengthens South Africa's role in the knowledge economy, contributing to the big data revolution through world-class research. "It also aligns with our Department's commitment to transformation and human capital by fostering opportunities for local scientists, students and engineers to engage in frontier research," said Patel.

Described as an advanced 1.8-metre infrared instrument, PRIME represents a groundbreaking development in astronomy. Its primary focus will be on detecting gravitational microlensing events and discovering exoplanets, particularly Earth-mass systems. Patel said that the launch of the PRIME telescope cemented Sutherland's position as a leading site for global astronomical research, supporting not only South Africa's, but the wider African continent's contribution to astronomy. He also mentioned that Sutherland serves as

NRF-SAAO

Imraan Patel, Deputy Director-General for Research, Development and Support at the DSTI (middle-right) and other delegates during the unveiling of the telescope.

a focal point for attracting domestic and international visitors interested in astronomy, cultural heritage and scientific discovery.

"The integration of astro-tourism with flagship astronomy projects like MeerKAT, the South African Large Telescope (SALT), and now PRIME, underscores the Department's commitment to leveraging scientific investments for broader societal impact, advancing innovation, ensuring inclusive growth, and showcasing benefits such as job creation, skills development and tourism linked to astronomy infrastructure," said Patel.

The *National Strategy for Multiwavelength Astronomy* leverages the country's historical strengths in astronomy, its geographic advantage of clear Southern skies in the Karoo, and its robust engineering and scientific expertise.

"It is for this reason that we have sought to use our flagship projects such as MeerKAT, the Square Kilometre Array (SKA) and SALT to position South Africa at the forefront of global astronomical research," he said. The telescope is a collaborative initiative between South Africa, Osaka University, the North American Space Administration (NASA)'s Goddard Space Flight Centre (GSFC), the University of Maryland, and the Astrobiology Centre of Japan.

NRF Chairperson, Prof. Mosa Moshabela, said that PRIME, as an international collaborative effort, exemplifies the power of partnerships in advancing the frontiers of science. "The PRIME telescope launch marks another milestone in South Africa's journey to establish itself as a global hub for multiwavelength and multi-messenger astronomy. This telescope will not only contribute to groundbreaking discoveries in infrared astronomy and exoplanet research but will also support transformation and skills development, benefiting our local communities," said Moshabela.

Principal investigator for PRIME, Prof. Takahiro Sumi of Osaka University, said that the data collected through PRIME can be used by anyone.

"This is one of the most significant benefits for the South African team. Fifty per cent of the telescope time will be spent on the Galactic Bulge Time Domain Survey, for searching for exoplanets and making data available to be used by anyone in the South African community," said Sumi.

The SAAO operates as a national research facility under the NRF, an entity of the DSTI. Established over 200 years ago, the SAAO is the premier centre for optical and infrared astronomy in South Africa and the rest of the continent. It has played a pivotal role in advancing astronomical research, technology development and human capital growth. **- DSTI.**

Africa 'REDEFINING WHAT IS POSSIBLE'

with launch of world-leading nanotechnology hub

"We need to constantly multiply excellence and stop celebrating mediocrity." This was the resounding message from Distinguished Professor Tebello Nyokong, a globally recognised expert in nanotechnology, at the official opening of the state-of-the-art Tebello Nyokong Institute for Nanotechnology Innovation (Nyokong Institute, or INI) in Makhanda, Eastern Cape, on 3 December last year.

The new R90-million nanotech facility, hosted by Rhodes University, represents a groundbreaking step for scientific research in Africa. According to Vice-Chancellor Prof. Sizwe Mabizela, it is a "one-stop shop for innovation" and the first of its kind on the continent. The Institute focuses on cutting-edge research areas, including nanomaterials for drug delivery, water purification, sensor development for detecting diseases and outbreaks, and a non-invasive alternative to chemotherapy.

The new INI building offers state-of-the-art technology and purpose-built research facilities tailored to advance and optimise nanotechnology studies. Nanotechnology is a field of science and engineering that focuses on the design and manufacture of extremely small devices and structures on the scale of atoms.

Led by Dist. Prof. Nyokong, the INI houses world-class scientific instruments and fosters collaborations with researchers globally. Moving these sensitive instruments to the Institute required meticulous planning, including a helicopter for transport and international experts for assembly. At the launch, Prof. Kenneth Ozoemena, a former student and collaborator, praised Nyokong as "a mentor you cannot avoid learning from". Despite her accolades, Nyokong quickly shifted her attention to her students. "The students – about 160 PhDs – are the inventors and drivers, not me. They educate me," she remarked.

The event, part of Rhodes University's RU120 anniversary celebrations, underscored the Institute's role in advancing Africa's scientific capacity. Mabizela noted its impact: "Many of our students, carrying the legacy of the Nyokong Institute, now benchmark their world-class experience without needing to leave the African continent."

Rhodes University's Prof. Philani Mashazi said the project grew from humble beginnings: "INI started 30 years ago as a laboratory with one postgraduate student. Today, we have, on average, 34 students here."

Dr Iain L'Ange, who witnessed the Institute's journey from a research group to a premier facility, described it as "not

just a place for research, but a space for redefining what is possible."

Dr Gugu Moche of the National Research Foundation (NRF) echoed this sentiment, highlighting the Institute's potential to "enhance South Africa's research capabilities and explore Nobel frontiers in technology."

Mabizela closed the launch with a commitment: "The Nyokong Institute will continue to build on the formidable intellectual power and global networks developed over the years, shaping the future of African science." **- Rhodes University.**

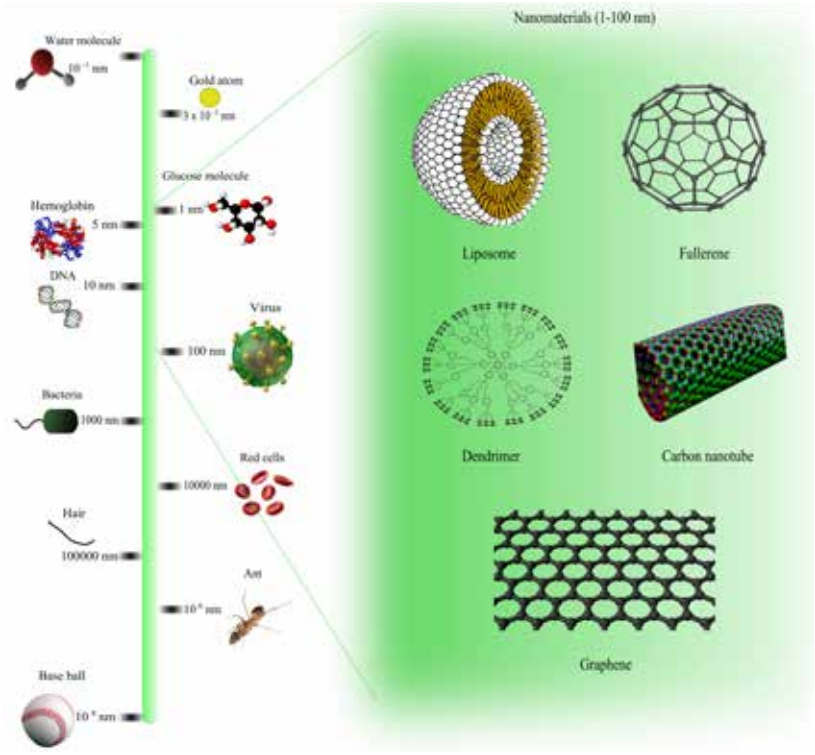
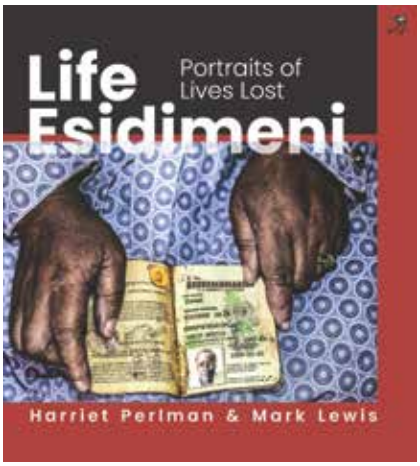


Figure 1: Explaining the scale of nanotechnology (Wikimedia Commons)

Books

Life Esidimeni: Portraits of Lives Lost (Jacana Media, 2024)



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This book review is republished from the *South African Journal of Science* (*SAJS*) Vol. 121 No.3/4 (2025)

Life Esidimeni: Portraits of Lives Lost is a moving tribute to the 144 mental health patients who lost their lives from 2016 due to systemic neglect, abuse, and the failure of the Gauteng public health system. Harriet Perlman and Mark Lewis recount the tragedy, which goes beyond being just a record of one of South Africa's darkest moments in mental healthcare; it is an urgent call for justice, accountability and the reform of a system that has failed not only its most vulnerable citizens but also the families and caregivers who love them.

The tragedy of Life Esidimeni was not just about the 144 lives lost. It affected over 1700 patients and their families – human beings who were treated as mere numbers, shuffled from a place many called home to unregistered and ill-equipped non-governmental organisations (NGOs) with no regard for basic human life. The authors open the book by immediately confronting the reader with the grim reality of these events. In a country where mental health care is already underfunded and often misunderstood, the Life Esidimeni disaster was the culmination of years of mismanagement, corruption and indifference towards mental healthcare users and ultimately, the community as a whole.

Perlman sheds light on the mammoth efforts made by various organisations, such as the South African Depression and Anxiety Group (SADAG), SECTION27 and the South African Society of Psychiatrists (SASOP), to prevent this catastrophe. These groups, along with the Life Esidimeni Family Committee, fought tirelessly to raise alarms about the closure of the Life Esidimeni facility in Randfontein as early as June 2015. They warned of the devastating consequences of this decision, yet their pleas were ignored. The book painstakingly details the systemic failures that led to this mass tragedy, including failed litigation processes and the sheer disregard for human life by key players in positions of power.

As someone with lived experience of mental illness, who has been involuntarily institutionalised multiple times in South Africa, this tragedy resonates deeply with me. The Life Esidimeni tragedy exposes not just cracks, but wide, gaping chasms in the South African mental healthcare system. It highlights how easily those who are most vulnerable – those who are silenced by stigma or incapacitated by illness – can be mistreated and ultimately forgotten. It is difficult to move beyond the story of the first life lost, the story of Deborah Phetla, a well-loved daughter found with plastic and brown paper in her stomach after her death. Deborah's suffering is a brutal reminder of how dehumanising the mental healthcare system can be.

This book stands as a testimony to the families and loved ones of those who lost their lives in this tragedy. It honours the emotional and psychological toll that families continue to bear. These individuals were not just numbers; they were loved and cherished by their families. The photographs that fill the pages of this book give back a semblance of dignity to the lives lost. The beauty of these portraits lies in the humanity they capture – a stark contrast to the inhumanity they endured in their final days.

The Life Esidimeni tragedy also illuminates glaring deficiencies in South Africa's mental healthcare policies and legal frameworks. The *Mental Health Care Act* of 2002 (MHCA) has long been criticised as outdated. Although South Africa ratified the Convention on the Rights of Persons with Disabilities (CRPD) in 2007, there has been little progress in fully integrating these principles into national

legislation and practice. The CRPD emphasises the right to healthcare, freedom from torture, and the right to dignity for persons with disabilities, including those with mental health conditions. This convention aligns with our Constitutional rights, but too often these are simply just words on a page.

This failure is systemic, but it is also deeply personal. It is about the everyday people – families, caregivers and mental healthcare users – who are desperate for care, but this often ends in tragedy. And it is also about the imbalance of power, where a small group of decision-makers can have such devastating control over the lives of so many. In July 2024, nearly a decade after the tragedy began, Judge Teffo ruled that nine of the deaths were unnatural and attributed the responsibility to key figures such as former MEC for Health, Qedani Mahlangu and the former head of the mental health directorate at the Gauteng Health Department, Dr Makgabo Manamela. However, for the families, and for those of us who are part of the mental health community, this is not enough. The compensation provided in June 2018 to some families who participated in the arbitration process does not equate to justice. True justice will only be realised when there are criminal convictions and when the entire mental healthcare system is reformed to ensure that this never happens again.

For those of us who have lived through mental illness and who continue to fight for the rights of mental healthcare users, this book is a sombre reminder that we cannot be voiceless. The brokenness of the system is not inevitable. There are people within the system – care workers, nurses, doctors, community workers, civil society, mental health advocates – who do their jobs with care and empathy, despite the challenges that are faced. But without systemic reform, these individual efforts are not enough to protect mental healthcare users from harm.

In its essence, *Life Esidimeni: Portraits of Lives Lost* is not just a memorial to those who lost their lives, but a manifesto for change. It calls upon every one of us to demand better. It reminds us that mental healthcare is not a medical issue but in fact a human rights issue.

We owe it to the victims of Life Esidimeni, their families, and future generations of mental healthcare users to ensure that their suffering was not in vain. We must demand the careful implementation of the CRPD, reforms to the MHCA and a complete overhaul of the current mental healthcare system. Only then can we begin to restore dignity to those who have been stripped of it and ensure that such a tragedy never happens again.

To the authors and all who fought for these patients' rights, you inspire hope that, through unity and dedication, we can create transformative change and protect the dignity and lives of the vulnerable. We are deeply grateful for your courage.

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