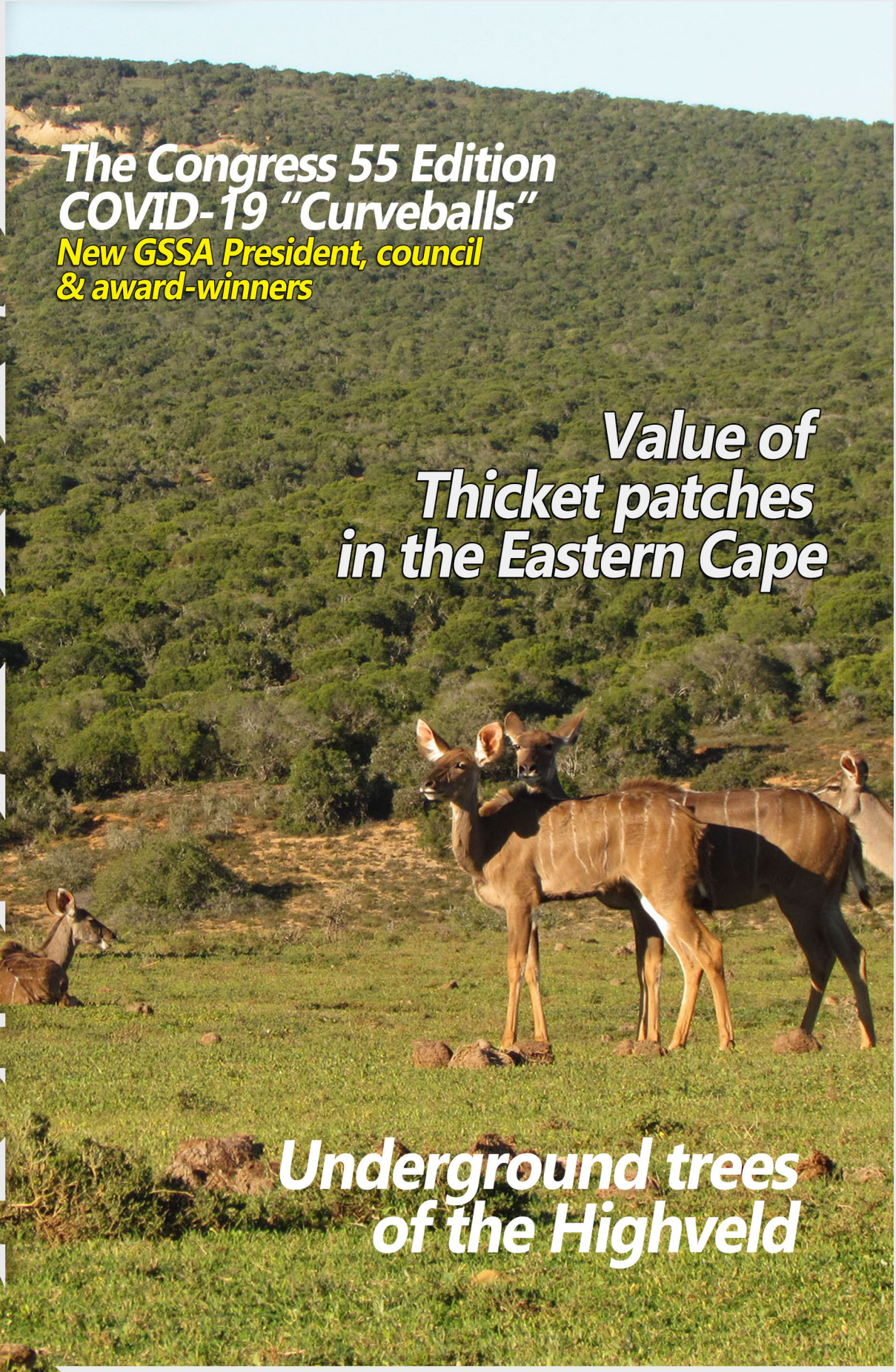
September 2020
Volume 20
Number 3

Grassroots

Newsletter of the Grassland Society of Southern Africa



The Congress 55 Edition
COVID-19 "Curveballs"
New GSSA President, council & award-winners

Value of Thicket patches in the Eastern Cape

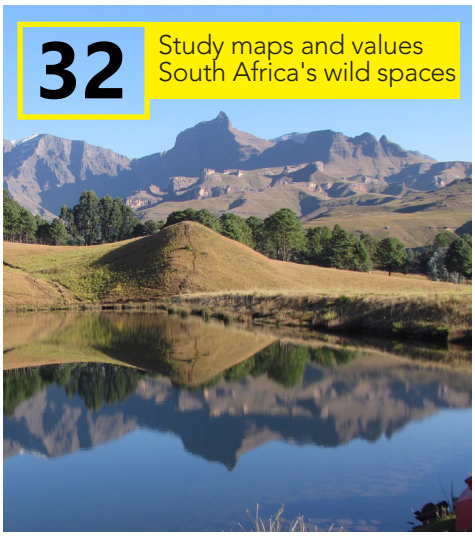
Underground trees of the Highveld

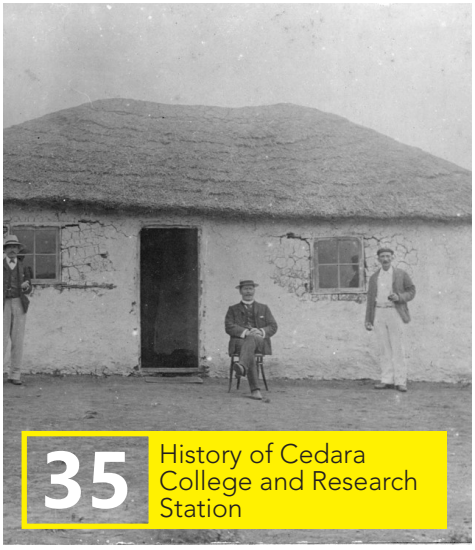
History of Cedara College & Research Station

Advancing Rangeland Ecology and Pasture Management in Southern Africa

ISSN: 10166122

In this issue





From our NEW editor

Welcome to Issue 3 of Grassroots for 2020.

The GSSA recently held its 55th and first virtual congress. The organising team did a fantastic job of ensuring that the quality of the congress remained intact and that the virtual platform allowed for great conversation and debate. In this issue, Debbie Jewitt and her team share some of the "curveballs" thrown their way and give a few pointers on organising a virtual event. Grassroots also welcomes the new president, vice-president and council members of the GSSA. Congratulations to all the award winners and those rising to the challenge of participating in a virtual congress! Let's keep on finding innovative ways of sharing our research amidst a global pandemic.

Highlights of this issue

In a preliminary study, Rina Grant asks an interesting question on whether thicket patches in the Eastern Cape have any value. Richard Gill gives us some great insights on underground trees of the Highveld. We learn more about the recent deaths of more than 350 elephants in Botswana, and a new study showed that painting eyes on the backsides of livestock can protect them from being attacked by carnivores.

Grassroots introduces a special series of articles on the history of South Africa's research stations. The first of this series is a lovely piece by Trevor Dugmore on the Cedara research station. He shares many photos taken around 1912 and it is amazing to see how times have changed (and how researchers used to wear suits or dresses whilst working in the field!).

Lastly, we have a new Grassroots team. I have taken over from Janet Taylor as Publications Editor and we welcome Charné Viljoen to the team as Sub-Editor. Janet stood in as Sub-Editor for this issue to help make the transition smoother. Thanks for all your guidance and support, Janet!

Enjoy the read!

Best regards

Malissa

Contact us
If you have any feedback, comments, or suggestions, feel free to contact us at:
info@grassland.org.za

@GrasslandSociety-ofSouthernAfrica

Presidential Address: 55th Annual Congress of the Grassland Society of Southern Africa

30 June – 2 July 2020

Dr Debbie Jewitt

Current Address: Ezemvelo KZN Wildlife
E-mail Address: Debbie.Jewitt@kznwildlife.com

Never waste the opportunity offered by a good crisis! And what a crisis we have had! The COVID-19 pandemic has certainly presented itself as a global crisis, turning our normal world upside down, yet at the same time offering opportunities to change and innovate.

It is major events such as these that push us over a threshold into a new paradigm, analogous to the state and transition models so well known in ecological theory, where an abrupt change in a feature occurs due to a variable thought to drive it, in this case, human health and well-being, and a virus.

It is good that humans have been given pause for thought. The pandemic has broken basic assumptions about our lives. It has illustrated that our destructive behaviour towards nature is endangering our health – a reality that we have been ignoring for a long time.

Diseases such as COVID, Zika, Aids, SARS and Ebola have all originated from animal populations under severe environmental conditions.

We are forced to ask: have we really been managing our world in a sustainable manner? Are we working with or against nature? The pandemic has served to demonstrate how connected we are and yet how fragile our earth is. And how reliant we are on natural systems for our health and well-being.

On December 24, 1968, astronaut William Anders took this iconic photograph of Earth from the moon's orbit during the Apollo 8 mission. It is considered one of the most influential photographs ever taken.

This photograph bred new thinking. For the first time, we could see our home in its entirety. A beautiful planet - the only known oasis for life for light-years around.

For the first time, we could see that earth was not limitless and indestructible. Indeed, it is small and fragile. Earth's resources are finite and there are natural limits to human expansion. For the first time, we saw ourselves as global citizens.

Whilst this pandemic has rapidly manifested itself across our world and brought our normal lives to a halt, forcing us to rethink, other threats are not as immediately apparent.

Their impacts may take years to manifest, with shifting baselines creating new but lower standards. But if not addressed, these threats could lead to a collapse of society as we know it.

Jared Diamond in his book "Elements of collapse. How societies choose to fail or succeed", defines collapse as a drastic decrease in human population size and/or political/economic/social complexity, over a considerable area, for an extended time".

He ascribes the main causes of societal collapse to environmental changes, the effects of climate change, hostile neighbours, unavailability of trade partners and the society's response to the foregoing four challenges.

The environmental problems he describes, we all know well: deforestation and habitat destruction, soil erosion, salinization and soil fertility losses, water management problems, overhunting, overfishing, alien invasive species, overpopulation, the increased per-capita impact of people, climate change, build-up of toxins in the environment, and energy shortages amongst others such as land degradation, food security and equality.

These slow but often cumulative threats are no less deadly in their consequences than the pandemic and yet they are seen as inconvenient truths, and remedies to fix these problems as stumbling blocks to classic economic development.

If the future environmental scenarios being put forward were truly listened to, we would all be actively changing things. We would be looking at our vulnerabilities and reducing our risks.

Never before has the need been so high or so critical to find solutions to

the problems we have created. We urgently need to tackle the underlying issues that are driving the destruction of nature and recognise that the way we produce and consume food is pushing the world to its limits with proven and demonstrated negative consequences for us.

However, I am heartened by the work I see you are all doing. When I look at the Congress programme and see the depth and breadth of the important work being done, I know that we will find solutions.

Necessity creates new thinking. Now is a good time to look at new economic models and to fix the disjunctions in our systems; to build more resilience.

My challenge to you is to take this opportunity that the pandemic has provided. Take time to rethink and innovate. Question everything. Look at the threats and find radical ways to find nature-based solutions.

Find ways to create an inclusive economy that accounts for nature. Find novel ways to create new sustainable businesses and provide jobs. Become and grow entrepreneurs. Create a bottom-up revolution. Use technology. Help create stability.

Be bold and embrace the change for it is a chance to renew and grow. Your world depends on it!

In the spirit of not letting a good crisis go to waste, the Grassland Society has embraced new opportunities and we are hosting our first ever virtual Congress.

The organising team has worked very hard in a short space of time, under challenging lockdown conditions to put the Congress together and I would like to extend my heartfelt thanks to all those involved in the Congress.

The organising team have certainly gone beyond the call of duty. It has been a privilege to serve with the dedicated members of this team.

We will certainly miss the interaction and camaraderie of a physical congress, but we hope you will embrace the different mechanisms available to interact with fellow delegates.

We also extend a warm welcome to our international colleagues who would otherwise not as easily have been able to attend.

I would like to thank our sponsors who have helped to make this congress a reality. We could not have done this without you.

In particular, I thank the Eastern Cape Department of Rural Development and Agrarian Reform who was originally going to be hosting us at Mentorskraal in Jeffreys Bay.

They demonstrated their ability to adapt to changing times. I further thank the Eastern Cape Parks and Tourism Agency, South African National Parks, NICS, Capstone Seeds Terreco Aviation and the Centre of Environmental Management for their generous support.

Honoured guests, delegates and members – welcome to the 55th but first-ever virtual Congress of the GSSA!

Thanks to our sponsors!

Province of the EASTERN CAPE RURAL DEVELOPMENT AND AGRARIAN REFORM

South African NATIONAL PARKS

South Africa EASTERN CAPE Yours to Explore

terreco aviation

NISC Publishing Africa's Research

Anonymous Donor - from a research grant at the University of the Free State

COVID "Curveballs": first-time hosting a virtual congress during a global pandemic

Debbie Jewitt[1,2], Freyni du Toit[3], Ed Granger[4], Ralph Clark[5], Kevin Kirkman[6] and Erica Joubert[7]

Current Addresses:
[1]Conservation Research and Assessment, Ezemvelo KZN Wildlife, P.O. Box 13053, Cascades, 3202, South Africa. E-mail Address: Debbie.Jewitt@kznwildlife.com
[2]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Private Bag X3, Johannesburg, WITS 2050, South Africa
[3]dNA Solutions cc, 10 Church Street, Middelburg, 5900, South Africa
[4]Themtek Environmental Consultancy, 10 Beaumaris Place, Dinsdale, Hamilton, 3204, New Zealand
[5]Afromontane Research Unit & Department of Geography, University of the Free State, Private Bag X13, Phuthaditjhaba, 9866, South Africa
[6]School of Life Sciences, University of KwaZulu-Natal, Pietermaritzburg, South Africa
[7]Grassland Society of Southern Africa, 10 Church Street, Middelburg, 5900, South Africa

The Grassland Society of Southern Africa (GSSA) was established in 1965 with the aim of advancing rangeland ecology and pasture management in Africa. The GSSA is one of the premier and respected professional societies in southern Africa and represents the interests of a diverse, multinational cross-section of rangeland practitioners, ecologists, policymakers, emerging scholars, farmers and other interested parties. The first meeting of the Society was held at the Faculty of Agriculture of the University of Natal, Pietermaritzburg in 1966 and attracted 96 delegates. Since then the Congress has been held annually. It is hosted by a different province in South Africa or a neighbouring country each year, to facilitate the attendance of delegates from different parts of southern Africa.

In July 2019 the Eastern Cape Province was selected to host the 55th Congress of the Society between 29 June and 3 July 2020. Planning for each year's Congress begins a year before at the Annual General Meeting of the Society, which is normally held in conjunction with the Congress. By February 2020 planning was well underway to host our conference at Mentorskraal in Jeffreys Bay. The venue and funding were secured, Congress tours were being planned, and our scientific programme development was underway.

In the first quarter of 2020, we were aware of the COVID-19 pandemic playing out, mostly in China and Europe, but it had not yet impacted South Africa. However, that changed on the 5 March 2020 when the first positive COVID-19 case was confirmed in the country. Shortly thereafter, the government restricted the number of people who could gather in one place to 50 people and imposed travel restrictions. Since our Congresses usually attract almost 200 delegates, the Council needed to consider alternative options.

At a special Council meeting on 19 March 2020, the following four options were discussed relating to hosting the conference: (1) cancel the Congress, (2) hold a virtual online Congress, (3) host a hybrid event, or (4) postpone the Congress. Consideration was given to the Congress prestige, impacts on the Society membership, financial impacts, social impacts, impacts on the Society continuity (e.g. the election of office bearers) and the Annual General Meeting (AGM). The Society also took its mandate to disseminate scientific information very seriously. This, along with producing a journal (the African Journal of Range and Forage Science), form the Society's most important function. Council anticipated significant hurdles with postponing the Congress to later in the year as many other congresses were being postponed leading to possible congestion later in the year. Further, the pandemic related disruption to work programmes might inhibit congress attendance e.g. changed academic timetables might make it difficult for academic staff to attend. Hosting a hybrid event significantly increased costs. After weighing the pros and cons of each option, the Council elected to hold a virtual online congress. Notwithstanding the challenges which this decision presented, it was felt that the benefits of hosting the Congress were in the interests of our members to further the aims of the GSSA, allow members to earn CPD (Continuing Professional Development) points which are a statutory requirement for professional scientists in South Africa, and generate sufficient income which is essential for the Society to continue operating as a Non-Profit Organisation. At this stage, we remained uncertain as to what further measures the government might put in place to curb the spread of COVID-19 and the levels of restriction for the rest of 2020. By 26 March 2020, the country was placed under a hard lockdown for

21 days (initially!), with only workers who were deemed by the government as being essential workers allowed to go to work under strict conditions. Little did we know that South Africa would still be under lockdown conditions, albeit under a less stringent level, by the time of the Congress!

As the Society had never held a virtual congress before, and in the absence of the Local Organising Committee who had withdrawn as they were of the opinion that a virtual congress was not a viable option, Council decided to step in and be pioneers. A small group (consisting of Council members, our Administrator, previous Administrator and Scientific Committee chairs) set about putting together, from scratch, what they hoped would prove to be a successful online congress, in only 3 months.

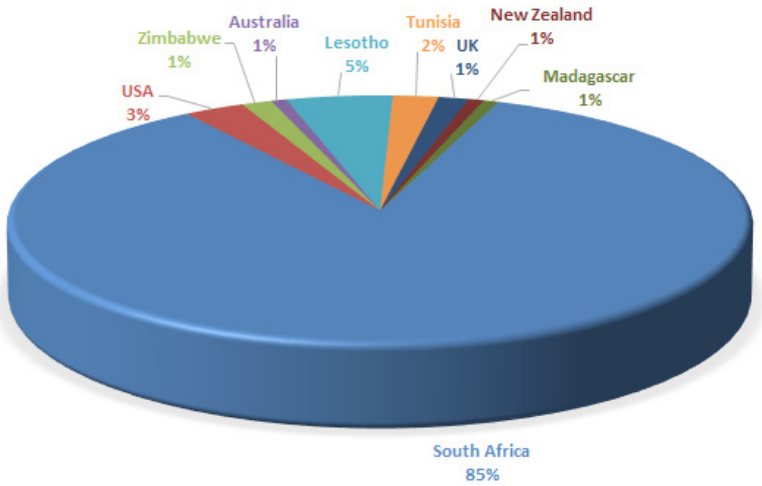


Figure 1: The breakdown of delegate attendance (141) from around the world (Courtesy of Erica Joubert).

Format

The services of a digital communications provider (DigiComm Facilitation) were employed to host the Congress on Zoom®. This service provider had access to three different Internet Service Providers between which connectivity could be switched in the event of streaming issues or errors. The provider also had a full Zoom® account. This was required because the freeware version of Zoom® limits the duration of continuous use of Zoom® webinar to 40 minutes and number of attendees to 100. The Zoom® host had full control of the Zoom® session to be able to control access to the event and control audio and video access.

The decision was taken that the virtual Congress would take the form of a Zoom webinar, where presenters were required to make a pre-recorded video of their presentation and submit these two weeks prior to the start of Congress. Early submission of the video presentations facilitated the allocation of submissions to specific sessions and quality checking of the video and audio feeds. Where required, presenters were requested to re-record their presentations, particularly if the audio quality was not good. Live Question and Answer sessions with the presenters and keynote speakers were held at the end of each session. It was decided to limit the length of each Congress session to a half-day (compared to the usual full-day event of a physical congress) for three days. Presentation time was shortened to reduce the possibility of fatigue associated with sitting in front of a computer all day. Standard presentations were limited to 10 minutes and keynote presentations to 20 minutes.

A Zoom® meeting format was used to host the one-day research-skills workshop and the Annual General Meeting of the Society. Poster presentations were hosted on the Twitter® platform (Reshef et al., 2020), which allowed non-attendees to view the posters and participate in an online discussion.

The Dryfta® app, a congress organisation platform, which had been used for previous congresses, was retained for administrative aspects of the Congress such as registrations, payments, abstract submissions, programme schedule and presenter profiles. Liaison with the technical staff of Zoom® and Dryfta® enabled the integration of the two software platforms.

All submissions were stored in the 'Cloud' on Google Drive® to facilitate backup and ease of access for multiple people. Abstract submissions needed to be edited using HTML coding to ensure streamlined web content on Dryfta®.

A major concern of the committee was uninterrupted, high-quality internet connectivity, both for hosting the Congress and for delegate access. The cost of data in South Africa is high in comparison to other countries and coverage frequently poor in many areas. Consequently, delegates received a free 5GB data package to use for Congress.

Guideline documents

Because online conference attendance was a relatively new experience for many participants, there was a considerable amount of uncertainty and some reluctance amongst members to embrace the use of new technologies. Surprisingly, the platform that initially met with the most resistance was Twitter®!

Hence much effort went into developing guidelines on how to register on the various platforms, how to convert a presentation into a video (*.mp4 format) and how to achieve the best video results. For the posters, Powerpoint® templates were developed for a four-panel poster with an example of a poster being created on Twitter® along with guidelines on how to use Twitter®. Guidelines were developed for presenters, attendees, session chairs and poster presenters. Live training was held for session chairs to ensure that they would be familiar with the format and workings of each session. We ensured we had back-up chairs for each session in case the dedicated session chair lost connection etc.

In order to test the various systems, several dry runs were held in the week prior to the Congress. Extensive use was made of social media posts across Facebook®, LinkedIn® and Twitter®, as well as email, to disseminate information and guidelines. All documents were available on the Congress website for ease of viewing and downloading.

'Curveballs'

Despite the dry runs prior to the Congress, the opening session experienced a major technical issue in that the videos would not play! It was the organising committee's intention to have paid-up delegate access available from only the Dryfta® app. This was a security consideration taken to ensure that Zoom® links were not shared with non-delegates. However, due to rapid updates being applied frequently across all software platforms, the integration between Dryfta® and Zoom® failed for the playing of the videos. This necessitated emailing the Zoom® links to delegates and restarting the session.

Internet connectivity was an intermittent problem throughout Congress. This might have been exacerbated by the high demand from the home-based workforce using the internet to continue working, teaching, learning etc. Poor internet connectivity caused pixelation of the videos making it difficult to read small-font text e.g. on graphs. In some instances, poor connectivity caused delays between the audio and the video. In anticipation of these issues, compounded by the possibility of electricity load-shedding in South Africa, all videos from each session were available to delegates for 48 hours for on-demand viewing.

The willingness of participants to adopt new technologies varied. The guideline documents and videos went a long way to allay these fears and as COVID-19 lockdowns extended around the world, these technologies are becoming the new norm not only for running congresses but also for on-line teaching in schools and tertiary institutions and are gradually becoming less intimidating than they were at the beginning of lockdown.

Some delegates did not adhere to the guideline documents. This led to some editing problems. A few presenters were uncomfortable speaking into a camera and microphone but again, this was no worse than 'speaker-nerves' at a physical congress. This problem might have been overcome had presenters practised their presentations more before submitting a final version. This suggestion is provided because some listeners found instances of hesitancy distracting.

Some participants were concerned that their employers would not regard a virtual congress being a 'real' event and were therefore concerned as to about how to prove their attendance at a virtual congress. However, the Zoom® software automatically tracks logins of participants, hence it was a simple matter to provide proof of attendance for delegates if this was required. Similarly, some employers were reluctant to pay for employees to attend a virtual congress because of a lack of experience or insight.

Shortly before our Congress, concerns were raised around the world about the security of the Zoom® software. This was compounded locally by a parliamentary Zoom® meeting being 'hacked' (it subsequently emerged that one of the attendees at this meeting had posted the Zoom® invitation publicly on social media, hence there was no control on who could attend the meeting). Some government departments and companies subsequently banned the use of Zoom® software. The organising committee worked closely with the developers of Zoom® to draft a letter outlining the security features of this software. It was also ensured that attendees used the latest version of Zoom® (version 5 or later) which had updated security features and full encryption. Letters substantiating these upgrades were provided to delegates who were required to allay the concerns of their IT departments.

Initially, the physical Congress was fully sponsored. Changing to the virtual online format required revision and remotivation for funding. Fortunately, the Eastern Cape Department of Rural Development and Agrarian Reform, the main sponsor, was prepared to fund a virtual event. It was, however, extremely difficult to obtain funding from other usual sources due to the severe economic implications linked to the extended lockdown.

Severe budget cuts and staff retrenchments associated with economic repercussions of lockdown resulted in many members who usually attended Congress being unable to attend even a virtual congress. Problems such as these were not foreseen in March 2020 when planning started.

A popular part of the physical congresses has always been the conference tours. The change to virtual format meant that tours had to be cancelled. Because the organising committee felt that this would diminish the 'fun' aspect of the congress stakeholders were asked to provide short videos highlighting the projects or tourism facilities available in the area around Jeffreys Bay and the Eastern Cape.

Submissions were played during session breaks to ensure a full engagement throughout the Congress and prevent 'dead' time. Care was taken to ensure that no copyright issues were infringed by any of the promotional material.

A unique feature in hosting a virtual congress was that this made it possible to engage with people around the world, to advise with planning the event or participate as presenters/attendees. Here time differences between RSA and other parts of the world had to be accommodated as far as possible. In this regard, thanks are extended to the American presenters who stayed awake until 2 am (their time) to participate in the live question and answer session linked to their presentations!

The organising team worked under exceptionally challenging conditions to put the Congress together. As already mentioned, lockdown in South Africa meant that only essential workers could go to work. Everyone else had to either stay home or, where possible, work from home. Schools were closed, meaning that parents had to balance altered working environments with revised home responsibilities.

Consequently, many a child and pet unintentionally participated in various planning meetings! Travel bans associated with the lockdown regulations compounded stresses for members dealing with their own or family health issues. There can be little doubt that the ban on the sale of alcohol increased the stress levels of at least some members who believed that a 'sundowner' or two would have helped them cope better!

Successes

The online Research Skills Workshop, R for Biologists, hosted by Dr Victoria Goodall, was a resounding success. By 23 June, the course was oversubscribed. Initially, the course was limited to 30 participants, however, Victoria graciously accepted another 6 delegates.

The poster presentations were similarly hugely successful, notwithstanding initial resistance by some members to use Twitter®. The first poster 'tweeted' on the first day of Congress received 1148 views on the first day alone.

Other posters received similar levels of interest. This was a remarkable level of exposure for the authors and their work. The success of using the Twitter® platform requires dedicated input, however, to stimulate conversations around the Congress.

No parallel sessions were run thereby making it possible for delegates to attend all the sessions. This aspect received many positive comments. Delegates appreciated not having to 'run' between different sessions thereby possibly missing the start of a session. Undoubtedly delegates did miss the in-person interaction and networking opportunities.

However, one positive comment received was that there were no distractions from chatting to others causing one to miss a session! Requests were made to include Zoom® 'break-away rooms' or 'chat-rooms' to improve networking opportunities.

This will certainly be considered going forward. Delegates were encouraged to use the Zoom® chat box and the Twitter® platform to engage with one another and this was well supported.

Congress topics ranged from drought-stressed rangelands, communal rangeland dynamics, governance and res-

toration, dairy pastures of the future - including nutrition and cultivated pastures, next-generation/4th industrial revolution advances in rangeland management, game farming, nature conservation and tourism, water production and fire management in rangelands and research project proposals. Interestingly, attendance was similar across all these disciplines.

That there were no parallel sessions no doubt allowed for greater attendance of all the sessions. Delegates appreciated the wide range of topics covered and considered them highly relevant to the Congress theme and considered them of high quality. It is intended to make session packages available for purchase in order to extend the opportunity to people to participate in the online congress after the actual event.

Some of the session chairs found it challenging to juggle listening to the presentations (especially if the sound was of poor quality), monitoring the chat and question and answer box and preparing for the next presenter.

Unexpected were the comments received from many members who expressed the opinion that a virtual congress was a format which is long overdue. The lower costs of the registration fee due to the online nature of the congress and the savings related to travel and accommodation costs were appreciated by many delegates, especially at this time. The lowered environmental impacts of a virtual congress compared to a physical congress were also appreciated.

Despite these advantages, congress attendance numbers were lower than anticipated: 141 delegates from nine different countries in comparison to an average of 193 delegates per annum over the last five years. It is felt that the lower than expected attendance was directly related to the economic implications of the pandemic rather than the virtual format.

Going forward the Society will consider an online format for congress which may even result in the development of a hybrid format of a physical and online congress.

Maintaining an online congress would help the Society to meet its objectives of growing its southern African and off-continent contributions with other rangeland groups and help to profile the GSSA beyond its current membership. Given the travel challenges in Africa even in normal times, a hybrid congress would allow for much greater intra-African connectivity and reach a much wider and very important audience.

The newer technologies facilitated certain aspects of congress. For example, the automatic reports generated by Zoom® greatly facilitated the collation of delegate session attendance and hence the calculation of CPD points required to generate the CPD certificates. Similarly, we were able to offer electronic 'goodies' for the delegate 'swag bags' which proved very popular with the delegates. 'Goodies' included electronic books, magazines and vouchers to tourism facilities.

Key lessons

Internet connectivity remains the most important consideration in hosting a successful virtual congress. This will remain a challenge in South Africa for the immediate future. In the absence of reliable data connectivity, backup plans need to be made, such as making the sessions available for later viewing. This also alleviates other potential problems such as electricity supply disruptions.

Similarly, redundancy needs to be built into the system and must include items such as having more than one internet service provider in the event of system or streaming errors occurring during a live event, so that it can be switched rapidly to a different provider if needed.

Having the videos pre-recorded was very useful, however, when the systems failed on the first day, this necessitated having to request the affected session speakers to present live. Having presenters forewarned and prepared to present live is a useful redundancy. One needs to be ready to 'adapt on the fly' as the challenges arise.

Whilst there was a choice of software platforms available to host the congress Zoom® was selected because it is software with which many people are familiar. Indeed, several participants commented on picture quality and the interactivity between several people in a single session being better than that of other commonly used platforms. That more people preferred Zoom proved invaluable given the short time available in which to organise the congress. Zoom® also offered the best value for money: an essential criterion given the current economic situation in RSA.

Hosting an online-only event presented some novel challenges for integrating all events normally associated with an actual congress. For example, the awards ceremony usually takes place at the gala dinner on the last evening of Congress.

Because this was not possible, the awards ceremony was moved to the Annual General Meeting which was held online the day after the congress. The AGM is usually only attended by GSSA members and not necessarily all Congress delegates.

This meant that congress delegates did not automatically know who the award winners were. This also had the effect of extending the duration of the AGM and extra-long meetings are not always popular.

It is important to try and make the event as interactive as possible. The Zoom® meeting host and the session chairpersons have a vital role to play to ensure that all questions posted are attended to and raised hands are acknowledged and people are given an opportunity to ask questions.

We found more questions were asked than during a physical congress as a level of shyness was removed with delegates being able to type in their questions. Ensuring a full programme, even during the breaks, ensures continuity of the programme. In this regard, the virtual tours worked well during the breaks. To simulate a live environment, presentations were acknowledged by playing a clapping recording at the end of each presentation. Some participants felt that this made the presentations somewhat artificial.

Despite the COVID 'curveballs' thrown this year and inexperience in hosting an online conference, especially under lockdown conditions, the event was hosted successfully. In conclusion, the authors would like to thank the organising team for all their hard work in making the 55th Congress a success, as well as all our sponsors for supporting us. We would also like to thank the delegates for their patience and tolerance of the 'glitches' which occurred.

REFERENCES

Reshef, O., Aharonovich, I., Armani, A.M., Gigan, S., Grange, R., Kats, M.A. and Sapienza, R. 2020. How to organize an online conference. *Nature Reviews Materials* 5:253-256. https://doi.org/10.1038/s41578-020-0194-0.

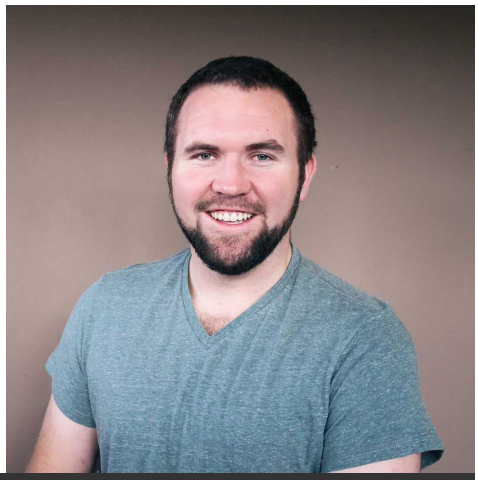
Award Winners

Best Platform Presentation

Devan McGranahan
North Dekota State University
Patch-burning buffers forage resources and livestock performance to mitigate drought in the United States Great Plains

Best Platform Presentation by a Young Scientist

Anisha Dayaram
South African National Biodiversity Institute
National Vegetation Map 2021: Our goals and an opportunity for the GSSA to contribute to the structure of the next version



Norman Rethman Planted Pastures Award

Craig Galloway
Trace & Save
Building soil carbon to improve water holding capacity

Best Poster Presentation

Craig Morris
Agricultural Research Council API
Is a long hygroscopic awn an advantage to *Themeda triandra* in drier areas?

Best Research Proposal Poster

Robyn Nicolay
University of KwaZulu-Natal
Grazing for carbon: Investigating soil, plant and ruminant interactions on carbon sinks in extensive mesic grassland and improved kikuyu (*Pennisetum clandestinum*) pasture

Most Prolific Adjudicator

Arend de Beer
University of Pretoria

Meet the new GSSA President: Kevin Kirkman

Debbie Jewitt

Current Address: Ezemvelo KZN Wildlife

I would like to introduce you to the new President of the Grassland Society of Southern Africa.

Kevin Kirkman is currently a Professor and Chair of the Discipline of Grassland Science at the University of KwaZulu-Natal. He lectures under- and postgraduate students in the School of Life Sciences, supervises postgraduate student research as well as contributes to the management of the School. In addition, he has been, Head: School of Biological and Conservation Sciences, Deputy Dean: Faculty of Science and Agriculture, Director: College of Agriculture, Engineering and Science, Dean of Research: College of Agriculture, Engineering and Science, and Acting Deputy Vice-Chancellor of the College of Agriculture, Engineering and Science. He has supervised 6 postdocs, 12 PhD students, 28 MSc and has 7 currently registered postgrad students. He has more than peer-reviewed 92 publications.

Kevin has a long and good history with the Grassland Society. He has been an active member since 1986 (34 years). He has been a member of the publications sub-committee for the International Conference: Meeting Rangeland Challenges in the 1990s. He was the Public Relations Officer 1993/1994, he was Chairman of the organising committee for Congress 31 held in Nelspruit, a member of the executive council in 1997, President in 1999, Chairman of the Grassland Society Trust 2001-2003 and Chairman of the organising committee for the 50th Congress of the Society.

I cannot think of a more suitably qualified and experienced leader to take the Society forward during these unchartered times. Congratulations Kevin!"

Figure 1: Kevin Kirkman

Meet the new GSSA Vice President: Dr Igshaan Samuels

Dr Igshaan Samuels is a senior researcher with the Agricultural Research Council – Range and Forage Sciences and is based in Cape Town. He is a trained rangeland ecologist and conducts his research mainly in pastoral systems in the Succulent and Nama Karoo biomes.

He has a keen interest in the impacts of land use on the biodiversity (flora and fauna) and ecosystem function in variable rangelands. His work also focuses on the different livestock management systems in communal and private lands and the underlying knowledge systems used by farmers to make important farming decisions.

Given the integrated nature of communal rangelands, he recently also started to incorporate climate change vulnerability and adaptation into his research to have a more holistic understanding of rangeland dynamics in the arid zone.

Dr Samuels collaborates with several local, national and international intuitions and co-supervises masters and PhD students from the University of the Western Cape and Stellenbosch University.

Dr Samuels served on the GSSA council previously from 2009-2015 including the position of President.

He also serves as an associate editor for the journals Pastoralism and African Range and Forage Sciences.

Introducing new council members

Robyn E Nicolay: Additional Member

Growing up partly in a stable yard in Zulu land and partly in Durban, my background in agriculture was limited to riding horses through the sugarcane fields on the north coast and visits to cousins' farms over school holidays. No surprise when studying agriculture became the next step following matric. I established my foundations in agriculture as a student at Cedara College, admittedly spending more time riding horses than in the classroom.

I followed on from Cedara with a degree in Agricultural management, from Nelson Mandela Metropolitan University, at the same time working on a small dairy. Whilst writing a (relatively uninteresting) research-based Masters, I had the opportunity to study abroad through a SANORD student exchange program to Hedmark University of Applied Sciences in Norway. Here, I was introduced to ecology and sustainable agricultural systems, developing my love for academics, and ultimately deciding to redirect my field of study. A necessary withdrawal from my master's program led me to apply for a course-based MSc in Agro-Ecology, majoring in soil ecology, at UK Agricultural and land-based institution, Harper Adams University. A bold and scary move. I was fortunate enough to be awarded a partial scholarship by the Elizabeth Creek Foundation and Harper Development trust. My two-year stint in the UK also had me working at the Harper University Dairy. These experiences were invaluable, both the practical knowledge working at a state-of-the-art research dairy, as well as the irreplaceable academic skills attained from studying at Harper.

Returning to South Africa, I am currently a full-time PhD student at the University of KwaZulu Natal - Grassland Sciences, researching Soil Carbon dynamics in grasslands managed under varying agricultural and environmental scenarios. My interests still lie in Agro-Ecological practices, Soil ecology and Sustainable Agriculture, with the end goal to continue indefinitely within the field of academics and research. Outside of this realm, I am very much besotted with Jerseys cows, being quite involved with the KZN Jersey club, an often-welcomed distraction. I also have an odd obsession with the theatre, musicals, and music, having previously played contrabass in local orchestras. The love for horses has remained

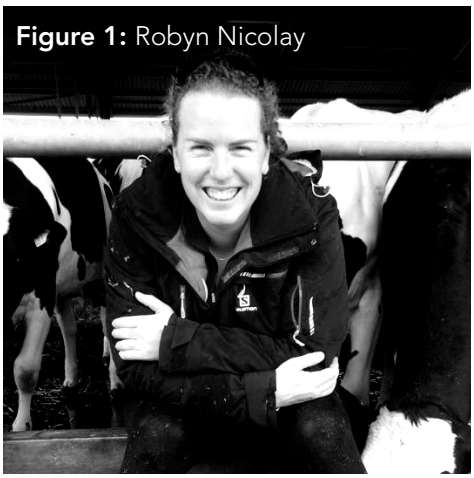


Figure 1: Robyn Nicolay

and I enjoy a long farm hack whenever time allows. Married to an academic (and my computer) with an active toddler and a house full of dogs, it is often difficult to hold conversations about anything else. I am looking forward to contributing as part of the GSSA committee this year.

Francuois Müller: Additional Member

My name is Francuois Lloyd Müller. From a very young age, I had a keen interest in environmental and biological sciences. This was probably stimulated by my upbringing in the agricultural environment in the Western Cape Province where my family was, and still is, actively involved with farming.

I started my scientific career at the University of the Western Cape (UWC) and completed my M.Sc. degree in plant eco-physiology, specifically looking at plant mineral nutrition at the Department of Biodiversity and Conservation Biology. During this time I volunteered to work with the Agricultural Research Council (ARC) Range and Forage Sciences team based at UWC. I was invited to join the team to collaborate on a project in the Leliefontein communal rangelands of Namaqualand. The project focused on recording livestock feeding preference and diet selection. As a plant eco-physiologist, it was my responsibility to determine the mineral nutrient content of the selected plant samples. In 2014 I started on the ARC PDP program where my initial work focused on evaluating *Medicago* and *Trifolium* species in the Caledon and Malmesbury areas of the Western Cape. However, whenever I had the time, I was still collaborating and working with the ARC unit at UWC on communal rangelands in Namaqualand. It was during one of these trips to the Leliefontein communal rangelands that the idea to identify, develop and use indigenous legume species as alternative, drought-tolerant forages within the Namaqualand rangelands arose. This idea was later developed further and became part of my PhD studies which resulted in me permanently moving back to the ARC Range and Forage Sciences group at UWC in 2015. During this time, apart from my PhD work, I collaborated on numerous projects, co-supervising various student research projects in rangeland science and plant eco-physiology. In 2017, I was appointed as a Junior Researcher in plant eco-physiology at the ARC and relocated to the Gauteng province where I am now managing the South African National Forage Genebank (SA-NFG) based in Roodeplaat. The SA-NFG team falls under the Range and Forage Sciences division where our research focusses on identifying and evaluating alternative indigenous grass and legume species for utilization as fodders in water-limited agro-ecosystems. At the

Figure 2: Francuois Müller

SA-NFG, my team and I, in collaboration with various seed distributors are constantly conducting seed viability tests, cultivar evaluation trials, and evaluating current commercial forages for their ability to cope with abiotic stress conditions such as drought. We also characterize and compare the accessions maintained at the SA-NFG to what is currently commercially available in South Africa to identify potential beneficial traits in the older plant genetic resources that sometimes are no longer present in the commercial cultivars.

Figure 1: *T. triandra* inflorescence. The awn (with seed) drops later in the season and the remainder of the inflorescence is left for quite some time afterwards

GRASS OF THE MONTH

Author: *Janet Taylor | Janet.taylor@kzndard.gov.za*
KZN Department of Agriculture and Rural Development, Cedara.

Themeda triandra

(Red Grass)

Themeda triandra is a highly palatable grass species, which is often indicative of veld in a healthy condition, and hence thrives on good veld management (fire, resting and good grazing principles). This Decreaser grass species is one of the most important grazing grasses and is widespread throughout southern Africa in regions of average to high rainfall and found mostly in undisturbed grasslands and savannas. Globally, there are 18 species of *Themeda*, but *T. triandra* is the only species which occurs in Africa.

Derivation of name:

The genus name *"Themeda"* is Arabic and is said to have something to do with water (or lack of), while the species name *"triandra"* is broken into two words originating from the Greek language. *Tri-* meaning three, and *andra (man)*. This refers to the three male spikelets which surround the bisexual spikelet in each cluster.

Distinguishing features:

- Often red/pink late in the season (hence its common name "red grass").
- These older red leaves often curl.
- Inflorescences are in groups of spikelets, surrounded by a spathe
- These spikelets have a long, dark and twisted awn
- Prominent midrib on the leaf blade and a serrated leaf tip.

Figure 2: Serrated leaf tip of T. triandra

Figure 3: The lower portion of the leaf has a prominent midrib

Figure 4: Later in the season, leaves and inflorescence turn a pretty red/pinky colour

Uses

Apart from it being of great economic and ecological value due to it being good for grazing, *T. triandra* can be used in:

- **Gardens:** It is a very hardy, water-wise plant which grows to approximately 50 cm in height. *T. triandra* is a very attractive blue-green colour which then turns pink with age and can flower from December through to July.
- **Basket work:** in Lesotho
- **Thatching:** in some parts of Africa
- **The production of paper pulp from stems.**

References:

SANBI. *Themeda triandra*. http://pza.sanbi.org/themeda-triandra (Acessed 20.08.2020)
Van Oudtshoorn, F. 2002. Guide to Grasses of Southern Africa. Briza Publications. Cape Town
All photos: Ricky Taylor - https://www.inaturalist.org/

Figure 1: The panicle style seed head of tall fescue (www.keyserver.lucidcentral.org)

PASTURE OF THE MONTH

Author: Malissa Murphy | malissam@elsenburg.com
Western Cape Department of Agriculture (HET), Elsenburg, South Africa

Festuca Arundinacea

Tall Fescue (Eng.); Langswenkgras (Afr.)

Tall fescue *(Festuca arundinaceae)* is a commonly cultivated perennial pasture in South Africa. Even though it is a temperate species, it also grows well in sub-tropical regions under irrigation. Tall fescue is a versatile crop that can be used for grazing, hay, silage and a cover crop.

Figure 2: Tall fescue is a tufted grass species (www.alchetron.com)

It remains green throughout the year and makes fantastic foggage in winter (from autumn growth). It's highest dry matter production is during autumn and spring and can yield between 18 and 24 t/DM/ha/season. It grows well in mixtures with clovers and perennial ryegrass. If tall fescue is managed well, it can be productive for well over 10 years.

Figure 3: The leaf blades are characterised by their equal-sized veins and having no midrib (www.wikipedia.org)

Growth Requirements

- High water requirement (> 800 mm)
- Deep, loamy to clayey, fertile soil
- Responds well to high N fertilisation
- Can survive prolonged waterlogged conditions (can grow in wetlands)
- Tolerates acidic soil (up to acid saturation of 25%
- Tolerates high salt conditions

What does it look like?

- Tufted grass
- Grows up of 1.2 m tall
- Wide leaf blades with equal-sized veins (no prominent midrib)
- Panicle style seed head containing 6-8 seeds.
- Typical dark green colour

Figure 4: Tall fescue on the Outeniqua Research Farm

References:

AGT Foods Africa: https://agtfoods.co.za/wp-content/uploads/2018/07/26.-Tall-Fescue.pdf

Truter WF, Dannhauser CS, Smith H, and Trytsman G. 2014. Integrated crop and pasture-based livestock production systems – Part 9: Langswenkgras (Festuca arundinaceae), SA Grain, ISSN 1814-1676, Page 71-73.

Pasture Handbook, Kejafa Knowledge Works, ISBN 0-620-31994-1

Thicket patches in the Eastern Cape: do they have any value?

Rina C Grant[1,2], Michael Powell[1], Kamva Zenani[1] and Putuma Balintulo[1]

Current Addresses: [1]Rhodes Restoration Research Group and [2]Nelson Mandela University
E-mail Address: Rinagrant@gmail.com

In the savannas of the Kruger National Park, the open grassland and sodic patches are favoured by grazers. They prefer these patches because of higher nitrogen concentrations in the grass blades that are kept short and growing by continuous grazing (Grant et al. 2019). Termite mounds also seem to act as islands of higher nutrient content that influence the nutrients in its surroundings (Grant et al. 2006).

In the Albany Thicket of the Eastern Cape large patches of thicket have been cleared to provide forage for cattle and sheep and to improve visibility for tourism operations. In Addo Elephant National Park (AENP) some of these opened patches are still clearly visible after 40 years, and all species, even elephant (*Loxodontha africana*) seem to utilize these areas extensively (SANParks 2015).

We were interested to find out:

1. Why these cleared patches have not been invaded by the surrounding woody species as happens in the savannas?
2. Whether the thicket species are present in the grassland patches, but just utilised intensely?
3. Do thicket areas provide ecosystem services in the form of nutrients or moisture to the adjacent cleared areas?

In a preliminary study in early May 2019, we looked at five sites in the main camp of AENP where there was a distinct boundary between the thicket patch and the adjacent cleared and transformed area. Surveys were done in fifteen 100 m transects with three transects in each of the five sites. Transects stretched from thicket to transformed area with 50 m in each. We collected a total of 36 soil samples at 20 and 40 m from the thicket – transformed boundary into the thicket and at 20 and 40 m into the transformed area. The vegetation surveys were done

Figure 1: A typical sodic patch in Southern Kruger National Park with the insert illustrating a well-utilized termite mound

Figure 2: A cleared patch adjacent to the thicket in AENP.

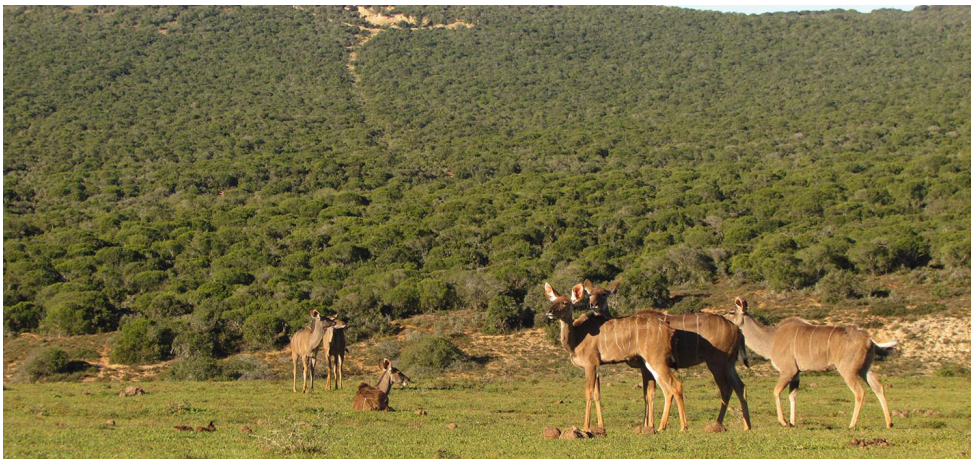


Figure 3: Typical study area with transformed areas next to well-utilized thicket.

along a 50 m transect into the thicket and 50 m into the transformed area.

The thicket patches were well utilized and were more open than we expected when viewing from the road. The transformed patches were very open and have been so for about forty years. These areas have been exposed to herbivory by Elephant (*Loxodonta africana*), Kudu (*Tragelaphus strepsiceros*), African Buffalo (*Syncerus caffer*) and Red Hartebeest (*Alcelaphus buselaphus caama*). Warthogs (*Phacochoerus africanus*) are also common utilizers of the transformed areas.

Results from soil samples

Our results were surprising, with the highest soil moisture at the 40 m mark from the thicket-transformed boundary, in the transformed area.

This is probably due to a rainfall event shortly before sampling. Work by Cowling and Mills (2011) show that rainfall interception by thicket canopy is some of the highest in the literature, and where rainfall events are small (<5 mm) there is very little water reaching the soil. The soil moisture response in this area would explain the preference of the animals for these transformed patches as the higher soil moisture will produce more green leaf as long as it lasts.

As expected, the soil in the transformed area was more compacted than in the thicket area, making it more difficult for seeds to establish and for rainwater to infiltrate (Sigwela et al. 2009).

Nitrogen in the soil was higher in the thicket area, which is likely to be associated with higher levels of protein in the associated vegetation, or indicative of the de-coupling of the nutrient cycle in the transformed habitat leading to steady-state of leakage.

There were also large differences in the vegetation between the two areas. The thicket areas had 17 woody species with 462 individuals. The most common woody species in these utilized thicket areas were *Azima tetracantha* (Beesting bush) with 73 individuals and *Euclea undulata* (Common Guarri) with 61 individuals. *Euclea* is fairly unpalatable (Haschick & Kerley 1997) and their unpalatability may explain why they seem to dominate the well-utilized xeric thickets. Of the more palatable and typical thicket species, there were only 19 individuals of *Portulacaria afra* (Spekboom) in the 1 500 m^2 surveyed in the thicket and 47 individuals of *Schotia affra* (karroo boerbean).

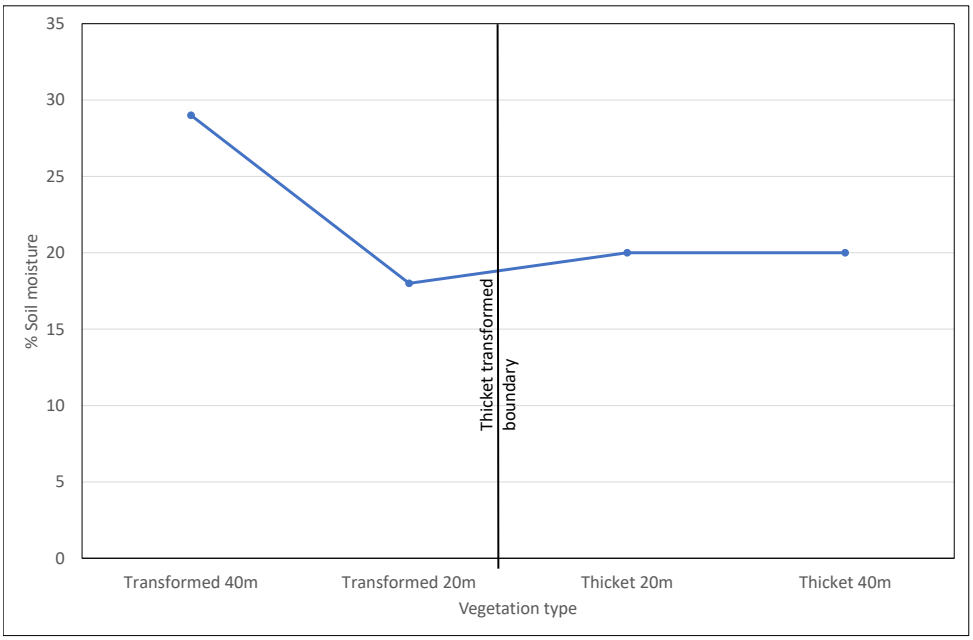


Figure 4: Percentage of soil moisture in the transformed and thicket areas.

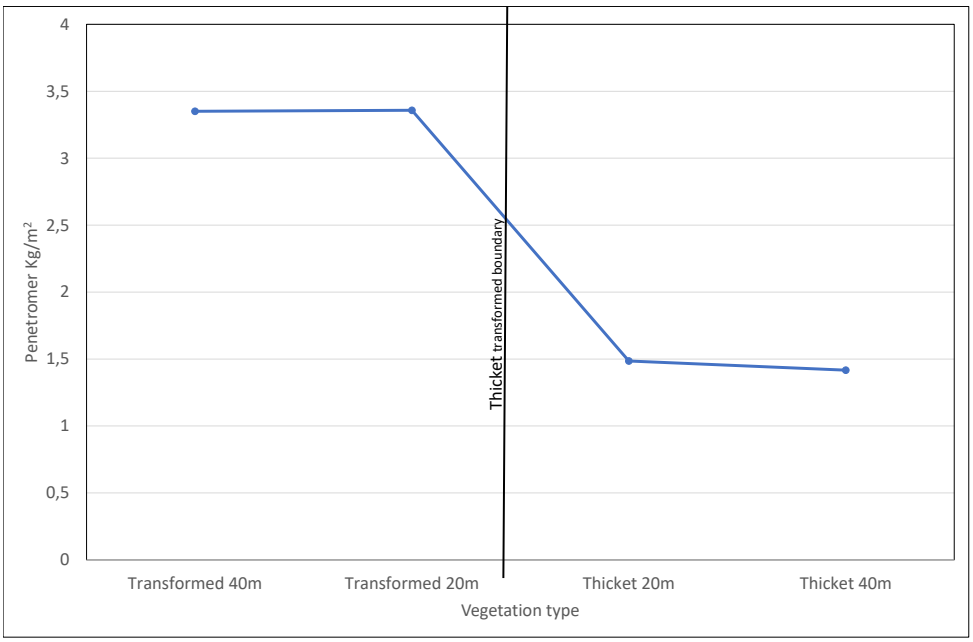


Figure 5: Soil compaction measured with a penetrometer in kg/m^2 Red line indicates the thicket-transformed boundary.

In the transformed area only nine woody species were found with 104 individuals. These were mainly *Gymnosporia* (spikethorn) species which amounted to a total 85 of the woody individuals found in the 1 500 m^2 of the transformed area.

The woody plants in the transformed area seemed to be well utilized as the average height of the vegetation in the transformed area was only 10 cm compared to the average height of 93 cm in the utilized thicket. Individual woody plants also covered a smaller area in the transformed area with an average of 24 cm compared to 95 cm in the intact thicket. During the survey in May there were no grasses recorded, with the forb layer dominated by a succulent vygie; *Drosanthemum*.

What do these results contribute to understanding the value of thicket patches?

Patches in the thicket are often cleared to provide forage to herbivores. These transformed areas are frequently dominated by grasses and provide high-quality forage with lots of valuable young green leaf to domestic and wild animals during the growth season. The thicket, even when well utilized, covers more nutrient-rich, less compacted soils

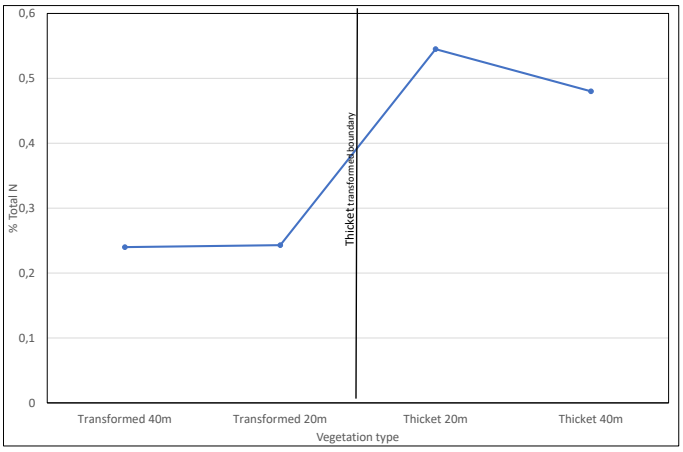


Figure 6: Total nitrogen in the soil in the thicket and transformed patches.

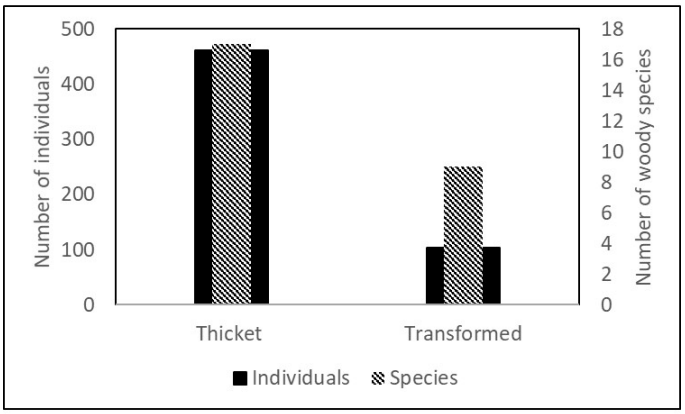


Figure 7: The number of individuals and number of species in the thicket and transformed areas.

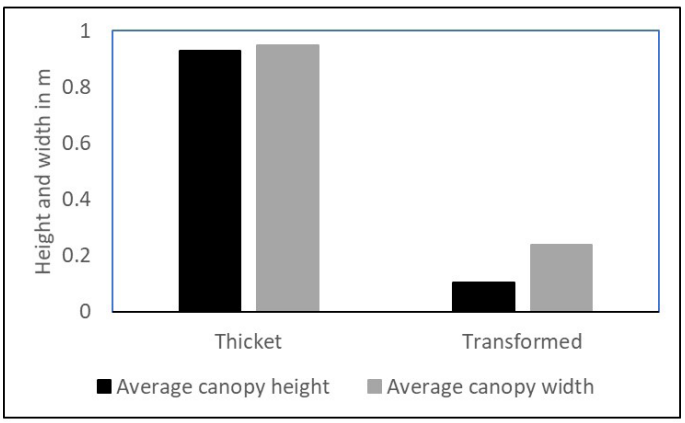


Figure 8: Average height and width in cm of woody plants in the thicket and transformed areas.

which, allow water infiltration as well as the establishment of seedlings. Higher total nitrogen in the soil produces high forage nitrogen in the thicket areas. This forms a valuable resource for herbivores when the soil moisture levels drop during the dry season and the transformed patches stop producing leaves with a resultant drop in the quality and quantity of the forage these areas. This is especially relevant during the ever-frequent inter-annual droughts in the Albany thicket Biome, and where annual evaporation is nearly 4-fold the precipitation (Jury & Levey 1993).

This preliminary study indicates that a mosaic of transformed grassland and thicket patches may be the best outcome for both production and biodiversity, allowing animals to forage in the cleared patches in the wet season and to be able to find quality forage in the thicket in the dry season. We do not yet know what the patch sizes and distribution should be to achieve this goal. We also still need to understand the ecosystem services that thicket patches provide much better to understand the best way to approach the management of the thicket to gain the most benefit in terms of ecosystem services.

These preliminary results also indicate that restoration of transformed areas to thicket will be a challenge. Soils in the cleared areas are more compacted and have lower nutrients than soils in thicket areas. Without improving the soil condition to a state that is closer to that found in the thicket vegetation, it will be exceedingly difficult to establish young plants. The presence of animals will further limit the success of restoration as many animals prefer to forage in these open areas utilizing young woody plants extensively.

REFERENCES

Cowling RM & Mills A J 2011. A preliminary assessment of rain throughfall beneath *Portulacaria afra* canopy in subtropical thicket and its implications for soil carbon stocks. South African Journal of Botany 70: 236-240.

Grant CC & Scholes MC 2006. The importance of nutrient hot-spots in the conservation and management of large wild mammalian herbivores in semi-arid savannas. Biological Conservation 130: 426-437.

Grant CC, Botha J, Grant TC, Peel MJS & Smit IPJ 2019. "When less is more: Heterogeneity in grass patch height support herbivores in counter-intuitive ways. African Journal of Range and Forage Science 36: 1-8.

Haschick SL & Kerley GIH 1997. Factors influencing forage preference of bushbuck and boer goats for Subtropical Thicket plants. African Journal of Range & Forage Science 14: 49-55.

Jury MR & Levey K 1993. The climatology and characteristics of drought in the Eastern Cape of South Africa International Journal of Climatology 13: 629-641.

SANParks, 2015. Addo Elephant National Park Management Plan (2015 - 2025) (Draft). South African National Parks. http://www.sanparks.org/conservation/park_man/ (accessed 29.04.20.).

Sigwela AM, Kerley GIH, Mills AJ & Cowling RM 2009. The impact of browsing-induced degradation on the reproduction of subtropical thicket canopy shrubs and trees. South African Journal of Botany 75: 262-267.

Underground trees of the Highveld

Richard Gill

Current Address: Johannesburg
E-mail Address: richardgillza@gmail.com

What are underground trees?

Botanically, an underground tree is referred to as a geoxylic suffrutex; where geoxyle refers to a subterranean woody plant with the bulk of its biomass below ground, and a suffratex is a shrub with a woody underground base and is also known as a subshrub or dwarf shrub. Often only the tips of their woody branches (ramets) protrude aboveground, to support their leaves and flowers. They are commonly referred to as geoxyles or geosuffs.

With their underground storage organs and bud-banks (accumulation of growth buds able to sprout in future) safely below ground, they are able to resprout quickly after disturbances such as fires (Figure 1), frost or grazing, and it is thought that some of them can live extraordinarily long lives. As a result, many of them produce very few seeds, and young plants are rare.

Professor Braam van Wyk, University of Pretoria, asked about a video suggesting a specimen of Sand Apple (*Parinari capensis*) in Pretoria is around 13 000 years old, suggested ages in excess of 10 000 years are quite possible for some specimens, and some may be considerably older: "The shoots die and renew continuously, but the clone persists. Now if an underground tree is essentially immortal, then it would certainly not be unrealistic to hypothesize that some clones in our Highveld grasslands may be as old as the grasslands in that area themselves. Hence I suspect that some of the larger underground tree clones in southern Africa may be much older than the 13000 years mentioned."

While there are challenges with determining their ages, Lynch et al. (1998) used radiocarbon dating, molecular markers and chromosome counts to estimate the age of a 1200 m wide clone of *Lomatia tasmanica*, in Tasmania, at 43 600 years old. While technically more

Figure 1: A recently burnt firebreak near Tarlton, exposing part of a "forest" of Sand Apple, *Parinari capensis*. Note how quickly they resprout after fire.

Figure 2: *Erythrina zeyheri*. Klipriviersberg Nature Reserve (a,b,c), and roots exposed after flooding - Bethal area (d,e) © Paul Meintjies

an underground shrub than an underground tree, this illustrates nicely how geoxyles are able to live a long time. Pando, a massive clone of more than 40 000 genetically identical Quaking Aspen trees in Utah, and the extensive Miombo woodlands in southern Africa are further examples of extreme longevity in clonal tree species. If clonal terrestrial trees can attain such great ages exposed to the elements above the ground, then there is little to suggest that subterranean species shouldn't equally be so old protected below ground.

What drove them underground?

Most species occur in the savannahs of sub-equatorial Africa, and Brazil. Studies in both these areas reveal they began evolving along with the spread of the savannahs during the last 8 million years, with many evolving as recently as 3-2 mya. There has been much debate about what drove them underground. Arguments have been put forward for various factors such as fires, frost, grazing, poor nutrients and seasonally waterlogged areas.

Maurin et al. (2014) concluded that geoxyles "may have evolved in response to the interactive effects of frequent fires and high precipitation. As such, geoxyles may be regarded as markers of fire-maintained savannas occurring in climates suitable for forests."

Lamont et al. (2017), working with the *Protea genus*, conclude that fire was the main driving factor and that frost may have had a later influence.

Maurin et al. (2014) mention 267 geoxyles in sub-equatorial Africa. The photographs in this article are some of the more commonly found species on the Highveld.

Figure 3a-3c: *Elephantorrhiza elephantina*. Crocodile River Nature Reserve, Suikerbosrand NR, and Klipriviersberg NR

Figure 4a & 4b: *Parinari capensis*. Kloofendal NR, and with exposed root in Muldersdrift

Figure 5a & 5b: *Rotheca hirsuta*. Crocodile River NR

Figure 6a-6c: *Ziziphus zeyheriana.* Muldersdrift

Figure 7a & 7b: *Pygmaeothamnus zeyheri.* Goorappeltjie

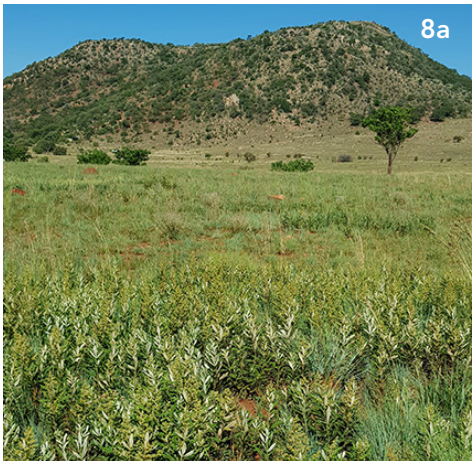


Figure 8a-8c: *Searsia discolor.* Grassveld currant

Figure 9a-9c: *Lannea edulis*. Wild Grape

Figure 10a-10c: *Searsia magalismontana. Berg Taaibos*

Why lions are less likely to attack cattle with eyes painted on their backsides

[1]Neil R Jordan, [2]Cameron Radford and [3]Tracey Rogers

Current Addresses: [1]Lecturer, University of New South Wales (UNSW), [2]PhD Candidate, UNSW and [3]Associate professor of evolution and ecology, UNSW

Reprinted From: https://bit.ly/2GrQtk5

The predation of livestock by carnivores and the retaliatory killing of carnivores, as a result, is a major global conservation challenge. Such human-wildlife conflicts are a key driver of large carnivore declines and the costs of coexistence are often disproportionately borne by rural communities in the global south.

While current approaches tend to focus on separating livestock from wild carnivores, for instance through fencing or lethal control, this is not always possible or desirable. Alternative and effective non-lethal tools that protect both large carnivores and livelihoods are urgently needed.

In a new study, we describe how painting eyes on the backsides of livestock can protect them from attack.

Many big cats – including lions, leopards, and tigers – are ambush predators. This means that they rely on stalking their prey and retaining the element of surprise. In some cases, being seen by their prey can lead them to abandon the hunt. We tested whether we could hack into this response to reduce livestock losses to lions and leopards in Botswana's Okavango Delta region.

The delta, in north-west Botswana, has permanent marshlands and seasonally flooded plains which host a wide variety of wildlife. It's a Unesco world heritage site and parts of the delta are protected. However, though livestock is excluded, the cordon fence is primarily intended to prevent contact and disease transmission between cattle and Cape buffalo. Large carnivores, and other wildlife including elephants, are able to move freely across it, and livestock losses to large carnivores are common in the area. In response, lethal control through shooting and poisoning can occur.

Figure 1: "Eye cows" Bobby-Jo Photography

While the initial focus of the study was ambush predators generally, it soon became clear that lions were responsible for most of the predation. During the study, for instance, lions killed 18 cattle, a leopard killed one beast, and spotted hyenas killed three.

Ultimately, our study found that lions were less likely to attack cattle if they had eyes painted on their rumps. This suggests that this simple and cost-effective technique can be added to the coexistence toolbox, where ambush predators are involved.

Eye-catching solution

Conflict between farmers and wildlife can be intense along the borders of protected areas, with many communities bearing significant costs of coexisting with wildlife. The edge of the Okavango delta in Botswana is no exception, where farmers operate small non-commercial livestock enterprises.

Livestock rub shoulders with lions, leopards, spotted hyenas, cheetahs, and African wild dogs. To protect the cattle, herds (anything between about six and 100 individual cattle) are kept within predator-proof enclosures overnight. However, they generally graze unattended for most of the day, when the vast majority of predation occurs.

Working with Botswana Predator Conservation and local herders, we painted cattle from 14 herds that had recently suffered lion attacks. Over four years, a total of 2,061 cattle were involved in the study.

Before release from their overnight enclosure, we painted about one-third of each herd with an artificial eye-spot design on the rump, one-third with simple cross-marks, and left the remaining third of the herd unmarked. We carried out 49 painting sessions and each of these lasted for 24 days.

The cattle were also collared and all foraged in the same area and moved similarly, suggesting they were exposed to similar risk. However, the individuals painted with artificial eye-spots were significantly more likely to survive than unpainted or cross-painted control cattle within the same herd.

In fact, none of the 683 painted "eye-cows" was killed by ambush predators during the four-year study, while 15 (of 835) unpainted, and 4 (of 543) cross-painted cattle were killed.

These results supported our initial hunch that creating the perception that the predator had been seen by the prey would lead it to abandon the hunt.

But there were also some surprises.

Cattle marked with simple crosses were significantly more likely to survive than unmarked cattle from the same herd. This suggests that cross-marks were better than no marks at all, which was unexpected.

From a theoretical perspective, these results are interesting. Though eye patterns are common in many animal groups, notably butterflies, fishes, amphibians, and birds, no mammals are known to have natural eye-shaped patterns that deter predation. In fact, to our knowledge, our research is the first time that eye-spots have been shown to deter large mammalian predators.

Figure 2: Nenguba Keitsumetsi demonstrates the eye-cow technique to local farmer, Rra Ketlogetswe Ramakgalo. Bobby-Jo Photography

Previous work on human responses to eye patterns, however, do generally support the detection hypothesis, perhaps suggesting the presence of an inherent response to eyes that could be exploited to modify behaviour in practical situations, such as to prevent human-wildlife conflicts, and reduce criminal activity in humans.

Possible limitations

First, it is important to realise that, in our experimental design, there were always unmarked cattle in the herd. Consequently, it is unclear whether painting would still be effective if these proverbial "sacrificial lambs" were not still on the menu. Further research could uncover this, but in the meantime applying artificial marks to the highest-value individuals within the herd may be most pragmatic.

Second, it is important to consider habituation, meaning that predators may get used to and eventually ignore the deterrent. This is a fundamental issue for nearly all non-lethal approaches. Whether the technique remains effective in the longer term is not yet known in this case.

Protecting livestock from wild carnivores – while conserving carnivores themselves – is an important and complex issue that requires the application of a suite of tools, including practical and social interventions. While adding the eye-cow technique to the carnivore-livestock conflict prevention toolbox, we note that no single tool is likely to be a silver bullet. Indeed, we must do better than a silver bullet if we are to ensure the successful coexistence of livestock and large carnivores. Nevertheless, as part of an expanding non-lethal toolkit, we hope that this simple, low-cost approach could reduce the costs of coexistence for some farmers.

Dr J Weldon McNutt (director, Botswana Predator Conservation) and Tshepo Ditlhabang (coexistence officer, Botswana Predator Conservation) contributed to this article.

Figure 3: "Eye-cows" by Ben Yexly

How Nature's 'Pooper Scoopers' Save Farmers Money

Zylem: Soil Health, Plant Health for Human Health

Web Address: www.zylemsa.co.za
Reprinted From: www.zylemsa.co.za/dung-beetles

Sustainable farming measures recognise the beneficial role played by insects, and dung beetles are one of the most helpful critters out there. Dung beetles have their name for a reason: the many species of dung beetles found worldwide spend their days breaking up, burying and rolling dung, which helps to put essential nutrients back into the soil, fosters plant growth and prevents a pasture from turning into a 'cowpat-ure'.

Types of dung beetles

As a sub-grouping (*Scarabaeinae*), dung beetles are part of the *Scarabaeidae* family. There are more than 5,000 species of dung beetles worldwide.

They are found on every continent but for Antarctica and will thrive in all climates (except where there is extreme cold).

Dung beetles can be broken down into four distinct groups:

- Telecoprid – roll the famous balls of dung and bury them in soft soil
- Endocoprid – lay their eggs in a pile of dung
- Paracoprid – dig down below a pile of dung
- Kleptocoprid – steal the balls from the Telecoprids.

Why are dung beetles important to the environment?

During the summer season, dung beetles clean up the majority of animal dung in the wild. If it weren't for dung beetles, animal dung would simply keep piling up. You can call them the 'clean-up crew' or the 'Pooper Scoopers'!

In agriculture, dung beetles provide the same service by breaking down and burying cow dung. This not only fertilises the soil (thus providing better grass for grazing) but also saves the livestock industry millions of rands a year by improving animal health. In fact, according to a study conducted by the American Institute of Biological Sciences (AIBS) in 2006, dung beetles save the US livestock industry a staggering US$380 million annually.

Here's how dung beetles save livestock farmers money

Dung beetles are important to the health of the soil and the farmer's bottom line, and having dung beetles in pastures is a sign of a healthy and productive land base. The main benefits to the farmer include:

Fly control

A cow can produce up to 12 cowpats a day. If left exposed on the ground, this faecal matter provides an ideal breeding ground for dangerous flies and parasites. In only two weeks, up to 3000 flies can breed on a single cowpat.

Dung beetles are dung burying 'machines', able to bury 250 times their own weight in dung per day. By burying dung, dung beetles prevent the growth of potentially harmful flies and parasites.

They move flies' eggs and brooding sites below the soil, thus breaking the life cycle of the flies.

Along with burying piles of poop, dung beetles that create dung balls (Telecoprids) excrete a chemical on the ball that will repel flies from trying to lay their eggs. Other varieties of dung beetle larvae will prey on the larvae of flies.

Improved pasture fertility

Dung beetles search for the most nutritious manure in the pile (this is what they ball up and roll away or bury directly under the cowpat). What's left behind are the smaller, high-fibre pieces. The portions of dung that dung beetles seek are the highest in nitrogen; by burying these bits, the beetles move this matter to the rhizosphere in the soil.

This means less nitrogen leaching back into the atmosphere, and more nitrogen for plant growth.

Water management and soil aeration

In the face of climate change, flood and drought cycles are affecting farmers around the world. They need sustainable, effective solutions to mitigate these risks.

Dung beetles continuously tunnel holes into the rhizosphere, aerating the soil and increasing the rate at which water can infiltrate the soil. In addition, by mixing with residual manure leftover from the dung beetle larvae, water will lock into the rhizosphere like a sponge, giving plants perfect access to water right where they need it most.

By promoting a healthier water cycle, dung beetles help healthier plants to grow, encouraging more photosynthesis and more feed for livestock.

The bottom line

With diseases carried by flies costing farmers millions per year, introducing dung beetles is a sustainable way to drastically reduce fly populations and associated parasites and diseases.

Add their ability to increase fertility in pastures and allow for more effective water cycling, and dung beetles can make a significant impact on farm financials. All you need to do is create the conditions for dung beetles to thrive.

The Australian Dung Beetle Project

Cattle were only introduced to Australia in the 1880s. The country has hundreds of species of native dung beetles, but these have evolved to use the dung of kangaroos and other indigenous mammals, which have a much more fibrous diet than cattle. The native beetles, therefore, are unable to break down the vast amounts of dung produced by newly-introduced livestock.

The problem of accumulating cow dung became so severe in Australia that the Commonwealth Scientific and Industrial Research Organisation initiated the 'Australian Dung Beetle Project', which introduced dung beetle species from South Africa and Europe to Australian farms.

The project monitored the effects of the dung beetles and found that pasture quality and fertility improved significantly. There was also a 90% reduction in localised bushfires since there was less flammable manure exposed on the topsoil.

Figure 1: Dung beetles are one of the most helpful critters out there

A SA company is live-streaming Africa's spectacular 'Great Migration' to viewers around the world

Andrew Thompson

Current Address: https://bit.ly/357KdIM

Even though inter-provincial travel is now allowed in South Africa, it's still not possible to venture beyond the country's borders for a casual holiday. And although some countries are starting to open up and travel once again, the appetite for long-haul international destinations may take some time to recover.

The result is a sustained interest in online and virtual travel - and South African company WildEarth, which has been broadcasting live safaris for several years, has seen its viewer numbers skyrocket as a result.

During the lockdown, WildEarth focused on broadcasting its twice-daily safaris from reserves adjacent to the Kruger National Park, but quickly expanded to include both Phinda Private Game Reserve and Tswalu, in the Kalahari, as soon as conditions allowed. And starting this month, they will be broadcasting live from the Maasai Mara to an expected bumper local and international audience - on various streaming platforms and via a dedicated 24-hour channel on DSTV.

"The Great Migration is probably the world's most iconic natural event and WildEarth are privileged to be able to share it with the world once again," says Graham Wallington, CEO of WildEarth. "WildEarth has a camp in the Mara Triangle and will be broadcasting every day from the Mara even after the migration leaves in a month or two. It truly is a spectacular place with magnificent wildlife."

During the great migration almost 2 million wildebeest, Thompson's gazelles and zebra migrate from Tanzania's Serengeti National Park into Kenya's Maasai Mara - with much of the action taking place at river crossings.

"Crossing the great Mara river is a very dangerous enterprise for these herds as the river is full of massive and hungry crocodiles who have been waiting a whole year for this feast," says Wallington.

It's at these rivers that tourists often pay vast sums of money to sit and wait amongst dozens of fellow travellers, in anticipation of watching the often-harrowing crossings. But with international travel still not available to many around the world, these numbers are expected to be lower than in previous years - and many more will settle for the livestream courtesy of WildEarth.

WildEarth currently has two safari vehicles going out into the Mara every day, led by guides Isaac Rotich and David Githu, and in a few weeks, they aim to increase this to three. And already the channel has broadcast a scene that shows just how dramatic the event can be.

Navigating Covid-19 lockdowns

One of the key appeals of these live-streamed safaris during the global pandemic has been the way in which they portray a sense of familiar normality of the outside world, during a time when the lives of most viewers are anything but.

With a constantly changing parade of personable and knowledgeable guides lamenting about such simple pleasures as hatching grebes and suckling hyena cubs, it required a minimal suspension of disbelief to imagine the world as it is was before lockdown.

As broadcast media, WildEarth was deemed an essential service - they were able to continue broadcasting during the strictest days of the lockdown and continue portraying this voyeuristic sense of normality.

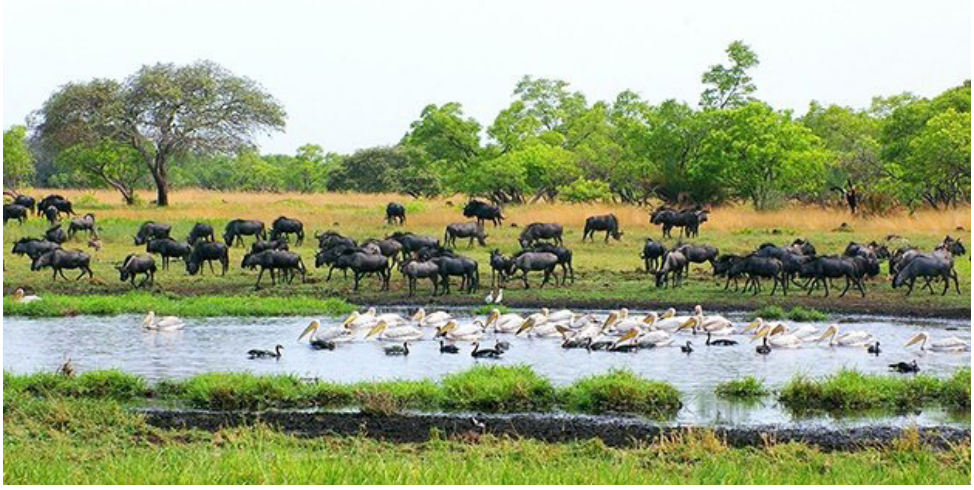


Figure 1: Africa's spectacular 'Great Migration'

"WildEarth has always been a decentralised company that has always operated 100% digitally, so moving to Zoom meetings and having everything in the cloud was not a challenge, as that is how we have always been," says Wallington.

As restrictions eased, WildEarth began adding more locations to their live streams - and in spite of the careful juggling act between presenters, camera operators and other staff, Wallington says they have successfully avoided any staff becoming infected with the coronavirus.

"We are lucky in that our teams can quite easily isolate, as they are isolated in the wilderness anyway," says Wallington.

Massive increase in lockdown viewers

South Africa's hard lockdown has been good for WildEarth - during early lockdown Wallington says WildEarth's viewership rose five-fold, with viewership from South Africa increasing fifteen-fold.

"While viewer numbers have dropped somewhat since the April peak, our global viewership is still more than double when compared with March, and South African viewership remains at well over seven times what it was before the lockdown," says Wallington.

"Expressed in hours viewed, this number for South Africa is currently still eleven times what it was before lockdown."

People are also starting to watch more of each safari than they did previously. Wallington says people are sticking around for 50% longer than they did before the lockdown, which means on average South African viewers are watching about 50 minutes per three-hour drive.

Each live-streamed safari is currently viewed by about 40,000 people, and in the month of July, a total of about 1.5 million watched their safaris - down from a peak in April of about 2 million.

The increased viewer numbers and interest around the world has led to interest from several new opportunities. In mid-lockdown they licensed shows to the BBC and Chinese conglomerate Tencent, and have recently agreed on a deal with CGTN to broadcast directly to China, complete with Chinese subtitles.

Locally, WildEarth struck a deal with SABC 3, to broadcast the safaris live between 3 pm and 4 pm daily, which Wallington says reaches 200,000 viewers per show. And in late-August, WildEarth announced that it will be launching a brand new 24-hour safari channel on DStv Channel 183.

The new DStv channel will initially feature seven hours of live safaris each day - with a vision to expand this offering to include live safaris around the clock, from various timezones.

South African company **WildEarth**, *which has been broadcasting live safaris for several years, has seen its viewer numbers skyrocket during lockdown.*

During the lockdown, WildEarth focused on broadcasting its twice-daily safaris from reserves adjacent to the Kruger National Park, but quickly expanded to include both **Phinda Private Game Reserve** *and* **Tswalu**.

From August, they will be broadcasting live from the **Maasai Mara** *and launching a dedicated channel on DSTV.*

Figure 2: A screengrab from Youtube: https://youtu.be/o0n7Fv_JRt4

Climate impact of grass-fed cattle overestimated, says study

Rhian Price

Current Address: Sutton, UK
E-mail Address: richard.allison@markallengroup.com

Reprinted From: https://bit.ly/3jM393N

Cattle that graze pasture rich in white clover produce just half the amount of nitrous oxide than previously thought, according to a study carried out by Rothamsted Research.

The findings suggest the climate impact of grass-fed cattle herds is overestimated and could help farming achieve its ambition of becoming a "net-zero" emissions industry by 2040.

Nitrous oxide is a potent greenhouse gas that is 265 times more harmful than carbon dioxide and thought to account for 40% of beef supply chain emissions.

How the emissions study worked

Most studies of emissions from livestock combine data from a variety of experimental systems in addition to some estimated values from the Intergovernmental Panel on Climate Change (IPCC).

These figures assume all cattle urine or faeces deposited on soils cause the same volume of nitrogen-based emissions irrespective of pasture type.

However, researchers at Rothamsted created a more realistic farming scenario by measuring emissions from one herd using a near "closed" system, which allowed the flow of nitrogen from soil to forage to cattle, and back to soil again (as deposited urine and dung) to be monitored.

The grazing platform at Rothamsted's North Wyke Farm, Devon, was divided into three grazing systems:

1. Permanent pasture (predominately perennial ryegrass), not ploughed for 20 years. This received inorganic nitrogen in the form of ammonia nitrate, applied three times during the grazing season at 40kg N/ha.
2. Perennial ryegrass containing a high-sugar grass (AberMagic). Also received inorganic nitrogen, as above.
3. A high-sugar grass and clover mix where no nitrogen was applied.

Weaned cattle were randomly assigned to each system. Urine and dung samples were collected from the cattle and applied to areas to reflect simulated grazing with grass also cut twice.

Nitrous oxide emissions were measured using static gas chambers installed in the soil, with samples collected over a six-month period (April to September 2017). Five treatments were analysed: cattle urine, dung, synthetic urine and synthetic fertiliser.

Figure 1: White clover pasture

Soil and grass samples were also taken so scientists could analyse microbial activity.

What the study found

The trial found the white clover-high sugar grass mix had the lowest urinary nitrous oxide emissions compared with the other two pasture types when the effect of nitrogen fixation from clover was removed from calculations.

Nitrous oxide is most associated with urine, so researchers focused on this.

Results showed clover had an emission factor of 0.44% for urine following exclusion of fixation. This is nearly half the amount of the most recent IPCC figures for urine, which estimate a factor of 0.77%.

This compared with 0.55% of nitrogen losses from urine for the permanent pasture and 0.76% for the high sugar pasture, which were higher because they also received fertiliser and the effects of urine could not be isolated.

At field-scale, researchers also observed lower amounts of the nitrous oxide-producing gene in the white clover/high-sugar grass mixed sward, which suggests a complementary relationship between these species.

Lead author of the study, Graham McAuliffe, said: "Regarding white clover, we have seen benefits on the Farm Platform time and time again. At a system level, including methane and carbon dioxide, this is largely driven by avoided nitrogen fertiliser production and application."

White clover roots have the ability to "fix" nitrogen from the atmosphere.

Dr McAuliffe said new models would need to be created to estimate just how much these new, lower values could reduce total greenhouse gas emissions, and more work would need to be done to understand the relationship between clover and high-sugar grasses, particularly at the soil microbial level.

Helping farmers meet net-zero

Nitrous oxide emissions can account for more than 40% of entire supply-chain greenhouse gas emissions so, used in calculations of the climate impact of beef, these findings can have considerable significance.

Atmospheric chemist, nitrous oxide expert and co-author Laura Cardenas added: "Although white clover is unlikely to be a 'silver bullet' for agriculture's net-zero ambitions on its own, adopting combinations, such as increasing legume-inclusion in pasture compositions and the utilisation of 'low-carbon' fertilisers, will be essential to maximise farming's national and international contribution to a cooler planet."

Download the full report click the full report on the ScienceDirect website: https://bit.ly/2Z99iPP

Groundbreaking study maps and values South Africa's wild spaces

United Nations Environment Programme

Reprinted from: https://bit.ly/320TvEv

From its vast savanna to its rugged coastlines, to its flower-rich montane grasslands, South Africa's KwaZulu-Natal province is rich in natural beauty.

But those ecosystems are more than just alluring – they provide services to people by trapping carbon, filtering water, and performing a host of other essential functions. Now, for the first time, a study has mapped a suite of the services provided by KwaZulu-Natal's natural systems and placed a monetary value on them. It's a key step, experts say, in helping to protect the province's wild spaces.

"The services provided to humanity by nature are often undervalued, or not valued at all," said Salman Hussain, the coordinator of the Economics of Ecosystems and Biodiversity initiative, which is hosted by the United Nations Environment Programme (UNEP). "But by showcasing the services that natural systems provide to our economies and societies, we can further the argument for protecting habitats and restoring ecosystems that have already been impacted by development."

Figure 1: Drakensberg, KwaZulu Natal, by Margy Sneeden/Pixabay

KwaZulu-Natal has the second-largest economy of South Africa's provinces, contributing around 15 per cent of the country's gross domestic product. It also has a broad array of ecosystems and a wealth of biodiversity. The new report found those ecosystems played an important role in storing carbon, retaining soil, preventing floods, improving water quality, promoting pollination, and providing recreational value. In 2011, the combined value of those "essential ecosystem services" was 33.4 billion South African Rand, equivalent to 7.4 percent of the province's economic output. But values of many of the services have decreased over time, particularly in the grassland and savanna biomes, partly as a result of their conversion to intensive land uses, such as cultivation.

The report's findings are based on what's known as natural capital accounting, which measures the often hidden services that ecosystems provide to the economy and society. This allows governments and businesses to take into account the benefits of these services when making decisions about things like where to locate industry, what agricultural systems to emphasize, and which areas to protect.

"Natural capital accounting helps decision-makers to go beyond gross domestic product and traditional economic measures, to gain a finer perspective on the environmental impacts of development, and the implicit trade-offs being made," says Hussain.

South Africa has long been at the forefront of this movement. The coun-

try held its first national Natural Capital Accounting Forum in July 2019. An array of decision-makers discussed how natural capital accounting could support South Africa's move towards a green economy, one in line with the country's National Development Plan and the global Sustainable Development Goals.

The new study was commissioned by UNEP and produced as part of the South African component of the European Union-funded Natural Capital Accounting and Valuation of Ecosystem Services project. The effort, which also involves Brazil, China, India and Mexico, is jointly implemented with the United Nations Statistics Division. In South Africa, Statistics South Africa and the South African National Biodiversity Institute are leading the project while collaborating with the Department of Environment, Forestry and Fisheries and other partners.

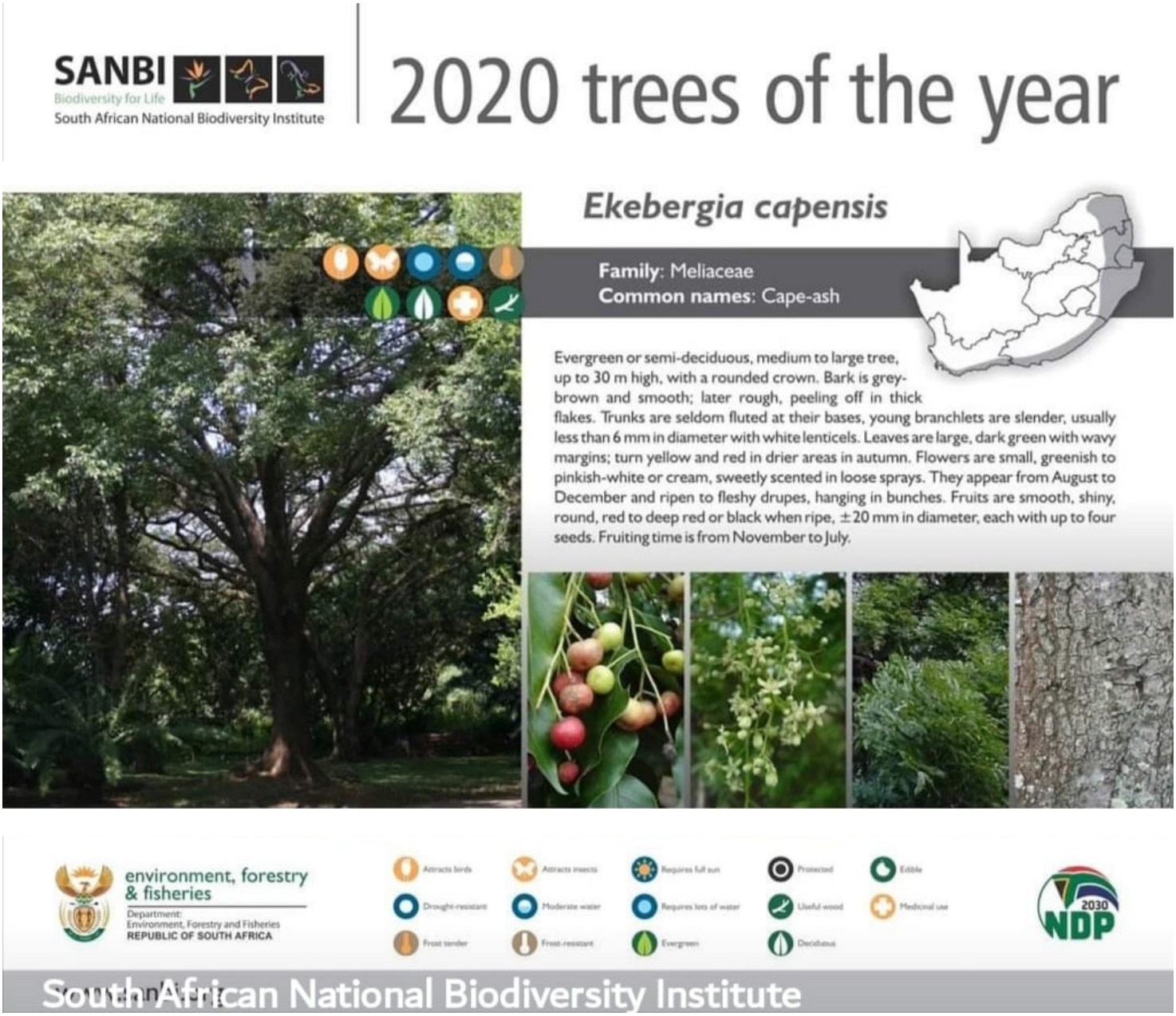
Jane Turpie of Anchor Environmental, lead author of the report, says the project demonstrates that it is possible for countries to develop accounts for a range of ecosystem services in both physical and monetary terms, consistent with a form of natural capital accounting known as the System of Environmental Economic Accounting Experimental Ecosystem Accounting framework.

In follow up work, the results from KwaZulu-Natal will contribute to national and global discussions about the use of accounting approaches for informing complex challenges such as land degradation neutrality by 2030, she added.

The project will also serve as an example for conservation efforts in other countries as part of the United Nations Decade on Ecosystem Restoration.

"This study serves as a shining example of how measuring what matters could lead to better policymaking," says Hussain.

"As the international community negotiates a post-2020 biodiversity framework, such research could hardly be more timely."



The advantages of sweet thorn

Roelof Bezuidenhout

Reprinted From: https://bit.ly/35eKYj0

While many farmers consider the common sweet thorn (*Vachellia karroo*, formerly *Acacia karroo*) an unwelcome indigenous invader, researchers point out that it is one of the best sources of feed and shelter in dry regions.

Its nutritious leaves and pods are eagerly eaten by livestock and game, while many farmers regard its yellow, ball-shaped flowers as a type of natural 'vitamin pill'. Sheep and goats eat them off the ground, and even small quantities can help keep animals in good condition under dry conditions when there is little greenery in the veld.

So much so, that sheep and goat farms with large numbers of these trees, which do best along water courses, tend to cope better in dry times than farms with few or none of them.

V. karroo provides plenty of shade on hot days, and thickets serve as highly effective windbreaks during cold snaps. However, they need to be controlled by browsers. Where only cattle are kept, the trees tend to form thick stands.

Why so many?

The species has proliferated over the past few decades, growing in thickets as well as singly where they were hardly seen before.

According to scientists, the growth of these trees and many other species has been spurred by increased carbon dioxide levels in the atmosphere.

This is supported by the results of an experiment at Rhodes University, in which researchers exposed sweet thorn specimens to various levels of carbon dioxide. Some of the saplings in the trial were subjected to carbon dioxide levels typical of pre-industrial conditions, while others were exposed to the high levels of the late 1990s.

The latter grew more than three times the biomass, developing massive root systems with increased starch concentration.

Higher levels of carbon dioxide in the atmosphere make the gas more readily available to trees, especially where plant growth is not limited by factors such as shade or low nutrient supply. The trees can therefore take in more carbon dioxide for the same amount of energy expenditure.

The sweet thorn tree has been appearing in increasing numbers. Yet this 'invader' should be welcomed by farmers, as it provides year-round feed and shelter, writes Roelof Bezuidenhout

Trees store the extra carbon in their roots or stems. Increased storage means they can resprout and recover more quickly after fire or browsing. In addition, seedlings grow faster and have a greater chance of survival.

Higher levels of atmospheric carbon dioxide also result in more carbon being channelled to the plant's defences, such as spines and tannins.

Magic mistletoe

Another reason that farms with extensive sweet thorn growth are more drought-resistant is the fact that the trees host the parasitic mistletoe, commonly known as voëlent.

Mistletoe (*Agelanthus natalitius*) grows in clusters high up in the trees that become almost as heavy as lucerne bales and are equally nourishing.

Plucked out of the branches by means of long hooks, they make a nutritious and palatable green feed that soon gets the rumens of sheep and goats working well.

Unfortunately, details about the real feed value of mistletoe are not available. But harvesting this plant is one of the most cost-effective drought survival measures available to stock farmers.

Researchers from the University of KwaZulu-Natal's School of Biological and Conservation Sciences have even established that the mistletoe has a higher nitrogen concentration than its host tree.

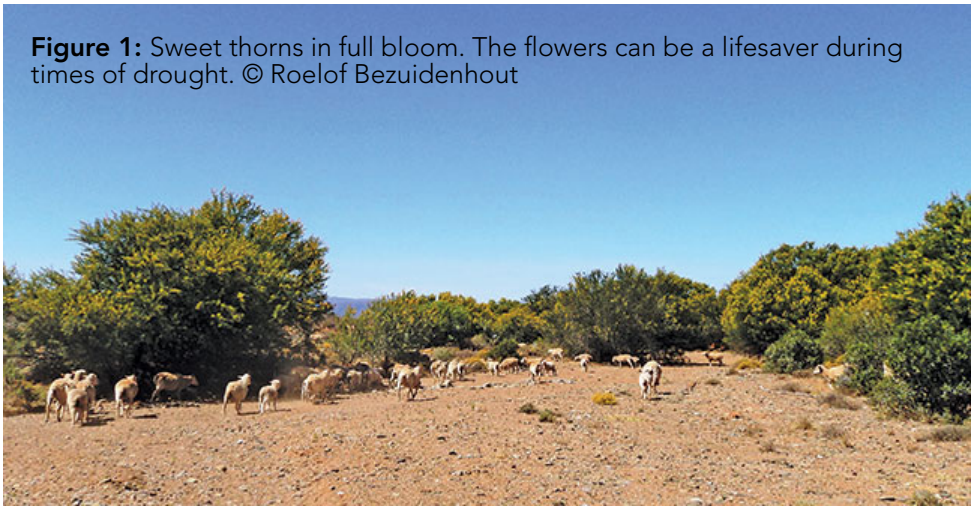


Figure 1: Sweet thorns in full bloom. The flowers can be a lifesaver during times of drought. © Roelof Bezuidenhout

Mycotoxins in water may have caused Botswana elephant death

Annelie Coleman

Reprinted From: https://bit.ly/356UOUc

No definitive answers have yet been found for the mass die-off of elephants in Botswana since May this year.

Early research results have suggested, however, that the deaths could be attributed to a naturally occurring toxin.

This emerged in a recent investigative paper published in the African Journal for Wildlife Research by a team of researchers from South Africa and Pakistan, who aimed to gain an understanding of the cause of death of more than 350 elephants in that country.

Dr Gerhard Verdoorn, CropLife SA's operations and stewardship manager, told Farmer's Weekly it was highly likely that the deaths were caused by mycotoxins from infected water sources.

The mycotoxins severely affected the neurological system, resulting in rapid death. This could explain why some of the elephants collapsed mid-stride and caved in on their knees.

Carcasses were first found in the Okavango Panhandle region, and blood samples had since been tested by scientists in Zimbabwe, the US, and at the University of Pretoria's Faculty of Veterinary Science in South Africa.

In the paper, the team observed that the death of the elephants in Botswana "was indiscriminate in line with their age and gender, while death for some was sudden, as elephants were found collapsed forward onto their chests, tusks in the ground, rather than on their sides.

Viral and bacterial agents that could precipitate species-specific mortalities on this scale, potential environmental sources of poisoning, and the samples and tests that would assist in excluding/confirming these candidate causes were considered".

Figure 1: There are indications that the recent deaths of more than 350 elephants in Botswana can be attributed to mycotoxins from infected water sources. © Denene Erasmus

Botswana's elephant population of 130 000 had been stable for the past 25 years.

Considering that yearly mortalities of between 3 000 and 4 000 individuals should be associated with this stable population size, the writers argued that the loss of some 400 elephants was unlikely to negatively impact the broader elephant population.

Their concern was, however, that the current wave of elephant mortalities would continue and spread to other areas.

A second consideration was that a similar mass mortality event would affect small and isolated elephant populations, which would not be able to withstand the loss of so many individuals, the paper said.

South African Risk and Vulnerability Atlas releases new portal

Dr Claire Davis-Reddy

Current Address: SAEON uLwazi Node

Reprinted From: https://bit.ly/3lTsYkk

The world is facing a number of complex global challenges. These include changes in the climate system as well as changes in biophysical and human systems such as urbanisation, deforestation, biodiversity loss and, more recently, the rise of pandemics.

Creating an enabling environment for communities, governments and sectors to respond to global change risks is critical to ensure future resilience.

One essential component of responding to global change is open access to data in a format that is suitable for use (i.e. decision-ready).

South African Risk and Vulnerability Atlas*

The South African Risk and Vulnerability Atlas (SARVA) is in its third phase of development and a new portal was released in April 2020 – sarva.saeon.ac.za.

The aim of SARVA is to profile the vulnerability of local municipalities and proactively provide information to strengthen the ability of the people of South Africa to cope with a range of natural and anthropogenic hazards, including climate change, biodiversity loss and epidemics.

SARVA will achieve this by providing open access to decision-ready data and translating the data and risk maps into a digestible narrative for decision-makers using a range of decision-support tools which include curated spatial data collections, indicator dashboards, infographics and a searchable atlas.

Researched blog reports on current topics

SARVA features several researched interactive reports on current topics including Covid-19 Preparedness Indicators. The purpose of these is to showcase datasets that can be used

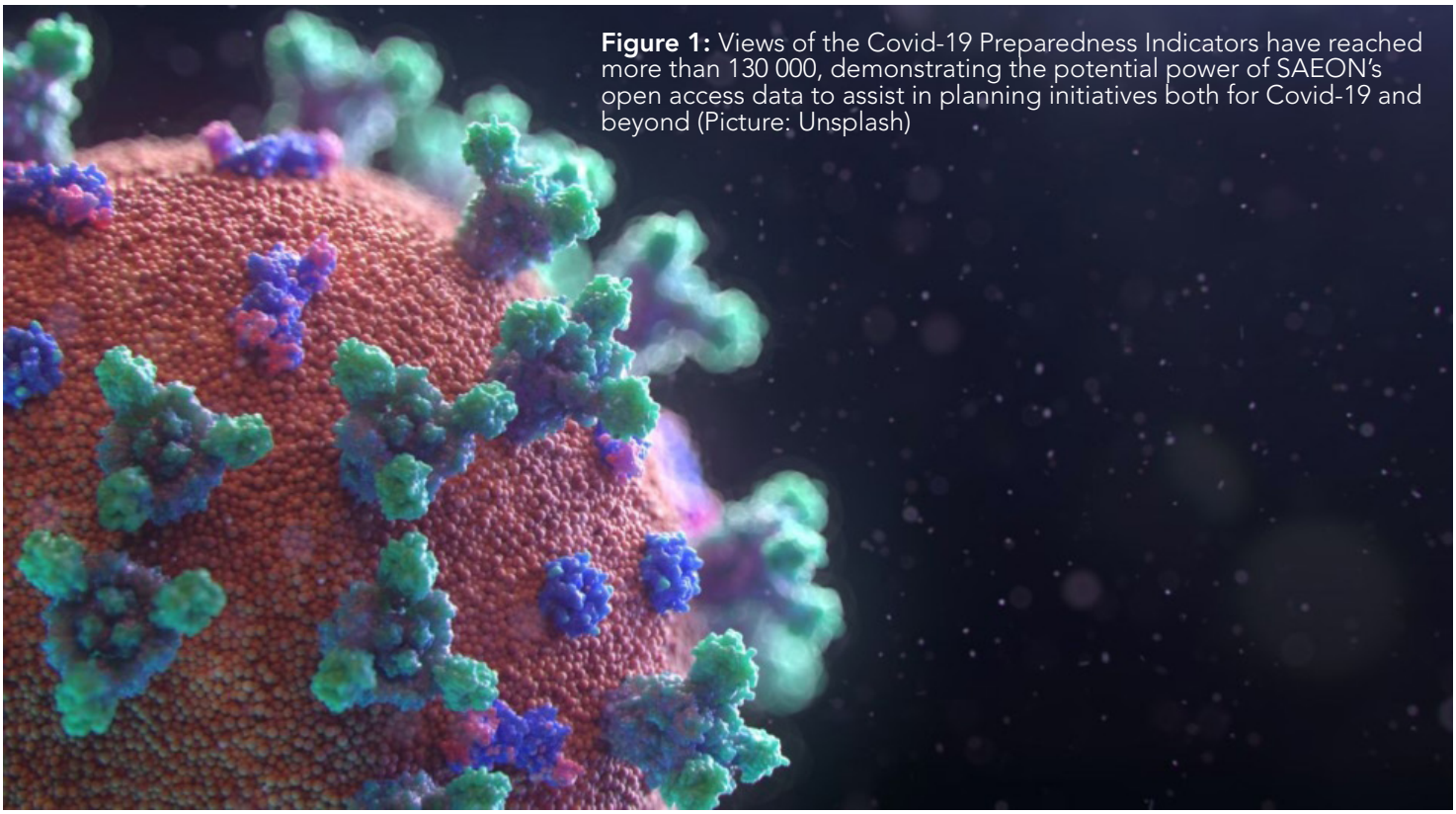


Figure 1: Views of the Covid-19 Preparedness Indicators have reached more than 130 000, demonstrating the potential power of SAEON's open access data to assist in planning initiatives both for Covid-19 and beyond (Picture: Unsplash)

as indicators of important challenges being faced by South Africa. Upcoming examples include a review of the socio-economic impact of natural disasters.

SARVA relies on infrastructure already developed by SAEON for the rapid development of decision-support systems based on properly published, standardised global change datasets.

The platform combines multidisciplinary datasets from a range of organisations in a single point of access (demography, health, climate and global change drivers, among others).

Datasets published through SAEON's Open Data Platform can be given a Digital Object Identifier which allows data providers to track downloads and citations through DataCite.

SARVA is an open science portal that provides access to a growing collection of decision-ready data, dashboards, infographics and maps. The team is continually working on providing access to spatial and non-spatial data on global change hazards facing South Africa.

Features

The features of SARVA 3 include:

- An online searchable database that holds more than 500 different geospatial datasets at national, provincial, district and local study site scale.
- Interactive infographics linked to curated data collections to assist in the translation of data from a variety of different sources into a consistent set of key messages on the vulnerability of communities.
- Value-added products and tools including indicator dashboards that are organised according to the 17 Sustainable Development Goals (SDGs).
- A District Municipality Risk Profiler that showcases exposure and vulnerability to a range of different hazards beyond that of climate change. This tool aims to assist in the implementation of the District Coordination Model.
- The development of a federated data-processing platform to assist in coping with sensitive data and ensuring the protection of privacy.
- The provision of data infrastructure and ICT services (e.g. SAEON has 300 TB of mirrored storage in three locations) for the storage, distribution, monitoring and curation of global change datasets.

User groups

SARVA serves different user groups requiring access to data. These range from decision-makers to domain experts and the research community.

SARVA can also serve technical software development teams who would like to reuse components developed by SAEON.

The content is driven by the data that SAEON has access to and which is openly provided by data providers and custodians.

The ability to highlight key gaps in data as well as data access and availability will be vitally important to the users.

The SARVA portal is a living atlas and will be updated as new data are made available and as new tools and services are developed by SAEON.

** SAEON is the lead agency and implementer of the South African Risk and Vulnerability Atlas, an initiative of the Department of Science and Innovation.*

SAEON's repository is available at https://bit.ly/3lMmvYi

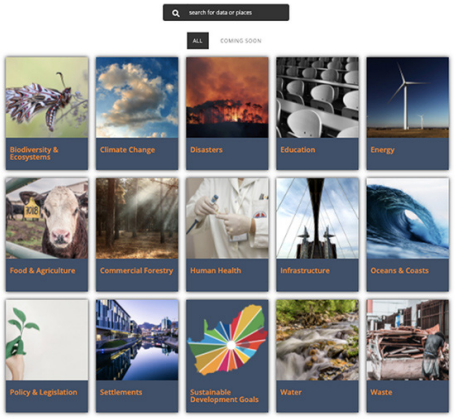


Figure 2: Discover collections of curated data, interactive visualisations and dashboards on the major challenges facing South Africa

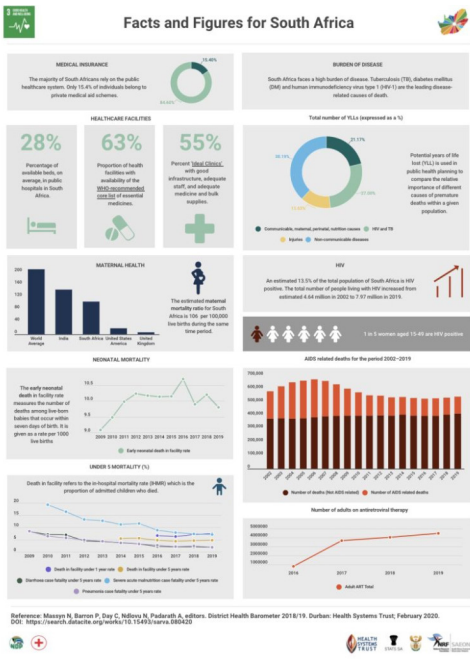


Figure 3: Facts and figures related to SDG 3: Good health and well-being

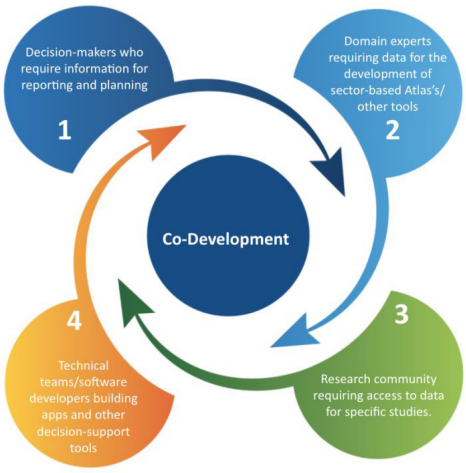


Figure 4: Co-Development

HISTORY ON RESEARCH STATIONS

Cedara College and Research Station

Trevor Dugmore

In the late 1890's the Minister of Agriculture for Natal, together with the farmers of Natal put together a proposal that the agricultural problems of Natal be addressed by a formal experimental station and place of learning. So began the process of finding and purchasing a suitable piece of land on which to establish what was first termed the Central Experiment Station. The land, some 1460, was purchased in 1902 with no infrastructure, with poor soils and virulent stock diseases in the area. It was part of the outspan at top of the arduous, long steep hill from Pietermaritzburg, but land so bleak and sour and grazing so poor that most waggoneers and transport riders preferred to ride further to the next outspan nearer to Howick were conditions were less harsh. The harsh conditions were considered ideal for an Experimental station. Some 900 experimental plots were established in the 1902/03 season and 1178 species and varieties of plants, including forest trees, were planted. Later some 700 ha of forestry was transferred to the Department of Forestry.

The name Cedara was first used in 1903. The Cedara Agricultural College was started by the Natal Government with an announcement in the Natal Agricultural Journal of the three important founding principles, which are still relevant today, that the courses would be; practical, make use of modern techniques and relevant to the needs of the farming community.

A few years later the College had developed significantly from the first wattle and daub building to laying of the foundation stone on 28 April 1905 by Governor of Natal - His excellency Sir Henry McCallum of the main building (Red Brick College building – left in picture) which would house offices, laboratories as well as College facilities, single quarters and rooms for visitors. The farm office, the livestock buildings the workshops, the sheds and married quarters were elsewhere. The construction of the Administration Building (White Building on the right of picture) commenced in 1914 but due to the shortage of manpower and materials caused by World War I was only competed in 1918.

Figure 1: Cedara entrance

Figure 2: Cedara's first building

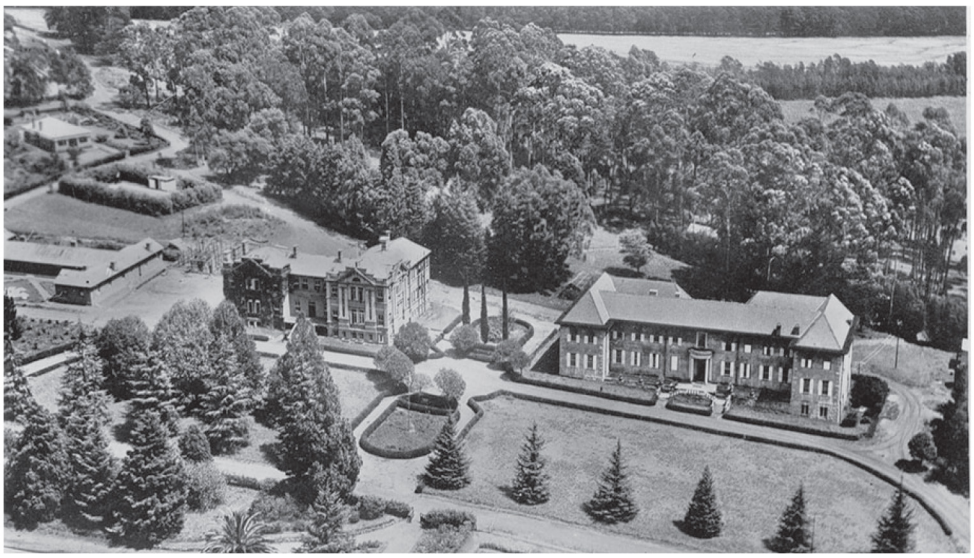


Figure 3: General view (aerial) of the hostel and college

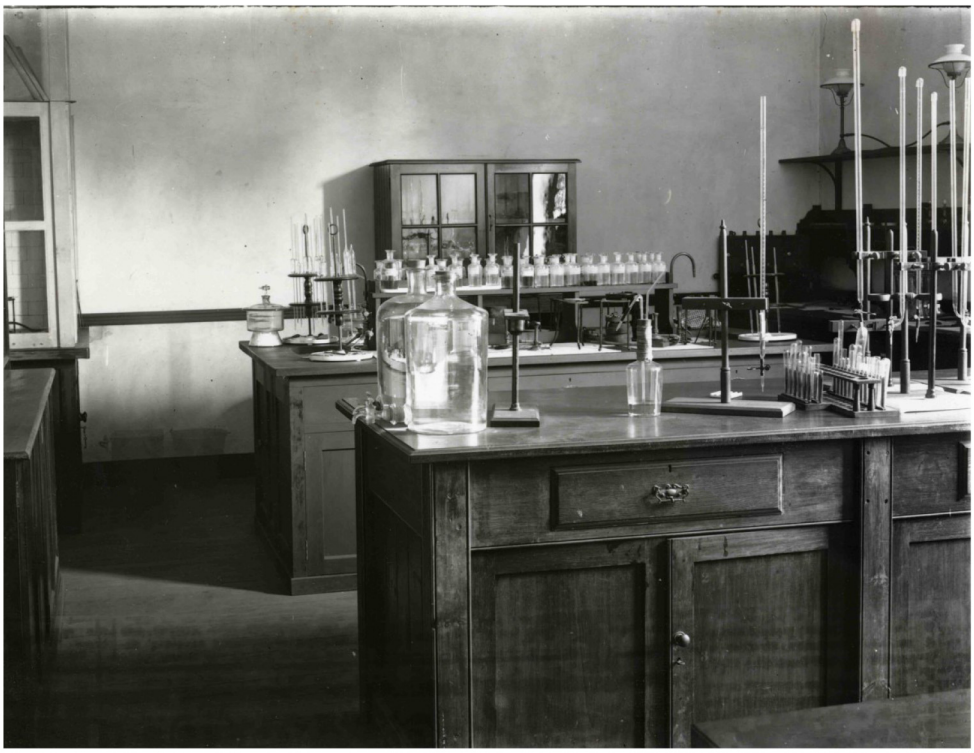


Figure 4: Chemistry Laboratory c. 1912

In the early years the College and Research were integrated, with satellite research stations; the Weenen Experimental Farm for irrigation and the Winklespruit Experimental Farm for horticulture and sub-tropical agriculture. The importance of experimentation was reflected in the early establishment of a chemistry laboratory with AJ Taylor, a chemist, appointed in 1910 and remained at Cedara for 38 years. AJ Taylor undertook groundbreaking work on kikuyu, which set the stage for further work resulting in it becoming the predominant pasture for dairy cows in the province.

The outbreak of East Coast Fever in 1908 resulted in restrictions being imposed on the movement of cattle. This resulted in a Dipping tank, the second in Natal being built on Cedara, after the first cattle dipping-tank in South Africa was built at Baynesfield by Joseph Baynes in 1902 to combat ticks, the carriers of east coast fever and other diseases.

Due to the outbreak of East Coast Fever, experiments were undertaken to investigate the domestication of indigenous animal species such as eland and zebra– which were immune to local diseases, for meat production and drought purposes.

The loss of draught animals resulted in increased mechanisation, with a steam traction engine acquired for Cedara.

Short courses and farmers days were introduced, with the first three-week short course was held in July 1908. Directed at schoolmasters who would receive instruction in crop-production and stock-farming. It was hoped that they would guide some of their pupils towards the farming profession. It is of interest to note the number of women attending due to the men serving in WW1.

Animal breeding of dairy and British Beef Breeds was an early objective, with progeny sold to local farmers at auctions, to improve the quality of the local cattle.

Pasture research commenced soon after the establishment of the Central Experimental Station and by 1909 there were 25 acres under pasture on Cedara. *Paspalum* was recorded as yielding 10 tons per ha annually on Cedara and lucerne 15 tons at Weenen. Kikuyu was introduced in 1915. By 1940 there was 200 ha of pasture on Cedara.

Agronomic crop evaluation commenced in the early years at Cedara, with crops such as potatoes, maize, soya beans, cowpeas and dry beans and manuring trials.

Some of the research by scientists based on Cedara include:

- The biological control of Eucalyptus snout beetle by parasitic wasps released into *E. viminalis* (blue gums) at the entrance to Cedara by the entomology unit in 1927.
- Breeding of a blight-resistant potato cultivar on Cedara.
- Veld reinforcement into degraded Ngongoni veld.
- Following on from the groundbreaking research by AJ Taylor on kikuyu, in-depth research was conducted on:
  - the soil fertility requirements for kikuyu fertility,
  - the biochemistry of kikuyu and its anti-quality factors
  - the nutrient value of kikuyu for dairy production
  - milk production trials off kikuyu
  - sheep production trials on kikuyu
  - beef production of the cow herd on kikuyu and the growth of beef animals off kikuyu
- Dairy production research on the nutritive value of pastures and the responses to supplementary feeding, the identification of an iodine deficiency in the KZN midlands, low sodium levels and an inverse Ca:P ratio in kikuyu affecting animal health and production leading to the development of the "Cedara"

system for dairying and the production of the "blue book" Dairying in Natal (1st ed) and the 2nd edition "Feeding and Management of Dairy Cattle in Natal" which transformed dairying in KZN and the Eastern Cape.

- The breeding and selection of forage species, particularly Midmar Italian ryegrass which revolutionised dairy production of pastures in KZN, as a winter pasture under irrigation.
- Condition scoring of beef cattle research commenced in the 1970's and later condition scoring of dairy cattle.
- The adoption of the systems approach to agriculture in the mid-1970's. Emanating from this approach were:
  - First disease forecasting programme in SA for blight.
  - Crop modelling predicting crop yields through the study of climatic data, soil data and cultural practices. Stress days on crop yield were also examined.
  - The Natal Dairy Herd Simulator (DAISI) model which used the actual herd date to generate lactation curves for the herd in order to predict milk production, from present hard data, in the following 6 months to a year with accuracy enabling management and business decisions to be made on solid facts.
  - The "Natal Simulator for Beef Feeding Trials", or NSBFT program to compare different beef feeding systems.
  - The Cedara Dairy Rationing Programme for desktop (Apple II) computers, which calculated the concentrate required to balance a cows diet with both protein and energy to meet a cow's requirements based on the roughages fed, the nutritive value of the roughage, the cow's body weight and conditions score, lactation number, stage of lactation, daily milk yield and the butterfat content of the milk. These programs distributed on 2 floppy discs were used throughout South Africa and even as far afield as Zimbabwe and Zambia.
  - Fodder Flow Planning utilising a spreadsheet to calculate herd feed requirements on a monthly basis and balance these requirements with feed supply utilising pasture/forage growth curves derived from cutting trials.
- Soil fertility research for various agronomic crops and pastures acidity. This research resolved the production problems on the acid soils of the highland sourveld by identifying Al toxicity as the causative agent and dramatically impacted on maize yields in KZN.
- Analytical services, continuing the legacy of AJ Taylor's chemistry laboratory. These comprise the soils, plant, feed and biochemistry laboratories.
- The soils laboratories use a model, FERTREC, to calculate the fertilizer requirement per crop and desired yield modelled from the numerous fertilizer response trial conducted on various soils and environments throughout KZN.
- Conservation agriculture. The use of no-till or minimum-till in agronomic systems, thereby conserving soil carbon/organic matter and minimising the impact on the ecology of the soils and soil structure. A no-till plot which has not been ploughed for over 30 years is maintained on Cedara.
- The advent of kikuyu poisoning in KZN led to collaborative research between the Allerton veterinary laboratories and Cedara. The role of armyworms was investigated.
- The Agricultural Production Guidelines, a set of comprehensive manuals on the production of the major crops grown in KZN as well as sheep, beef, dairy production, veld, pastures, irrigation and soil conservation. These followed a long legacy of production manuals, including, Natal Beef Guide, Intensive Fat Lamb Production in Natal, Feeding Dairy Cattle, followed by The Feeding and Management of Dairy Cat-

Figure 5: Eland held by staff

Figure 6: Zebra with a staff member

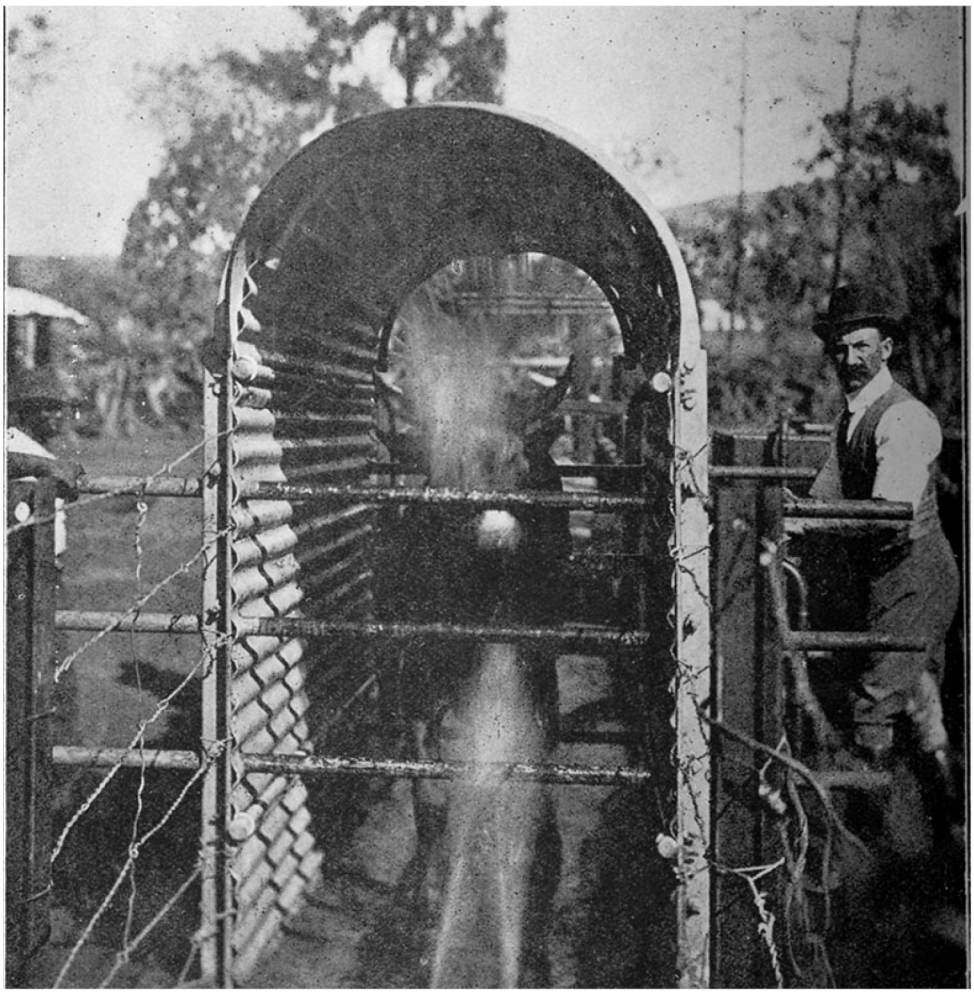


Figure 7: The Natal Spray Pen (in Natal Agricultural Journal 1910 Vol XV)

Figure 8: Milk producers at a Farmer's Day (approximately 1910)

Figure 9: Short course during World War 1

Figure 10: Stud bulls on the field during a mini show

tle in Natal and the Natal Farming guides.

- One of the most significant recent developments is the bio-resource program. The classification of Bioresource Units (BRUs) was developed to provide a reconnaissance appraisal of the natural resources for both environmental impact assessments and the agricultural potential of KwaZulu-Natal. Storage of the Bioresource Programme in a geographical information system (GIS) facilitates usage. Of the criteria used for the classification of BRUs, climate (rainfall and temperature in particular), was considered to be the most important factor. Other factors used were the soil association codes of the land types, plant indicator species and communities, and terrain type. The system also includes crop models which can model the potential of that crop throughout the province.

As Cedara moves forward after over a century of excellence, the same basic principles apply as set out in the founding principles.

The College has grown over the years now offering either a 2-year certificate or 3-year diploma in agriculture with specialisations in either the plant or animal sciences.

In a joint venture, the College also hosts the B Agric (Agricultural Extension & Rural Resource Management) programme offered by UKZN. Short courses continue under the FET unit of the College.

Expertise, training and research continue in:

- livestock production (including the conservation and characterisation of the productivity of the indigenous Nguni cattle, sheep and goats),
- grass and forage science,
- agronomy,
- horticulture,
- weed science & plant pathology,
- entomology,
- soil science, looking at conservation agriculture and cover cropping amongst others,
- analytical (laboratory) services, namely the soils, biochemistry, feed and plant health laboratories backed up with expert advice, and
- the natural resources unit responsible for the bioresource program, with new challenges facing researchers, such as climate change and global warming, leading to new and increased disease and past challenges.

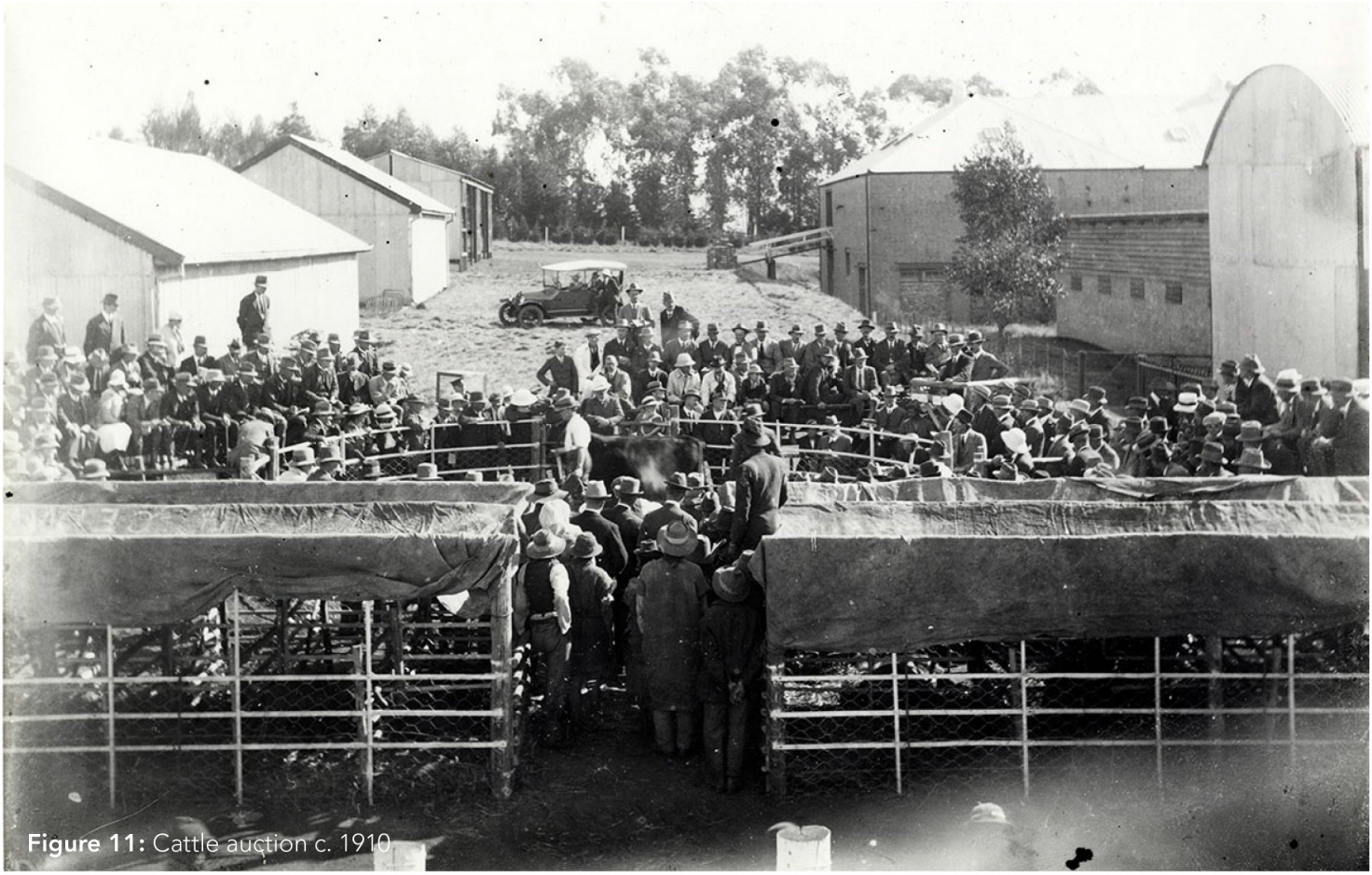


Figure 11: Cattle auction c. 1910

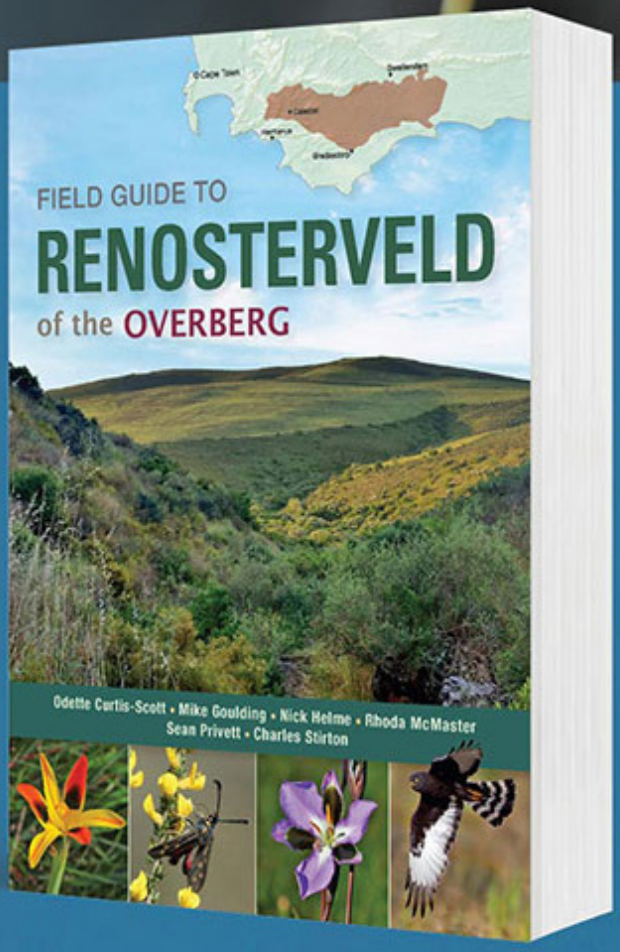
Figure 12: Experimental plots

Figure 13: Staff member, S van der Poel, standing alongside maize trials

Figure 14: Staff members standing in soya bean trials

Figure 15: Cedara summer combo trials

FIELD GUIDE TO RENOSTERVELD of the OVERBERG

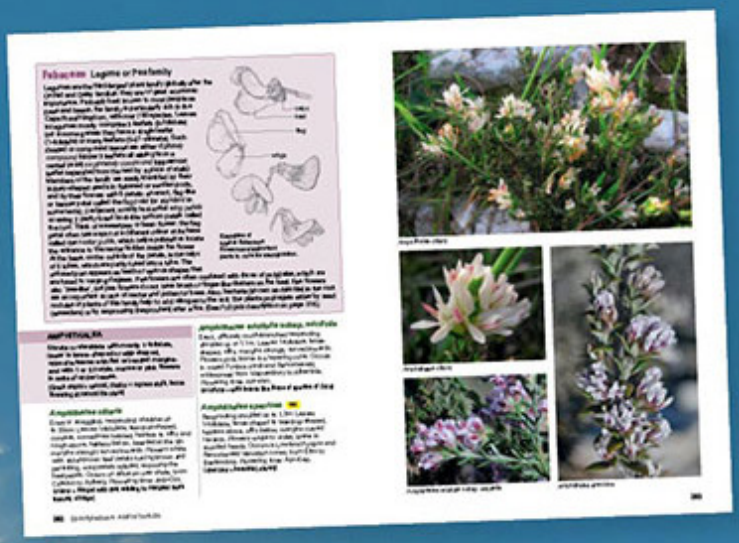


Part of the Fynbos biome, Renosterveld is one of the world's most threatened vegetation types, with just 5% of its original extent remaining. Focusing specifically on the Renosterveld of the Overberg region in the Western Cape, this field guide is the first of its kind to cover this highly endangered ecosystem.

Features include:

- **over 980 plant species, from the common and 'showy' to the weird, obscure and often-overlooked.**
- **140 animal species representing the diversity of fauna in the region**
- **illustrated glossary and guidelines for landowners and farmers**

***Field Guide to Renosterveld of the Overberg* promises to be an enduring record of this unique and severely threatened ecosystem. It will be a vital addition to any nature lover's bookshelf.**



Upcoming events

5 - 8 October 2020

THE ARID ZONE ECOLOGY FORUM (AZEF) 2020
Virtual Conference
Fore more information contact
gill@azef.co.za or go to
www.azef.co.za

12 - 16 October 2020

Veld Management Course
Africa-Land-UseTraining (ALUT) presents a 5-day accredited training course on Veld Management at the ALUT Farm, Modimolle, Limpopo. For more information, send an e-mail to courses@alut.co.za or SMS your name and e-mail address to 071 866 1331.

2 - 6 November 2020

The Conservation Symposium. Virtual Congress. For more information see https://conservationsym2020.conservationsymposium.com/index.php or Contact Freyni du Toit by email at secretariat@conservationsymposium.com

8 - 10 December 2020

AWMS Annual Virtual Conference 2020
The conference will be free for all to attend. For more information contact: conference@awms.org.au
or visit www.awms.org.au

If you would like to advertise your upcoming event, please contact us and we will include it in our next edition.

Upcoming events

5 - 10 September 2021

SAWMA 2020: 50th Anniversary Conference,
Berg-en-Dal, Kruger National Park. For more information see
https://sawma.co.za/conference-2020/ or contact
Elma Marais (elma@mweb.co.za)

6 - 10 September 2021

MEDECOS will be held at Club Mykonos, Langebaan, Western Cape are now inviting proposals for symposia and workshops for the 15th Conference on Mediterranean-type ecosystems.
You can direct any questions on symposia and workshops to Karen Esler (kje@sun.ac.za) and Nicky Allsopp (allsopp@saeon.ac.za).
See http://medecos2020.org/ for more details.

October 2021

Joint XXIV International Grassland (IGC) and XI International Rangeland (IRC) congresses to be held in Nairobi, Kenya. The theme is 'Sustainable Use of Grassland/Rangeland Resources for Improved Livelihoods'.
Information is available here: http://bit.ly/Kenya2020

ONLINE COURSES/WEBINARS

Earn SACNASP CPD Points by doing short free SACNASP courses
http://sacnasponlinecpd.co.za/courses2/
Birdlife South Africa's Weekly webinars: www.birdlife.org.za/blsa-conversations/
EWT Wild Chat - Together Apart: www.birdlife.org.za/blsa-conversations/
Free Ecology/Life Science/Environmental Science related courses through Coursera:
www.coursera.org/courses?query=ecology
FutureLearn: www.futurelearn.com/subjects/nature-and-environment-courses/ecology
Alison: https://alison.com/courses/life-science
Principles of modelling with spreadsheets through the University of Vermont:
www.uvm.edu/rsenr/vtcfwru/spreadsheets/?Page=pom/pom11.htm
Animal Health: https://www.coursera.org/browse/health/animal-health

If you would like to advertise your upcoming event, please contact us and we will include it in our next edition.