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Featuring Congress 51

Advancing Rangeland and Ecology and Pasture Management in Southern Africa

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Editor's Note

Here we go! It gives me great pleasure to welcome you to the third *Grassroots* instalment of 2016 – a special issue. The 'special issue' status was assigned due to the following aspects:1) this issue includes GSSA51 congress reports; 2) *Grassroots* goes digital parallel with the hardcopy; and 3) this is my first *Grassroots* publication after being appointed as the new publications editor ☺. Having said that, I have colossal shoes to fill after the great work that Pieter Swanepoel and his team have done the past two years– I salute you.

The GSSA51 congress in Wilderness was a huge success. The scientific content of the congress was of international-standard. We also held our first quiz evening which was rather fun despite some technical glitches. Thank you to the Organising Committee who made it possible – the amount of work and preparation that goes on behind the curtain is mind boggling – respect.

This issue not only focuses on congress reports, but also includes some interesting news articles and feature articles. Climate change remains a hot topic therefore we look at 2016 climate trends, the affect thereof on water quality and the proposed SA carbon tax. South Africa's second most invasive tree is in the lime light and global biodiversity reaches worrying levels. Also, read more on virtual reality as a possible conservation tool and the science of honest sampling. Remotely piloted aircrafts (or drones) opens up a whole new dimension in the agricultural sector such as precision farming and monitoring of rangelands – read more on this fascinating feature article.

I would like to invite you to submit your knowledge to *Grassroots*, let it be news, important dates, events, feedback, feature articles, anything – we love it. Dig out all the unpublished data, clean out the office and submit. Let's continue to make *Grassroots* a hub of knowledge and excellence.

Enjoy this one!

Josef van Wyngaard

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Biodiversity falls below 'safe levels' globally

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http://phys.org/news/2016-07-biodiversity-falls-safe-globally.html

Levels of global biodiversity loss may negatively impact on ecosystem function and the sustainability of human societies, according to UCL-led research.

"This is the first time we've quantified the effect of habitat loss on biodiversity globally in such detail and we've found that across most of the world biodiversity loss is no longer within the safe limit suggested by ecologists" explained lead researcher, Dr Tim Newbold from UCL and previously at UNEP-WCMC.

"We know biodiversity loss affects ecosystem function but how it does this is not entirely clear. What we do know is that in many parts of the world, we are approaching a situation where human intervention might be needed to sustain ecosystem function."

The team found that grasslands, savannas and shrublands were most affected by biodiversity loss, followed closely by many of the world's forests and woodlands. They say the ability of biodiversity in these areas to support key ecosystem functions such as growth of living organisms and nutrient cycling has become increasingly uncertain.

The study, published 15 July 2016 in Science, led by researchers from UCL, the Natural History Museum and UNEP-WCMC, found that levels of biodiversity loss are so high that if left unchecked, they could undermine efforts towards long-term sustainable development.

For 58.1% of the world's land surface, which is home to 71.4% of the global population, the level of biodiversity loss is substantial enough to question the ability of ecosystems to support human societies. The loss is due to changes in land use and puts levels of biodiversity beyond the 'safe limit' recently proposed by the planetary boundaries - an international framework that defines a safe operating space for humanity.

"It's worrying that land use has already pushed biodiversity below the level proposed as a safe limit," said Professor Andy Purvis of the Natural History Museum, London, who also worked on the study.

"Decision-makers worry a lot about economic recessions, but an ecological recession could have even worse consequences - and the biodiversity damage we've had means we're at risk of that happening. Until and unless we can bring biodiversity back up, we're playing ecological roulette."

The team used data from hundreds of scientists across the globe to analyse 2.38 million records for 39,123 species at 18,659 sites where are captured in the database of the PREDICTS project. The analyses were then applied to estimate how biodiversity in every square kilometre land has changed since before humans modified the habitat.

They found that biodiversity hotspots - those that have seen habitat loss in the past but have a lot of species only found in that area - are threatened, showing high levels of biodiversity decline. Other high biodiversity areas, such as Amazonia, which have seen no land use change have higher levels of biodiversity and more scope for proactive conservation.

"The greatest changes have happened in those places where most people live, which might affect physical and psychological wellbeing. To address this, we would have to preserve the remaining areas of natural vegetation and restore human-used lands," added Dr Newbold.

The team hope the results will be used to inform conservation policy, nationally and internationally, and to facilitate this, have made the maps from this paper and all of the underlying data publicly available.

More information: "Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment," Science, science.sciencemag.org/cgi/doi/10.1126/science.aaf2201

Gentle giants taking root

Tarryn Rae Genis

Venetia Mine

Venetia Mine and its surrounding areas are home to the beautiful baobab tree, a bushveld succulent scientifically known as the *Adansonia digitata*. These trees are indigenous to the area and classified as a protected species.

Venetia's Environmental Team goes to unusual lengths to prevent disturbing baobab and have pioneered the technique of transplanting fully grown baobab trees with a 100% success rate. Since 2008, Venetia Mine has successfully relocated a total of 110 baobab trees. This is a complex process that requires written permission from the Department of Agriculture, Fisheries and Forestry (DAFF).

Because of the sheer size of some of these specimens, the relocation of a single tree generally requires the use of an excavator, dozer, low bed truck, crane and a water bowser.

Interestingly, a huge contributing factor in the successful relocation of a baobab tree is the direction in which they are planted. These gentle giants will only take root in their new home if their trunks are planted facing precisely the same direction as their original home. As a result, Environmental Officers make sure to mark the north facing side of the tree before transportation so that they can ensure that the tree is correctly transplanted.

Venetia Mine was recently called up onto assist the Musina Local Municipality and construction company Terra Viva in the relocation of a medium-sized, 28 ton baobab tree from the main parking area of the new Musina Mall to a traffic circle200m from the entrance.

The Venetia Environmental Team provided technical expertise in performing an environmental assessment, conducting a risk assessment, relocation and monitoring of the identified specimen. This tree is now flourishing and is clearly visible upon exiting the bustling border town of Musina.

Credit: Sigrun Ammann

How South Africa's second most invasive tree can be managed better

Ross Shackleton

Stellenbosch University, Conservation and invasion Biology

http://theconversation.com/how-south-africas-second-most-invasive-tree-can-be-managed-better-62723

Many plants have been moved around the world for many reasons – for example for ornamental purposes, forestry and agriculture. A small proportion have become invasive, spreading beyond the areas in which they were initially planted. In some cases this has negatively affected humans and the environment.

One such tree genus, Prosopis, or mesquite, originally from the Americas, has been introduced to more than 100 countries. It was introduced into the arid parts of South Africa to aid farmers and local communities with fodder production, provide shade for livestock and produce firewood.

It has now invaded large parts of the country and has become the second most widespread invasive tree after Australian acacias. It has had a negative impact on biodiversity, livestock production, land value, human health, infrastructure and water supply. These are all crucial factors for the economy and for local people's livelihoods.

The negative effects of these invasions have led to the initiation of programmes to manage them across the world. In South Africa the Working for Water programme drives management on state and private land along with input from private landowners. Without active management these invasive plants would become more widespread and their impact on people and the environment would be more pronounced.

Reducing the impact

Management initiatives, such as Working for Water, aim to reduce the impact and spread of invasive plants. In South Africa the initiative also aims to create jobs and drive rural development.

We recently conducted a study to assess the barriers that impede the effective management of widespread Prosopis invasion. More than 100 barriers were identified in the study, which tried to identify the problems that hinder current management operations. The results could be used to come up with solutions about how to overcome these problems.

The key barriers identified were:

- Using versus removing the tree and control options. Some parties wanted to continue using Prosopis for fodder and fuelwood and did not want them removed. Others pointed to the serious negative impact they have. There was also controversy about labour-intensive management, which is time consuming and makes progress slow. Mechanical and biological control approaches are obviously faster but employ fewer people.

- The ecology of the species. It is hard to control because it grows very fast and spreads rapidly. It is also capable of regrowing from cut stumps if herbicide is not applied correctly.

- Poor planning and prioritisation. Often no systematic control strategy is followed.

- Coordination and cooperation, which is linked to poor planning, inefficient management, corruption and lack of collaboration between different government departments and farmers.

- There were differences in how the importance of some barriers were perceived. Most farmers – 80% – placed high importance on a lack of planning and poor management as important barriers. Few managers – 20% – regarded these as important. This reflects different views about the context in which management projects operate.

Adaptation responses

1. Many of the barriers can be overcome and ways to do this were identified in some

instances. But not all were conducive to simple solutions.

2. Key adaption responses include the adoption of more effective clearing methods. These include:

3. Mechanised options and biological control. These are more time and cost effective but can still allow for job creation.

4. Raising awareness and building partnerships to ensure that different actors work together to control the problem.

5. Ensuring landowner follow-up control. This will ensure state investment is not wasted and long-term control is guaranteed. It is also legally binding but not enforced.

6. Improved monitoring to get an understanding if control is working and of its benefits. This can also help to reduce inefficient management.

7. Incorporating systematic strategic planning at various levels to ensure the limited funds available are spent wisely and in a way that has the most benefit.

All of this will improve the effectiveness of control programmes with the funding available.

Prosopis tree. Credit: Justin Du Toit.

SADC appeals for assistance as drought hits hard

Tsholofelo Mathibedi

SABC News

http://www.sabc.co.za/news/a/de5561804da33cd3bd45ffcfeb4bc468/SADC-appeals-for- assistance-as- drought-hits- hard-20162607

The Southern African Development Community (SADC) region needs at least $2.7 billion to mitigate the effects of El Nino induced drought. The region has launched an appeal for humanitarian assistance in Gaborone, Botswana.

Since being hit by the worst drought in more than thirty years, SADC is more concerned about food security which may lead to millions suffering from starvation.

Currently, 40 million people representing 14% of the region's total population are food insecure.

"In South Africa - the biggest grain producer in the region - it is estimated that the maize harvest resulted in approximately 7.16 million metric tonnes, about 4.0 million tonnes less than average. Several countries including Lesotho and Swaziland have recorded over 50% drop in their crop harvests," says SADC Chairperson, Ian Khama.

South Africa has its fair share of challenges. The chairperson of Agri North West, says many of its farmers have been badly affected by the drought. He says less food production may mean not being able to help our neighbours in the region.

Seeing that in South Africa we have a very well developed agricultural sector that includes supply lines you know the whole value chain obviously. If our growing population and being able to produce and the implementation of new technologies make it possible, it is under pressure to be able to say whether we will have access food to be able to export," says Agri SA's Pierre Vercueli.

Donor countries are already responding to the call by SADC. According to the European Union's (EU) Alexander Baum, "This year alone we are providing 60 million Euros to the most affected countries in the region, which are about seven countries."

While a US Aid representative, Blake Chrystal says, "There are two things: there is an immediate need for food and people who are food insecure. We are providing assistance for that. There's also resiliency and disaster drought mitigation which is longer term."

The region says it has learnt from El Nino to be vigilant against natural disasters in the future.

Set for Success: climate proofing the Malabo Declaration (2016)

Agriculture for Impact (A4I)

http://ag4impact.org/news/set-for-success-climate-proofing-the-malabo-declaration

Launching on 14 June 2016, the Montpellier Panel briefing paper 'Set for success: Climate-proofing the Malabo declaration' explores the climate change-related targets set out by the Malabo Declaration, which was adopted in 2014 with the aim to improve nutrition and food security across Africa, and to increase agricultural productivity by 2025 while building resilience to the effects of climate change.

Despite continuous positive economic growth at an average of 5% per year, Africa needs accelerated economic development if it is to cope with the increasing demands for food, water and energy challenged by a rapidly growing population, rapid urbanisation and climate change. The pressure on African countries to boost productivity and accelerate growth is now higher than ever, and is being further complicated by the potential adverse impacts of climate change and extreme weather events, such as the 2015-16 El Niño.

The briefing paper argues that in order to achieve the targets set out in the Malabo Declaration, African governments must support programmes that will contribute to strengthening smallholder farmers' resilience and improving their livelihoods. To do so national investment plans are increasingly taking up climate-smart agriculture objectives and while this is a good start, more action has to be taken to scale-up programmes that have proven impactful and scalable. The briefing paper highlights 15 success stories that have had substantial impact and can be taken to scale or replicated in other contexts.

The region has been hit by the worst drought in more than thirty years. (SABC)

The science of using research: why it starts with the policymaker

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Since the SRM Meeting in February, Jim O'Rourke (International Rangelands Congress), Lovina, and I have been working to gain an understanding of the process for gaining a UN designation for an International Year of Rangelands. This has involved extensive email discussions with people representing a variety of organizations around the world. What we discovered is quite complex. A Government, or a coalition of Governments, must take the lead on an International Year designation request to the General Assembly, and this needs to be pursued through the political channels of the UN. To facilitate this process, Governments can first discuss the idea during international for a, such as the United Nations Environment Assembly (UNEA). Typically, Governments will follow up by discussing the idea in other subsequent for a with UN agencies (i.e. UNEP, FAO, UNDP, and IFAD) who assist in this process. Since UNEA is an officially delegated Assembly of the General Assembly, it too can submit a recommendation through its President for an International Year, as can any other UN agency.

In late May, UNEA will hold its second meeting, UNEA-2, in Nairobi Kenya. UNEP and its partners (FAO, IFAD, ILRI, IUCN and WAMIP, WISP), and, in particular, the Pastoralist Knowledge Hub (FAO) have successfully competed to have a dedicated Side Event at UNEA-2 on Sustainable Pastoralism. The Pastoralist Hub was also set to pursue an IY designation.

This meeting is very important to gain high level buy-in by other countries, UN agencies, and other stakeholders to promote pastoralism as a key UNEP priority area. We are working now to identify attendees who could make brief statements during the "open discussion" session in support of a proposal for a combined International Year of Rangelands and Pastoralists in 2020. In addition, we have contacted the President of UNEA requesting her to include pastoralism and rangelands in her opening remarks. We have also prepared an "open flyer" calling for support of an IY designation that will be distributed at the meeting along with RP "ranching stories" demonstrating sustainable management practices.

Assisting in identifying potential presenters for the Side Event are Jess Peterson and Kelly Fogerty at SRM. They are contacting key officials at USDA and other US agencies to brief them on our plans and to ask for their engagement and support. There is a greater likelihood of success with strong backing from the U.S. To this end, if you have contacts in U.S. agencies who would might help with this effort, please feel free to share this update or contact me for further information.

Credit: Justin Du Toit

Can Virtual Reality emerge as a tool for conservation?

Heather Millar

Freelance writer, San Francisco

New advances in technology are sparking efforts to use virtual reality to help people gain a deeper appreciation of environmental challenges. VR experiences, researchers say, can be especially useful in conveying key issues that are slow to develop, such as climate change and extinction.

Could virtual reality (VR) — immersive digital experiences that mimic reality — save the environment?

Well, that may be a bit of a stretch. But researchers say that it could perhaps promote better understanding of nature and give people empathetic insight into environmental challenges.

"Virtual reality can give everyone, regardless of where they live, the kind of experience needed to generate the urgency required to prevent environmental calamity," says Jeremy Bailenson, professor of communication at Stanford University.

Bailenson's Virtual Human Interaction Lab (VHIL) this year released a short VR documentary and an interactive VR game that seek to explain the issue of ocean acidification, the process by which excess carbon dioxide in the atmosphere dissolves in the ocean, making it more acidic and less healthy for ocean life.

As Bailenson notes, "One of the greatest challenges to staving off irrevocable climate change isn't simply getting buy-in from skeptical politicians – it's getting people to visualize how driving a gas-guzzling car or living in an energy inefficient home is contributing to a problem that may only manifest itself completely in future decades."

The lab's documentary and game were presented at the Tribeca Film Festival in April. Phenomena such as ocean acidification are difficult to illustrate because they happen in slow motion. Video from the documentary has been adapted to be included in Google Expeditions, a VR educational program that's still in beta, but has already been shown to one million school kids around the world and will soon be released to many more.

"Google Expeditions will be the means to reach the student for whom the textbook or the lecture isn't working," explains James Leonard, a program manager on the Google for Education team. "It's a totally different medium. It's powerful and super-engaging. It will bring students closer to places they otherwise wouldn't be able to visit."

So far, the Google/Stanford effort seems to be one of the few aimed specifically at environmental education. Predictably, a lot of early VR investment is going into entertainment applications: VR movies and games.

The nature documentary filmmaker David Attenborough has just produced a VR experience of a dive in the Great Barrier Reef. While meant to entertain, that project will no doubt educate as well. In more academic and policy settings, VR is beginning to be used mostly to create 3D representations of pollution or other human impacts on wild areas.

Many environmental issues are complex and difficult to explain fully. Phenomena like climate change, ocean acidification, extinction, and glacier erosion are especially challenging to illustrate, either because they're happening in slow motion or because they're evolving in remote places that few people see, or both.

Virtual reality solves many of these problems, Bailenson says. With the proper software, video feed and VR headset, just about anyone might be able to experience environmental change in the Amazon, the Arctic, or even under the ocean.

When I take my ocean acidification dive, I jump off from Palo Alto, California.

One minute, I'm in a high tech virtual reality (VR) lab at Stanford University, standing on a "haptic" floor of aeronautic aluminium that can move and vibrate to simulate the feeling of movement, encircled by speakers that can immerse me in sound, and by cameras that can track my every move, where I look, how and where I turn my body.

The next minute, I put on the VR headset and suddenly I'm in Italy, near the northern end of the Gulf of Naples, on a jetty that extends from a volcanic island called Ischia. To say it looks and feels idyllic would be an understatement: The sun

glints off the waves and bright primary colour boats bob in the harbour. On the island, pastel stucco houses stair-step up toward a grey, crenelated castle. Above water, everything seems lovely.

Then I'm underwater. The sea around Ischia, it turns out, provides a perfect place to show people the contrast between a healthy ocean and an acidified one: In one part of the harbour, colourful schools of fish rush past me. Sea grasses undulate. Eel squiggle by brilliant coral reefs. Along the bottom potter various species of sea snail.

Next, I turn to the part of the harbour where volcanic vents have created an acidified environment: The corals, the eel, and many of the fish have disappeared. Everything looks red-brown and murky as certain types of algae have taken over.

In my headset, Prof.FioMicheli of Stanford's Hopkins Marine Station in Monterey says, "One of the most difficult parts of my research is getting people to care about ocean acidification."

Full disclosure here: I knew all about ocean acidification before the VR tour; I've written about it for various magazines. But as I took off my VR headset, I felt upset and deeply sad. If a picture is worth a thousand words, then an experience — even a digital one — seems to be worth many more. As music video director and VR entrepreneur Chris Milk has put it, VR is an "empathy machine."

"The virtual reality platform allows someone who has never even been in the ocean to experience what ocean acidification can do to marine life. We are visual creatures, and visual examples can be very striking," explains Kristy Kroeker, an assistant professor of ecology and evolutionary biology at the University of California, Santa Cruz and a consultant on the VR project.

There was a lot of hype about VR in the 1990s, followed by technical challenges, missteps, and public disappointment. This time, the technology seems poised to become a mass experience. Costs have come way down and computing power is improving all the time.

Google cardboard headsets and the Samsung Gear VR dipped a toe into this new universe last year, but experts generally said they were not quite ready for prime time.

If people have a VR experience of cutting down an old-growth redwood, they are more likely to conserve paper.

However, in late March, Facebook released the Oculus Rift headset, an immersive VR setup intended for mass market use, priced at $599, about $1,500 with a bundled computer. The first 30 Rift games have gone on sale, with another 100 to follow by the end of the year.

Competitors such as HTC Vive, Sony PlayStation VR, and the Microsoft HoloLens are on the way. There are reports that both Google and Apple have projects targeting this new market.

Meanwhile, the ocean VR experiences produced by VHIL are building on a decade of social science research that shows people who have a VR experience are more likely to change behaviour in ways that benefit the planet.

For instance, various VHIL studies have shown:

- If a person has a VR experience of cutting down an old-growth redwood tree — feeling the vibration and sound of the chainsaw, the crash of the tree as it falls — that person is more likely to conserve paper.

- If a person takes a VR shower and sees their avatar or doppelganger eating coal to represent the amount of energy used, that person is more likely to conserve water.
- People who experienced an early version of my ocean acidification "dive" — one with more cartoonish graphics and less accurate biology — cared more about the issue than other people who just watched a video about it.

VHIL is developing a fish avatar project, which will take movement data from electronically tagged fish in the kelp forests of Monterey Bay and transfer it into a virtual reality where people will be able to join the fish in their underwater world. The project's goal is to enable individuals to "adopt a fish," thus becoming more invested in the bay's future.

Currently, VHIL is working on how to distribute the latest ocean acidification experiences. Obviously, Google Expeditions provides one outlet. But having secured project funding from the Gordon and Betty Moore Foundation, the Stanford team now hopes to get as many views as possible for the documentary and the game as well. They're also designing studies to measure the effect of the content.

Cody Karutz, the Stanford team's hardware manager, acknowledges that there's still quite a bit of work to be done fine-tuning these experiences.

For instance, you start the game on a boat in the Ischia harbour, but I found myself getting distracted by wanting to turn the ship's wheel, which isn't yet possible.

When I was "swimming" around trying to collect samples in the game, my brain balked at conflict between the visual information — swimming horizontally — and the physical information — standing vertically in a lab.Also, as I was swimming and bent to collect samples in the game, I had this weird feeling that half my body was above the sea floor, the other half below it.

"Typical live camera arrays still capture two-dimensional information. The challenge is combining those with an additional sense of depth and integrating them over frames of time to create interactive graphics," Karutz explains. "Computing power and data storage are the limitations right now, and that will sure change over the next few years."

Lots of people experience stimulation overload when experiencing both VR and a voice-over with content. The team is experimenting to find the best way to explain content without making people nauseated. There's a fridge in the lab stocked with ginger ale for those who get woozy. I partook.

A user tests out the Vive virtual reality headset. (Photograph by HTC Corp)

An all-angle camera helps scientists recreate ecosystems for virtual reality. (Photograph by Cody Karutz)

Divers prepare to take footage of coral reefs for the Stanford acidification VR experience.(Photograph by Cody Karutz)

2016 Climate Trends Continue to Break Records

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http://www.nasa.gov/feature/goddard/2016/climate-trends-continue-to-break-records

Two key climate change indicators -- global surface temperatures and Arctic sea ice extent -- have broken numerous records through the first half of 2016, according to NASA analyses of ground-based observations and satellite data.

Each of the first six months of 2016 set a record as the warmest respective month globally in the modern temperature record, which dates to 1880, according to scientists at NASA's Goddard Institute for Space Studies (GISS) in New York. The six-month period from January to June was also the planet's warmest half-year on record, with an average temperature 1.3 degrees Celsius (2.4 degrees Fahrenheit) warmer than the late nineteenth century.

Five of the first six months of 2016 also set records for the smallest respective monthly Arctic sea ice extent since consistent satellite records began in 1979, according to analyses developed by scientists at NASA's Goddard Space Flight Center, in Greenbelt, Maryland. The one exception, March, recorded the second smallest extent for that month.

While these two key climate indicators have broken records in 2016, NASA scientists said it is more significant that global temperature and Arctic sea ice are continuing their decades-long trends of change. Both trends are ultimately driven by rising concentrations of heat-trapping carbon dioxide and other greenhouse gases in the atmosphere.

The extent of Arctic sea ice at the peak of the summer melt season now typically covers 40 percent less area than it did in the late 1970s and early 1980s. Arctic sea ice extent in September, the seasonal low point in the annual cycle, has been declining at a rate of 13.4 percent per decade.

"While the El Niño event in the tropical Pacific this winter gave a boost to global temperatures from October onwards, it is the underlying trend which is producing these record numbers," GISS Director Gavin Schmidt said.

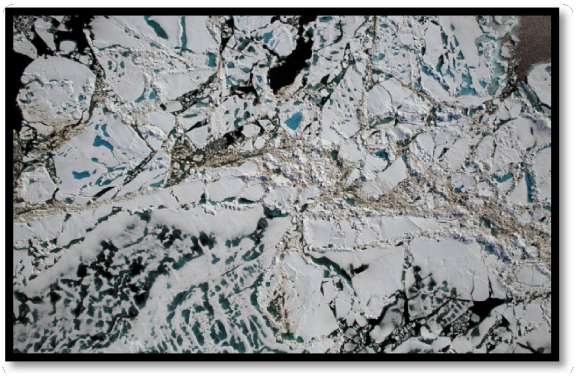

Figure 1: Chunks of sea ice, melt ponds and open water are all seen in this image captured at an altitude of 1,500 feet by the NASA's Digital Mapping System instrument during an Operation IceBridge flight over the Chukchi Sea on Saturday, July 16, 2016. Credits: NASA/Goddard/Operation IceBridge

Previous El Niño events have driven temperatures to what were then record levels, such as in 1998. But in 2016, even as the effects of the recent El Niño taper off, global temperatures have risen well beyond those of 18 years ago because of the overall warming that has taken place in that time.

"It has been a record year so far for global temperatures, but the record high temperatures in the Arctic over the past six months have been even more extreme," Meier said. "This warmth as well as unusual weather patterns have led to the record low sea ice extents so far this year."

NASA tracks temperature and sea ice as part of its effort to understand the Earth as a system and to understand how Earth is changing. In addition to maintaining 19 Earth-observing space missions, NASA also sends researchers around the globe to investigate different facets of the planet at closer range. Right now, NASA researchers are working across the Arctic to better understand both the processes driving increased sea ice melt and the impacts of rising temperatures on Arctic ecosystems.

NASA's long-running Operation IceBridge campaign last week began a series of airborne measurements of melt ponds on the surface of the Arctic sea ice cap. Melt ponds are shallow pools of

water that form as ice melts. Their darker surface can absorb more sunlight and accelerate the melting process. IceBridge is flying out of Barrow, Alaska, during sea ice melt season to capture melt pond observations at a scale never before achieved. Recent studies have found that the formation of melt ponds early in the summer is a good predictor of the yearly minimum sea ice extent in September.

"No one has ever, from a remote sensing standpoint, mapped the large-scale depth of melt ponds on sea ice," said Nathan Kurtz, IceBridge's project scientist and a sea ice researcher at NASA Goddard. "The information we'll collect is going to show how much water is retained in melt ponds and what kind of topography is needed on the sea ice to constrain them, which will help improve melt pond models."

Operation IceBridge is a NASA airborne mission that has been flying multiple campaigns at both poles each year since 2009, with a goal of maintaining critical continuity of observations of sea ice and the ice sheets of Greenland and Antarctica

At the same time, NASA researchers began in earnest this year a nearly decade-long, multi-faceted field study of Arctic ecosystems in Alaska and Canada. The Arctic-Boreal Vulnerability Experiment (ABoVE) will study how forests, permafrost and other ecosystems are responding to rising temperatures in the Arctic, where climate change is unfolding faster than anywhere else on the planet.

ABoVE consists of dozens individual experiments that over years will study the region's changing forests, the cycle of carbon movement between the atmosphere and land, thawing permafrost, the relationship between fire and climate change, and more.

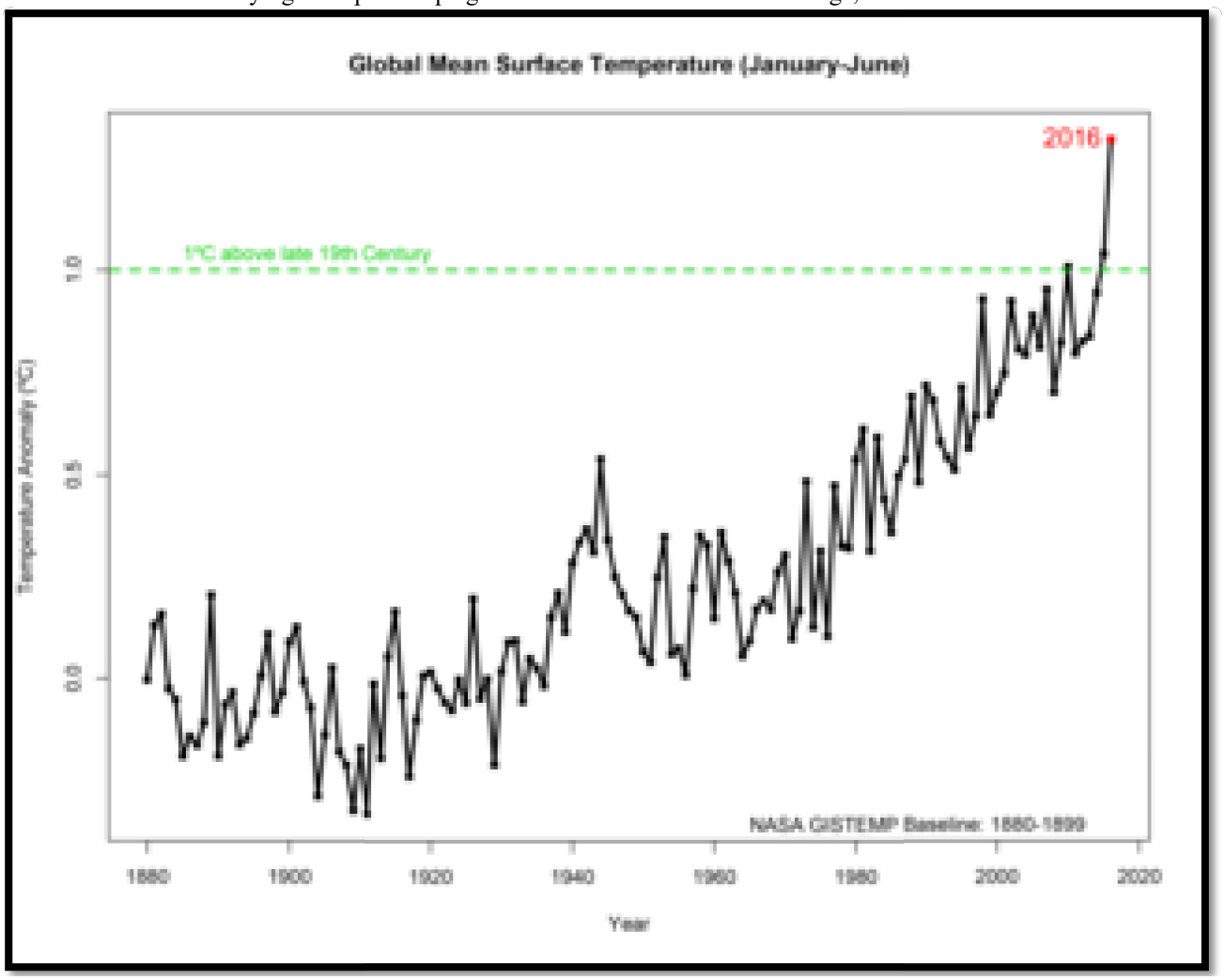

Figure 2: The first six months of 2016 were the warmest six-month period in NASA's modern temperature record, which dates to 1880. Credits: NASA/Goddard Institute for Space Studies

Dragonflies as sentinels for freshwater conservation

Michael Samways and John P. Simaika

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http://theconversation.com/dragonflies-as-sentinels-for-freshwater-conservation-62519

Viewed from space, our planet is a blue speck of mostly water in a seemingly endless expanse of darkness. It is this water that is vital for life as we know it. This wonderful life is amazingly complex, yet very fragile. Away from the sea, it is fresh water on which life depends, especially free running water and precious wetlands, all of which are teeming with life.

Yet fresh water is the most threatened habitat on Earth.

Several thousand species worldwide live in freshwater habitats, from the smallest ponds to the largest rivers. Some are highly sensitive to any human impact while others are real opportunists. They will inhabit the most artificial of habitats, like cattle troughs and even bird baths. It is this range of sensitivities that make them very useful as measures for the quality of fresh water.

When a water system becomes degraded through human impact like pollution or damming, there is a change in the species profile away from sensitive specialists towards insensitive generalists. We can quantify this and relate it to whether a fresh water system is deteriorating or improving.

A prominent group of species associated with water and that can tell us something about the state of our water resources is dragonflies – the collective term for true dragonflies and damselflies. When they are young they live in the water as larvae, then later emerge as flying adults that grace fresh waters throughout the world, except the ice caps. Both life stages are predatory.

So these beautiful insects are near the top of the food chain and have few natural enemies other than birds. These are occasionally frogs, spiders and robber flies. At times humans enjoy the larvae as a tasty addition to a side dish. For example, in Bali, larvae may be fried in coconut oil and served with vegetables. Indeed, dragonflies and humans are much more intimately linked than normally thought.

Tracking dragonflies

In South Africa, a water-scarce country, we have been conducting research on new ways for assessing the quality and ecological health of fresh water systems using dragonflies. There are 162 species of dragonfly in South Africa alone. Some are sensitive specialists, while others are hardy generalists. This and their two-staged lifestyle, with dependencies on both the water and land, make them excellent candidates for freshwater assessment.

We have developed an index that is based on three main features of each species in turn;

- The general distribution of a species;
- Its threat status (its rating on the International Union for Conservation of Nature and Natural Resources' Red List); and
- Its sensitivity to human modifications of the water system.

When a system deteriorates there is a shift in the total scores of all the species present from high to low. When systems are restored there is a shift in the other direction from low to high. Using dragonflies it is possible to determine whether there should be concern about a system that is going downhill or whether a system is improving, and how well it's doing.

Using dragonflies to this end is incredibly simple. All you need is a good guide, a pair of close-focus binoculars and a sunny day.

Recently all our research has been synthesised into a user-friendly manual showing how to undertake fresh water assessments. As this index operates at the level of species, it is highly sensitive. And as dragonflies are relatively easy to identify, it is easy to use.

Next steps

Dragonflies are pushed away from their normal habitats when invasive alien trees like eucalyptus, wattles and pines shade the water and bank. This can lead them to become locally extinct. This means that the removal of alien trees from the banks of rivers, in particular, is an important nature conservation exercise. It has been one of the great

contributions to South Africa's nature conservation through the governmental Working for Water Programme.

But not all human activities are harmful to dragonflies and other water, fauna and flora. Farm dams can encourage many species that would otherwise be very scarce in the area. Good nature conservation dams are those with constant water levels, much water weed and marginal vegetation, and no pollutants, especially fertilisers and pesticides used in agriculture.

Successful management of fresh water biodiversity depends on the quality of data on the species that these ecosystems support. Projects monitoring the health of fresh waters are a vital component of this. The process of fresh water assessment is very pleasant, like going bird watching. This new approach makes freshwater assessment so much easier than in the past and makes a major contribution to nature conservation.

Figure 1: Damselfly like the white malachite are excellent candidates for water assessment. Credit: Michael Samways

Credit: Justin Du Toit

Study role of climate change in extreme threats to water quality

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Record-breaking harmful algal blooms and other severe impacts are becoming more frequent. We need to understand why, says Anna M. Michalak

With concerns about climate 'extremes' growing[1], water is often the focus — either too much or too little. That is no coincidence: climate and the hydrological cycle are tightly coupled, and water is essential to ecosystems and societies. But it is not just the quantity of water that matters. So does its quality.

Last year, Lake Erie, one of the US Great Lakes (which contain one-fifth of the world's fresh surface water), experienced its biggest recorded harmful algal bloom. At its peak, the bloom spread some 200 kilometres across most of the lake2. Meanwhile, off the continent's west coast, another record harmful bloom stretched from Baja California in Mexico up to Alaska, probably triggered by unusually warm water in the Pacific Ocean3. Both blooms were dominated by species of phytoplankton that produce powerful toxins.

Such episodes can wreak havoc. During a previous bloom, in 2014, 500,000 people living near Lake Erie were ordered not to drink tap water, because it contained levels of hepatotoxins produced by the cyanobacterium Microcystis that were 2.5 times higher4 than the World Health Organization's safe standard. The 2015 west-coast bloom of the diatom algae Pseudo-nitzschia shut down fisheries. The Dungeness crab fishery, one of the most valuable on the west coast, opened four months late owing to toxic levels of the neurotoxin domoic acid in the crabs. Brain damage in sea lions has also been documented as a result of exposure to this toxin5.

Impaired water quality is a global and growing problem, limiting resources for drinking, domestic use, food production and recreation, as well as harming ecosystems. The types and causes range from excess nutrients feeding harmful algal blooms and hypoxic 'dead zones', to bacterial, viral and chemical contamination, to pollution by personal-care products and pharmaceuticals. Cases of extreme impairment often lead to disproportionate human and ecosystem impacts. The costs can be huge. More than US$4 billion are lost each year in the United States alone as a result of harmful algal blooms6.

Because the most severe water-quality impacts are exacerbated by weather, climate plays a part. Runoff of nutrients from farmland spikes after heavy rains; warm temperatures accelerate the growth of bacteria and phytoplankton. As climate change alters weather patterns and variability, conditions conducive to severe water impairment are likely to become more frequent.

Yet there has been scant study of how climate will affect the occurrence of the extreme events that relate to water quality rather than quantity. We do not know how to relate water-quality extremes, their causes, their severity or their occurrence directly to changes in climate. It is time to plug this knowledge gap.

Complex chain

Scientific understanding of extreme storms, droughts and rising sea levels has improved markedly over the past decade. The impacts of extreme weather events are integral to discussions about climate-change mitigation and adaptation. The expected rise in the frequency and severity of such events is well established, and even individual episodes have been linked probabilistically to climate change1.

Not so for water quality. Researchers have explored trends in water quality with climate, but the science of projecting and attributing the occurrence of extremes is in its infancy. This is despite evidence of strong links with climate.

Regional studies reveal how multiple factors often conspire to create conditions ripe for dire water quality. For example, summer toxic blooms in Lake Taihu, the third-largest freshwater lake in China, are more intense after tropical cyclones, because the associated rains wash more nutrients into the lake, and the subsequent warmer temperatures and lower wind speeds further encourage the growth of blooms7. In 1999, a series of hurricanes triggered severe hypoxia in Pamlico Sound, North Carolina (part of the United States' second-largest estuarine system) by delivering huge amounts of nutrients, organic carbon and fresh water to the estuary8. In North American regions as

diverse as the Great Lakes, the east coast's Chesapeake Bay and the Gulf of Mexico, the severity of summer hypoxia has been linked to the effects of weather on nutrient loading, water-column structure and water circulation. Although these examples all relate to harmful algal blooms and hypoxia, other types of water pollution are also affected by weather conditions, which are altered by climate change.

The challenge

Several factors explain the paucity of research. First, the role of climate is difficult to pinpoint, because changes in water quality result from a delicate and complex interplay of human activities across local, regional and global scales. Complex chains of causative steps must be understood. These start with how climate change affects factors such as precipitation, temperatures and wind patterns for given regions and watersheds. Next, we must understand how these conditions alter the flow of water, nutrients, contaminants and other constituents to water bodies. Finally, we need to assess how these inputs, combined with meteorological conditions that influence freshwater and coastal systems directly, will change water quality. We do not yet know how to put the pieces of this puzzle together.

For example, the harmful algal blooms in Lake Erie are driven by excess phosphorus from changing farming and land-management practices in the region, but a summer 2011 bloom shattered previous records. A forensic analysis9 revealed that a series of intense rainstorms led to record springtime discharge from rivers, which flooded the lake with a record amount of nutrients flushed from fields. Warmer-than-average summer temperatures and low winds then accelerated the growth of buoyant Microcystis cyanobacteria. Unusually weak water circulation during the summer kept nutrients in the lake for longer, further feeding the bloom. How climate change influences the occurrence of all these factors, individually and together, needs to be elucidated to predict the likelihood of similar events happening more frequently in the future.

> "There is disagreement about which variables best capture water quality."

Second, water-quality and climate scientists work in disciplinary silos, and each tends to have a different scale of focus. Whereas much of climate science is global or concerned with large regions, most hydrologists and limnologists study processes in individual streams, lakes, watersheds or estuaries. Similarly, water-quality impacts have been treated mostly as local or regional issues, resulting from human activities in a particular basin or watershed. Little attention has been given to the local impacts of human action at global scales. For example, strategies for preventing harmful blooms and hypoxia often rightly focus on limiting nutrient loads through land management, but should also consider how a shifting climate will alter local meteorology, and thus nutrient loads.

A clear understanding of the interplay between climate and severe water-quality impairment events is predicated on tracking cause and effect across a cascading range of scales, from the globe to individual watersheds and from decades to days.

Third, observational evidence to underpin a global view of this interplay is lacking. Unlike for weather variables such as temperature and precipitation, no global network tracks water quality. Existing monitoring of water quality is sparse in space and time, and site-specific. Satellite-based observations could expand coverage, but there are no widely accepted approaches for doing so. There is even disagreement about which variables best capture water quality. For example, is the severity of a harmful algal bloom best represented by its area, the total mass of phytoplankton it contains, the amount of toxins that it produces or the ecosystem and human impacts that it engenders? Each brings a different observational challenge.

Next steps

Researchers need to assess which meteorological conditions, in what combination, make extreme water-quality impairments most likely. In doing so, they must also consider land use, land management, population distributions and other regional factors that compound the effects of weather. An initiative such as Future Earth, which provides a research platform for global sustainability science, would be a good umbrella for developing and integrating such knowledge globally.

The first step should be a retrospective analysis of past extreme events, to understand commonalities and differences across types of systems and impacts. The resulting conceptual model will differ depending on the type of problem — hypoxic dead zones and microbial outbreaks in recreational waters will not link to climate in the same ways. The water-quality and climate research communities will have to work together to identify key mechanisms and feedbacks.

Understanding meteorological drivers would allow researchers to assess whether climate models can accurately represent the occurrence of key

specific conditions (such as high precipitation or warm temperatures), as well as their joint or sequential occurrence (such as high precipitation followed by low winds and high temperatures). This could be explored, for example, in the context of the Coupled Model Intercomparison Project Phase 6 (CMIP6), and effort to compare climate projections under different scenarios that is under way in anticipation of the next Intergovernmental Panel for Climate Change assessment.

A clear conceptual model would also inform observational needs. Observations must capture the severity of extreme events, their impacts and key variables for assessing the links to climate change. There will be trade-offs between specificity and coverage. For example, whereas satellites might monitor some water-quality parameters and impacts globally, other key indicators such as toxin concentrations can be tracked only in situ. The GEO (Group on Earth Observations) AquaWatch initiative would be a natural forum for exploring these challenges10.

As the science improves, its implications must inform broader global discussions around water, such as the strategy for meeting the United Nations' Sustainable Development Goal of ensuring 'availability and sustainable management of water and sanitation for all', one of 17 such goals adopted last year.

The scientific community has made remarkable progress in understanding the role of climate in the occurrence and intensity of droughts, storms and other extreme events relating to water quantity. It is time for a similar examination of extremes in water quality.

SOURCE: www.nature.com
LINK: http://www.nature.com/news/study-role-of-climate-change-in-extreme-threats-to-water-quality-1.20267

Figure 1: An algal bloom in Stuart, Florida, in June led to a state of emergency.

Credit: Justin Du Toit

The role of remotely piloted aircrafts (RPA's) in rangeland monitoring

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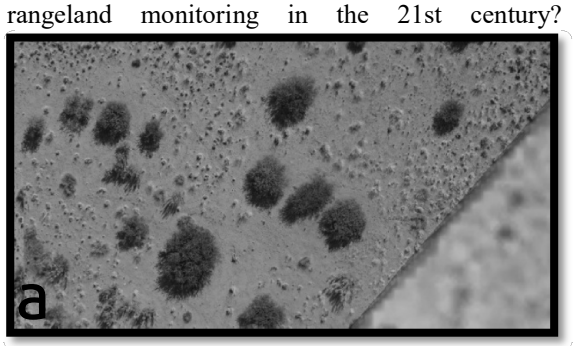
One of the primary objectives of rangeland monitoring is to determine if grazing management strategies meet the goals for sustainable resource utilization and to prevent rangeland degradation from taking place (James et al., 2003). However, monitoring is an ongoing process needed to determine whether progress is being made towards the achievement of objectives on given variables such as prolonged droughts, veld fires, grazing pressures, land-use and climate change. Ground surveys can be time consuming, labour intensive, logistically challenging in remote areas and, therefore, very expensive (Gardner et al., 2008). Depending on the scale, the objectivity and representativeness of ground based assessments can at times be questioned since surveys cannot be conducted at the frequency required for proper analysis and monitoring of trends due to high cost implications and inaccessibility. Therefore, a significant weakness in ecological research and rangeland monitoring in southern Africa's rangelands remains its inability to easily track changes in vegetation structure and composition resulting from management strategies, land-use and climate change (Koh&Wich, 2012). This can further be attributed to the lack of access to high resolution geospatial data sets (Mishra et al., 2015). Therefore, rangeland monitoring is often neglected and the question must be asked, whereto with rangeland monitoring in the 21st century?



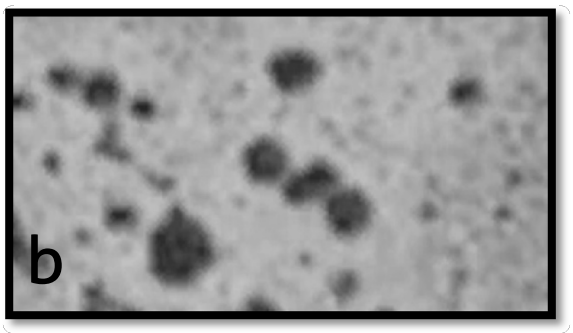


Figure 1: High quality geo-referenced image captured by a RPA (a) with a clear distinction possible between individual grass tufts compared to (b) a lower quality satellite image with only larger woody plants barely visible as darker patches.

Ground resolutions and sensor capabilities of satellites have improved immensely within recent years (Whitehead et al., 2014). While remote sensing technologies are evolving at a rapid rate, most researchers currently rely on satellite based remote sensing for mapping and monitoring (Broich et al., 2011). Even though certain low resolution satellite images are freely available (e.g. Landsat and MODIS), other sub-meter resolution images (such as IKONOS, Worldview and Quickbird) can be extremely costly and may not always offer timely high resolution images to fulfil the objectives required (Koh&Wich, 2012). Remote sensing images from satellites are also often obscured by cloud cover, preventing any real-time monitoring (Hansen et al., 2008; Koh&Wich, 2012). Therefore, only a few studies utilizing high resolution remote sensing data, such as Wessels et al. (2007) and Wessels et al. (2012) have been undertaken in southern Africa rangelands.

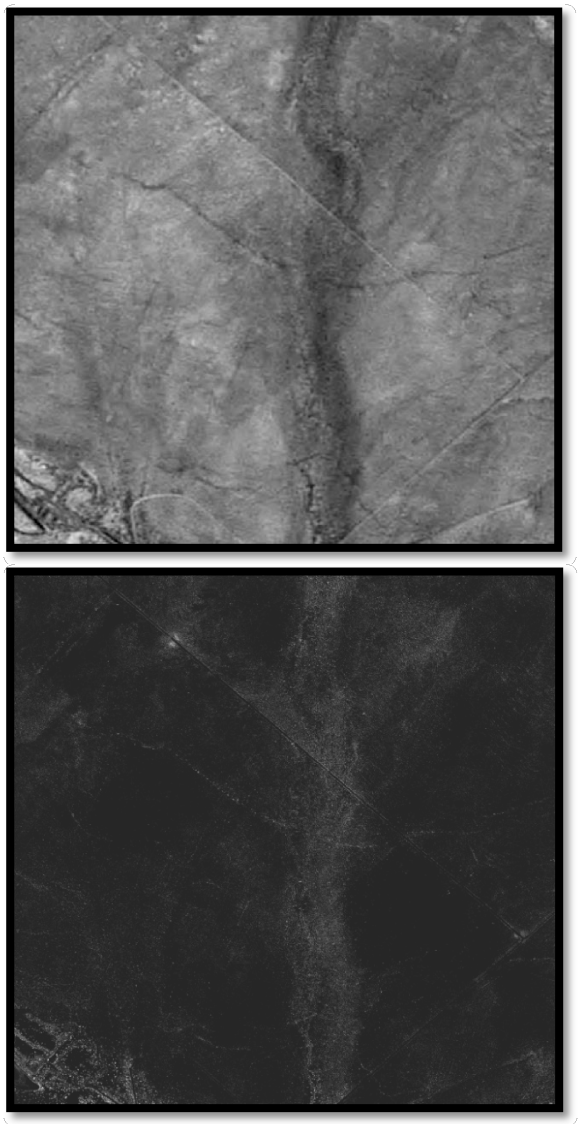


Figure 2: a) Remotely sensed image of a drainage line running down the middle of the image, b) Enhanced Vegetation Index calculated from Near-infrared image captured by a RPA indicating, in white, photosynthetic activity of the vegetation layer in and along the drainage lines.

With the introduction of affordable remotely piloted aircrafts (RPA's), also known as unmanned aerial vehicles (UAV's), one can now safely acquire timely hyper-resolution aerial images at low altitudes (Whitehead et al., 2014; Giessel, 2015). Currently the National Aeronautics and Space Administration (NASA; http://www.nasa.gov/centers) as well as the National Oceanic and Atmospheric Administration (NOAA; http://uas.noaa.gov) have Unmanned Aircraft Systems Programs. RPA's provide low operational complexity and costs, compared to manned aerial photography (Whitehead &Hugenholtz, 2014). Remote sensing sensors placed in RPA's furthermore provides the capacity to combine high spatial resolution and quick turnaround times in order to meet critical requirements of spatial, spectral and temporal resolution at budget cost (Dunford et al., 2013).

There are three general classes of RPA's, close range (± 50 km), medium range (±200 km) and long range (>200 km) (Watts et al., 2012). Cost of medium and long range PRA's amount to multi-million Rand's and may require complex and expensive ground control stations. Close range RPA's provides lightweight, versatile and cost-effective opportunities to act as carriers of a variety of sensors, including NIR (near infra-red), RGB (red, green and blue bands), RE (red edge), multi- and hyper spectral, LIDAR (Light Imaging, Detection and Ranging) and temperature measuring thermal sensors. Furthermore, different models of RPA's are advantageous for different applications. Multi-copter RPA's are more suitable for surveillance and mapping of small areas, while fixed wing RPA's are more suited for mapping when extended flight times are required to cover longer distances.

Potential applications of RPA's in rangeland research and monitoring

The RPA's have the potential to bridge the gap between ground-based surveys and remote sensing data acquired from satellites or manned aircrafts (Whitehead et al., 2014). Ground surveys provide only the information required to develop high resolution maps and allow monitoring of vegetation changes in small areas. Remote sensing data acquired from satellites are sufficient to produce maps and monitor vegetation activity over areas of a much larger extent; however, limitations arise in terms of lower spatial resolution and operational flexibility (Whitehead &Hugenholtz, 2014). It becomes expensive to monitor features at a finer-scale from satellite derived remote sensing images on a routinely basis. However, with fully autonomous GPS-guided RPA's, mapping and monitoring changes on a routinely basis at an intermediate spatial scale is possible (Koh&Wich, 2012; Whitehead et al., 2014). The RPA is capable of producing high quality orthorectified and geo-referenced images (Figure 1) which can be used for mapping purposes as well as a tool to verify course scale satellite data in order to conduct ground truthing on vegetation indexes calculated from near-infrared images, such as; the Normalized Difference Vegetation Index (NDVI) and Enhanced Vegetation Index (EVI) (Figure 2; Laliberte et al., 2010).

Satellite derived remote sensing has already been used in various previous studies to depict land-cover change (Stow et al., 2004, Shalaby&Tateishi, 2007; Koh&Wich, 2012), the impact of fires (Huesca et al., 2013; Wooster et al.,

2013) and grazing systems on plant biomass (Sannier et al., 2002; Archer, 2004; Edirisinghe et al., 2012) , biodiversity science (Turner et al., 2003) and for assessing drought events and the relationship that exists between biophysical-, climate variables and vegetation indices (Yang et al., 1998; Ji & Peters, 2003; Tadessa et al., 2005). Therefore, UAV's offer a range of new opportunities in high resolution applications in rangeland research including:

- Species identification. Frequent observations with a RPA can be used to determine the spectral signatures (also called reflectance curves) for indicator plant species (Fairbanks et al., 2000; Laliberte et al., 2010; Laliberte et al., 2011).
- Biomass determination. Quantitatively evaluating vegetation community structure by accurately measuring canopy height and volume (Kaneko &Nohara, 2014).
- Conservation. Monitor and detect vegetation cover change (e.g. map degraded areas by classifying rangeland cover types) (Koh&Wich, 2012).
- Plant health/stress analysis. Changes in the vegetation health conditions can be monitored by assessing the photosynthetic activity of the vegetation layer (e.g. vegetation indices such as NDVI and EVI) (Figure 2).
- Bush encroachment. Identify and monitor shrub encroached areas (Figure 3);
- Animal management and conservation. Tracking and counting animals, perform nest surveys and monitoring grazing and migration patterns. Study spatiotemporal dynamics of individual organisms at close range (Archer & Gaston, 2013);
- Terrain mapping. Create three-dimensional detailed topographical images.
- Monitoring and evaluation. Impact assessment and monitoring of management practices, veld fires, droughts and floods on vegetation conditions and recovery rates (Laliberte et al., 2010).

Advantages and challenges of RPA technologies

From first-hand account on the use of RPA technologies in rangeland research, the following advantages and challenges were experienced;

Advantages

- Easy to acquire timely, hyper-resolution and georeferenced aerial images at low altitudes;
- Low cost and versatile (i.e. lightweight and easy to transport) compared to manned aerial photography;
- Low labour intensity as the RPA can be operated by only one person;
- Wide area coverage;
- Map and monitor inaccessible areas;
- Allow for frequent monitoring and baseline assessments.

Challenges

- Limited flight time due to battery life;
- Air space restrictions and regulatory environment;
- Big data analytics. Processing platform need to be able to process and analyse large amounts of data.

The way forward

New and improved sensors are developed almost on a routinely basis (Jensen, 2000). With the rapid advancements in technologies; energy sources will most certainly in the near future ensure longer flight times (Koh&Wich, 2012). Satellite and airborne remote sensing images were not always able to meet the demands of research and professional communities (Whitehead &Hugenholtz, 2014). However, the use of RPA's in the military has been implemented quite successfully already and is now rapidly expanding in the commercial sector.

There has been much speculation on the potential scientific applications that RPA's hold (Kerr &Ostrovsky, 2003; Hugenholtz et al., 2012). The use of RPA's in rangeland monitoring and research in the South African environment is silent and literature mainly addresses potential applications. RPA's together with the appropriate multispectral sensors are emerging as essential monitoring and quantitative research tools that have the ability to enhance objective measurement of rangeland dynamics (Laliberte et al., 2010; Whitehead & Hugenholtz, 2014).

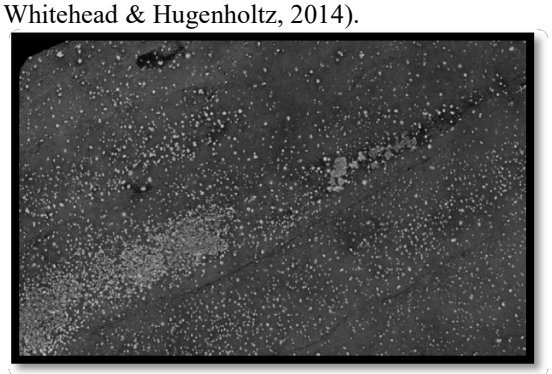


Figure 3: Mosaic image indicating individual woody shrubs and trees (i.e. white dots) that can be exploited to identify and monitor shrub encroached areas as seen on the bottom left of the image.

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Update on International Year of Rangelands Proposal

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Since the SRM Meeting in February, Jim O'Rourke (International Rangelands Congress), Lovina, and I have been working to gain an understanding of the process for gaining a UN designation for an International Year of Rangelands. This has involved extensive email discussions with people representing a variety of organizations around the world. What we discovered is quite complex. A Government, or a coalition of Governments, must take the lead on an International Year designation request to the General Assembly, and this needs to be pursued through the political channels of the UN. To facilitate this process, Governments can first discuss the idea during international for a, such as the United Nations Environment Assembly (UNEA). Typically, Governments will follow up by discussing the idea in other subsequent for a with UN agencies (i.e. UNEP, FAO, UNDP, and IFAD) who assist in this process. Since UNEA is an officially delegated Assembly of the General Assembly, it too can submit a recommendation through its President for an International Year, as can any other UN agency.

In late May, UNEA will hold its second meeting, UNEA-2, in Nairobi Kenya. UNEP and its partners (FAO, IFAD, ILRI, IUCN and WAMIP, WISP), and, in particular, the Pastoralist Knowledge Hub (FAO) have successfully competed to have a dedicated Side Event at UNEA-2 on Sustainable Pastoralism. The Pastoralist Hub was also set to pursue an IY designation. This meeting is very important to gain high level buy-in by other countries, UN agencies, and other stakeholders to promote pastoralism as a key UNEP priority area. We are working now to identify attendees who could make brief statements during the "open discussion" session in support of a proposal for a combined International Year of Rangelands and Pastoralists in 2020. In addition, we have contacted the President of UNEA requesting her to include pastoralism and rangelands in her opening remarks. We have also prepared an "open flyer" calling for support of an IY designation that will be distributed at the meeting along with RP "ranching stories" demonstrating sustainable management practices.

Assisting in identifying potential presenters for the Side Event are Jess Peterson and Kelly Fogerty at SRM. They are contacting key officials at USDA and other US agencies to brief them on our plans and to ask for their engagement and support. There is a greater likelihood of success with strong backing from the U.S. To this end, if you have contacts in U.S. agencies who would might help with this effort, please feel free to share this update or contact me for further information.

The proposed South African carbon tax

Tim James and Teresa Legg

The Carbon Report's Blog

info@thecarbonreport.com

How will the draft carbon tax bill affect your business?

The draft carbon tax bill which was released for comment on the 2nd of November 2015 and outlines the carbon tax design has caught the attention of the business community which has to date been dragging its feet with respect to transitioning to a low carbon economy.

To date the tax has been delayed a couple of times. While many believe delays will continue, the treasury has indicated that it will stand firm on implementing the tax in 2016 (Treasury stands firm over carbon tax. Business Day, 8 April 2015). The draft bill points to 1 January 2017 as the start date.

Recognising the importance of reducing carbon emissions and foreseeing the benefits that a low carbon economy can bring, the South African government has committed to ambitious greenhouse gas emissions reductions of 34% by 2020 and 42% by 2025 against a business as usual curve. Policies, frameworks and financial instruments need to support these commitments for any hope of achieving such reductions. The purpose of a carbon tax, seen too often as a way to increase the tax base, is intended more to send the necessary price signals to change consumer behaviours and stimulate investor appetite to shift towards low carbon options. With a commitment to implement revenue recycling measures the effects on economic growth in the broader economy should be minimal.

In summary, the key points of the design features of the carbon tax include:

- The tax will be phased in over a period of time to allow for smooth transition in adopting cleaner and more efficient technologies and behaviours. The first phase will run from implementation up to 2020.
- The initial marginal carbon tax rate will be R120 per tonne of CO2e (carbon dioxide equivalent). Taking into account the thresholds mentioned below, the effective tax rate is much lower and ranges between R6 and R48 per tonne.
- To allow businesses to adapt and transition to low carbon alternatives in the first phase a basic percentage based threshold of 60% will apply below which tax is not payable. The following additional tax-free allowances apply:
  - An additional 10% for process emissions;
  - An additional allowance for trade exposed sectors, to a maximum of 10%;
  - An additional allowance of up to 5% based on performance against emissions intensity benchmarks. These benchmarks will be developed in due course.
  - A carbon offsets allowance of 5 to 10% per cent, depending on sector;
  - And finally, an additional 5% tax-free allowance for companies participating in phase 1 of the carbon budgeting system.
  - The combined effect of all of the above tax-free thresholds will be capped at 95%.
- Due to the complexity of emissions measurement in the waste and land use sectors, 100% thresholds have been set i.e. these sectors are excluded from the tax base for phase 1.
- The tax base comprises emissions from fossil fuel combustion, emissions from industrial process and product use and fugitive emissions.
- The greenhouse gases covered include carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride.
- Carbon tax on liquid fuels (petrol and diesel) will be imposed at source, as an addition to the current fuel taxes.
- For taxation on stationary emissions, reporting thresholds will be determined by source category as stipulated in the National Environmental Air Quality Act. Only entities with a thermal capacity of around 10MW will be subject to the tax in the first phase. This threshold is in line with the proposed DEA GHG emissions reporting regulation requirements and the Department of

Energy (DoE) energy management plan reporting.

- The carbon tax will be administered by the South African Revenue Service.

The Bill together with supporting documentation also maps out the technical workings of the tax. If not au fait with emissions and emissions calculation methodologies, the services of a carbon consultant will help you navigate this process.

It is important for all organisations to assess the likelihood and extent of risk exposure to the tax, understand where you may be exposed to tax, to what extent you will be exposed and start planning to transition away from a reliance on carbon. Outside of direct taxation businesses should also anticipate potential price increases on taxable activities such as transport. A full review of a business' supply chain will also provide information on a supplier's exposure which may trigger price hikes.

Businesses who use this window now to review their risk exposures and start the necessary process of evolving their business practices will be better equipped in the long run.

For more information on the proposed carbon taxation and its relevance to your organisation and our carbon tax consulting service

Please call us on +27 21 403 6411.

We also offer a free, no obligation carbon tax assessment to determine whether the tax has any relevance to your organisation.

SOURCE: http://www.thecarbonreport.co.za/

LINK: http://www.thecarbonreport.co.za/the-proposed-south-african-carbon-tax/

Methane research at Outeniqua research Farm: Jersey cows equipped with the SF6 technique on perennial ryegrass pasture.'

Soil erosion may threaten global food security

Joe Turner

SciDev.Net

http://www.scidev.net/global/farming/news/soil-erosion-threatens-global-food-security.html

Global soil erosion has reached levels that will endanger humanity's ability to feed itself if nothing is done to lower it, a study warns.

Tim Benton, University of Leeds The review, published in Science last week (7 May), says soils are being lost faster than they are being naturally produced in many parts of the world. In addition, there is increased pressure on farmland from non-food uses, such as crops being grown for biofuels, and there may be future shortages of rock phosphate, which is used to make fertiliser, it says.

"The increases in food production in the developed regions of the world are plateauing," says Ronald Amundson, a soil scientist at the University of California, Berkeley, in the United States, and one author of the study. "There are opportunities to increase food production in underdeveloped nations, but this will require expenditures for fertilisers to bring their yields up to what the regions can potentially produce."

The phosphorus needed to create fertiliser is mined. This raw material has risen in price recently, according to the paper, prompting worries about the availability of inorganic fertilisers for farmers in developing countries.

The paper's authors say that, instead of relying solely on fertiliser to increase yields from conventional farming, more efficient food distribution and nutrient recycling are needed to end hunger — one of the UN's proposed Sustainable Development Goals (SDGs).

Soil erosion is caused by the overuse of land, deforestation, desertification and water runoff— all of which are, to some extent, caused by farming. The Science paper comes as many scientists worry that soil protection targets in the draft SDGs may be removed from the final list of goals.

Since January, which marked the start of the International Year of Soils, scientists have been calling for greater political focus on soil management.

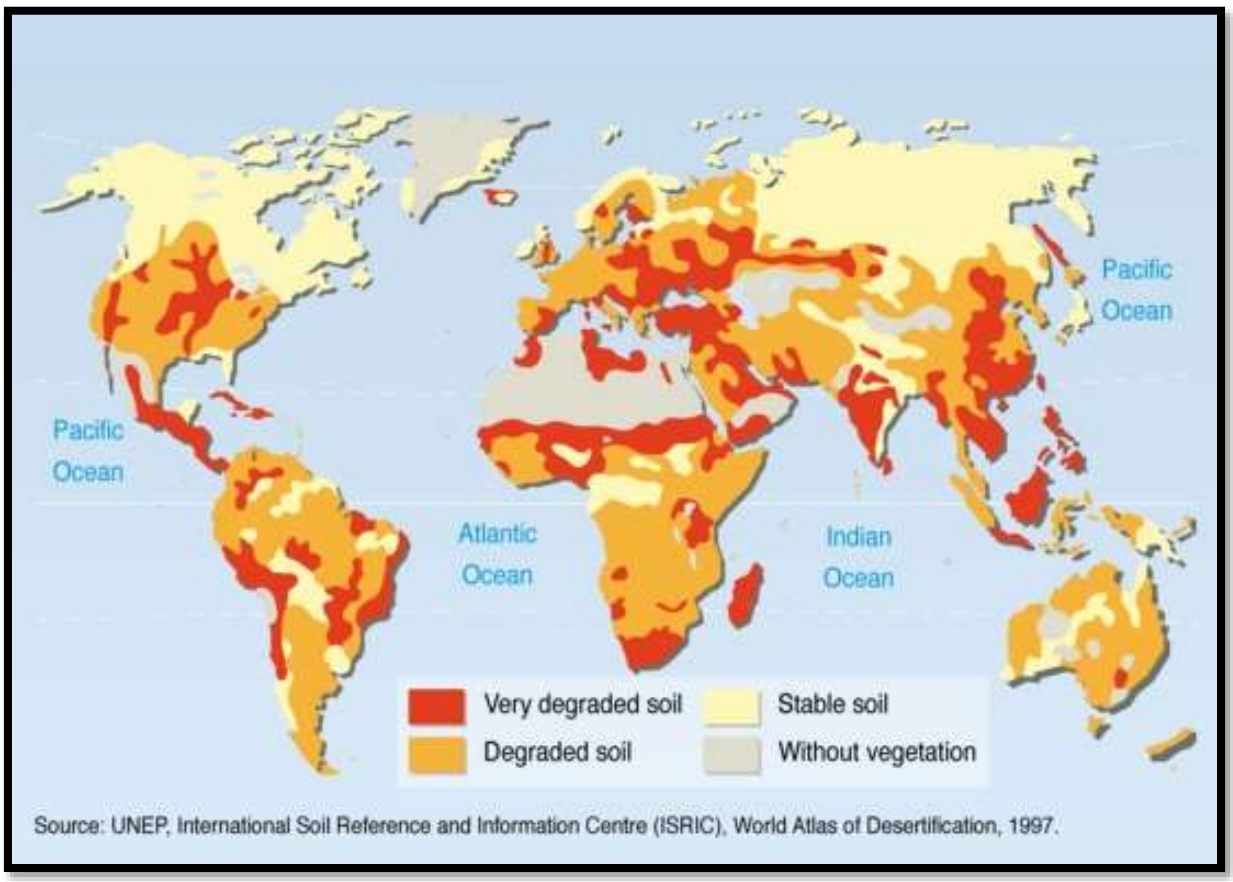
Tim Benton, a population ecologist at the University of Leeds in the United Kingdom, says better soil management could go a long way towards producing enough food in the future.

"I don't think we worry enough about conserving soil resources for the long term," he says.

In traditional farming systems, food production can be increased by using various techniques to reduce soil erosion, says Rattan Lal, a soil scientist at the Ohio State University in the United States. For example, he says farmers can preserve their soils using agroforestry and by covering it with crop residues.

But it is a major decision to switch to such methods, he says, as these are more labour intensive and can be less economically efficient, considering many farmers use agriculture to meet household needs for feed, fodder and building materials.

According to Lal, around 500 million farmers worldwide depend on farms of less than two hectares. If soil management were included in the global agenda to address climate change and food shortages, much could be done to help the two billion 'hidden hungry', who are not eating enough nutrients in their food, he says.



Credits: UNEP, International Soil Reference and Information Centre (ISRIC), World Atlas of Desertification, 1997

Jobs report shows the resilience of South Africa's agricultural sector

Wandile Sihlobo and Tinashe Kapuya

AgBiz

http://www.thegreenkeeper.co.za/jobs-report-shows-the-resilience-of-south-africas-agricultural-sector/

In May, Statistics South Africa indicated that the country's official unemployment rate reached 26.7% in the first quarter of 2016, rising from 24.5% in the previous quarter. This increase in unemployment was on the back of lower production in some sectors of the economy, as weak economic growth continues to negatively affect business confidence.

The total employment dropped by 355 000 to 15.7 million, which is a 2% quarter-on- quarter contraction. On a quarterly basis, job creation contracted in almost all the sectors of the economy, with the exception of the agricultural sector, as well as community and social services sector.

The jobs gains in agricultural sector were, to some extent, a surprise given that the sector is currently battling the adverse impacts of an El Nino induced drought. In the first quarter of 2016, the agricultural sector employed 876 000 people, up by 2% from the previous quarter, but 2% lower when compared to the same period last year. It is important however to note that the primary agriculture constitutes 6% of employment in South Africa, which is well above sectors such as mining, and almost at par with the transport industry.

A close observation of the agricultural sector reveals that most sub-sectors performed well on a quarterly basis, despite the negative effects of the ongoing drought. The organic fertilizer industry, animal husbandry, game industry and logging services sub-sectors recorded notable gains, which were however coming off a low base. Meanwhile, the aquaculture industry and forestry industry showed some contraction.

When comparing the first quarter of 2015 to the first quarter of 2016, it is clear that some sub-sectors such as crops, logging and related services and livestock (farming of animals) showed positive jobs gains. This could be attributed to seasonal employment increases during the harvest period in the horticulture industry, increased cutting trees on the back of drier conditions in the logging and related services side, as well as increased slaughtering in the livestock sector, as the higher feed prices – induced by drought conditions – continue to put the sub-sector under increased pressure.

The outlook for the South African jobs market remains poor as the domestic economy continues to offer less confidence to business. The prospects of a lower GDP growth, projected at 0.7% this year, will keep the labour market under sustained pressure. The agricultural sector is likely to register contraction in the next quarter, due to reduced activity in most crop producing areas, as an aftershock of the drought. South Africa's 2016 total summer crops production is estimated at 8.6 million tons, down from 11.9 million tons in the previous year, and well below the 2014 volume of 17.5 million tons (Summer crops:maize, sunflower-seed, soybeans, groundnuts, sorghum and dry beans).

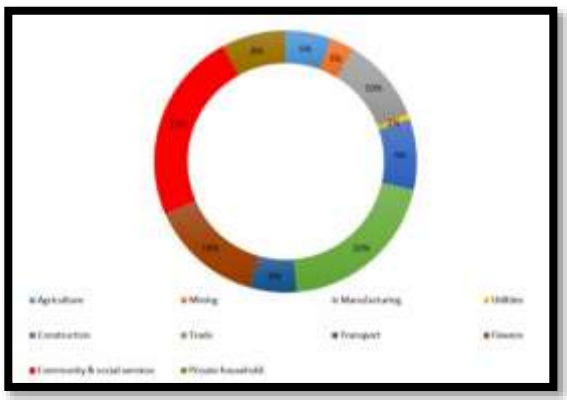


Figure 1: Employment in South Africa. Credits: Statistics South Africa, Agbiz Research

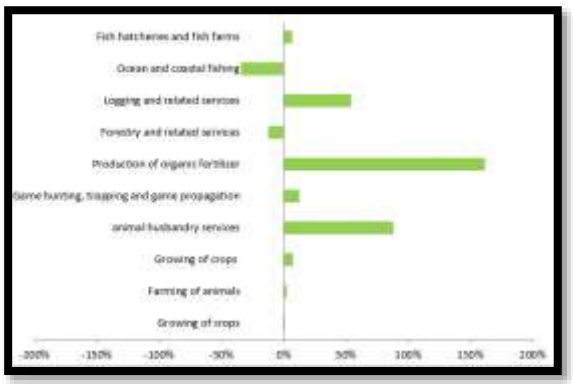


Figure 2: Quarter-on- quarter percentage employment in South Africa's agricultural sector Credits: Statistics South Africa, Agbiz Research

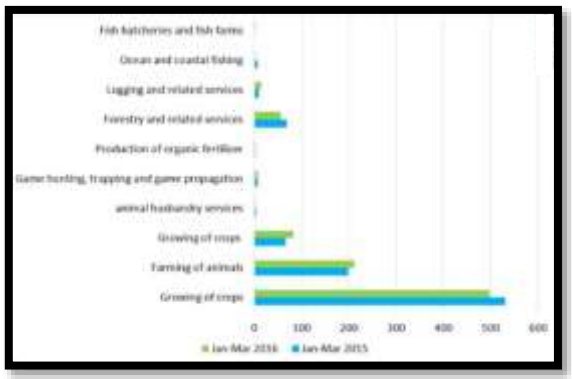


Figure 3: Employment in South Africa's agricultural sector. Credits: Statistics South Africa, Agbiz Research

Africa: SDGs Could Boost Citizen Science in Africa

Inga Vesper

Global news and features editor, SciDev.Net, London

Manchester — The Sustainable Development Goals are a chance for Africa to give citizens a say in shaping local science activity and the innovations that follow from it, a UK conference has heard.

The explosion of science initiatives now taking place across the continent in the wake of the SDGs means local people need a say in what research is being done, according to a panel yesterday at the EuroScience Open Forum. This is particularly important to ensure Africa's research agenda supports wellbeing and healthy growth on the continent, the conference heard.

"The SDGs can be a beacon for innovation in the way research programmes are designed to include the people who are meant to benefit," said Elizabeth Pollitzer, the director of Portia, an organisation that supports women in science. "The goals have created a renewed interest in research among the development community."

Consulting ordinary citizens on what science should be done and how it should be applied would especially benefit women, the conference heard. This is because women are often not involved in research projects and rarely get a chance to voice their needs, according to the panellists.

One example is car design, where things like crash test dummies are typically based on male weights and proportions. As a result of leaving them out of the design process, women are 47 per cent more likely to be injured in car crashes than men, Pollitzer explained.

The move to get laywomen involved in science is part of a broader move in the science community towards responsible research and innovation - a concept that puts research's impact on wider society first.

But doing this means governments must also get more involved with science, especially in developing countries, where information channels between people and politicians are often poor, the conference heard. Kathrin Bimesdörfer, an analyst at Germany's Institute for Organisational Communication, said governments often fail to apply citizen feedback on science, preferring to file it away for "future consultation".

"This is a problem," she said. "It creates fatigue among the public if their engagement is not taken up."

The conference heard that Africa has an advantage over other continents in citizen engagement, because there are many funders and non-governmental organisations on the continent that specialise in giving ordinary people a voice. Pollitzer said these NGOs should push harder for laypeople to play a role in the science aspects of Africa's Agenda 2063 development plan and the Continental education strategy for Africa 2016-2025.

"This should make it easy for African researchers to connect with a population already interested in science," she said.

Mid-Congress Tour: Community Projects and Forest Restoration

Amy Schroeder and Laetitia Piers

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With the venue for the GSSA51 congress along the most famous Garden Route, it was most fitting to organise a mid-congress tour to witness the ground-breaking projects which benefit both nature and communities within the Fynbos and Forest biomes. The initial pouring rain could not dampen the enthusiastic spirits of 11 delegates who traveled to the Pledge Nature Reserve, the Freshstart Swop Shop, and the Sizamele Indigenous Nursery.

Pledge Nature Reserve, is a natural jewel found in Knysna. Our hosts, Patricia Nurse and Robert Smith, graciously welcomed the group and informed us about the history of the Reserve and the different challenges they face managing the Reserve. They make an effort to restore indigenous trees to sustain the surrounding forest and contribute to the much-needed finances that the Reserve needs to survive. Furthermore, we discussed the various indigenous and threats of invasive trees in the Reserve. Our final destination was the endangered and highly fragmented Knysna Fynbos. The transition from the typical vegetation of the Reserve to the fynbos was very abrupt and attests to the intricacy of the Fynbos vegetation. The local prison has a beautiful view of the Reserve and Patricia Nurse pointed out that the inmates have a five-star accommodation waking up to a beautiful view of the Reserve every morning.

Figure 1: Nurse and Robert Smith at the Pledge Nature Reserve

Figure 2: Congress delegates which attended the Community Projects and and Forest Restoration Tour

Figure 3: The Knysna Heads viewed from the top of the Pledge Nature Reserve where the Knysna Fynbos is situated

The second stop was the Freshstart Swop Shop located in Smutsville. The Freshstart community initiative is a non-profit organization that was established by Lida and Schalk van As. The motto: “helping people to help themselves” is the prime focus and is done through projects such as recycling or upcycling of waste material. The Smutsville Recycle Swop Shop is one of Freshstart’s empowerment projects and its purpose is primarily to help children in the Smutsville Township, Sedgefield community. This Swop Shop is situated at Sedgefield Primary School, and operates once a week, and involves children between the ages of six and sixteen.

Hundreds of children flock to exchange recyclable material for items from the Swop Shop. This barter works on a point system known as

"MULA" where there is no involvement of real money. Children earn their MULA by exchanging recyclable material for items from the Swop Shop.

The children are able to save their MULA points towards bigger items which range from essential and aspiring items which they can acquire from their own effort. The shop provides second-hand clothing, toys, sports equipment, bedding, books, pens and pencils as well as new stationary items needed for school and new toiletries. The most popular items include the basic essentials such as soap, face cloths, toothpaste, toothbrushes, deodorants and toilet paper. This Swop Shop not only teaches children the value of personal effort but it also educates them on environmental issues surrounding waste disposal. This project aids in minimizing waste through recycling and cleans up the environment. Children can participate in various activities once they are at the Swop Shop, these include: drawing, puzzle building, reading and most importantly interacting with volunteers and other children. There is also anurse on duty who conducts basic medical check-ups on the children before they go home. This project is truly encouraging for many children and the broader community. The vegetable gardens that Freshstart established in the community further highlight their efforts to make a difference in the lives of the local community.

Figure 6 and 7: Schalk van As displaying examples of items from the Swop Shop container and addressing the delegates about the Swop Shop process

Figure 4 and 5: The items inside the Swop Shop container including the point system

The final stop was at Sizamele Indigenous Nursery (also situated in Smutsville) established in 1995 by Willy Pedro. Willy gained practical plant skills and knowledge when he joined the Department of Forestry. However, when the Department transformed the southern Cape plantations and forests into a private enterprise many workers, including Willy, were retrenched. Willy found a love and passion for indigenous trees and dedicated his life to creating an absolute indigenous nursery masterpiece. He kicked it off by planting one tree, which is now his pride and joy and standing strong and tall in the centre of his nursery. The nursery is embedded in the southern afro-temperate forest. Walking through the nursery, you can hear the sounds of the forest and feel the crisp and cold moist air surrounding you. The knowledge that Willy gained from his previous workplace played only a small part in the success of his nursery. It was rather the knowledge that he gained from the surrounding forest that was the key to the success. Willy studies the growth habits of indigenous trees and mimics the forest processes. All of his trees are grown from seed. In my amazing because it requires mass amounts of care and maintenance to grow plants from seed. The nursery is a majestic sight which radiates life, and is managed using recycled sewerage water and homemade compost. Willy also grows fresh vegetables and popular garden ornamentals. This nursery is his income and assisted him in providing for his family. Willy is the keystone of the nursery and shows that patience and hard work can create a natural gem. The Community Projects and Restoration Tour left all who attended inspired and happy hearted. These projects support sustainable living and provide solutions to many problems.

Sizamele Indigenous Nursery, situated in Smutsville. Credits: Laetitia Piers

Workshop: Invasive Species

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The 51st Annual Congress of the Grassland Society of Southern Africa was recently held at The Wilderness Hotel in Wilderness and was followed by an Invasive Species Workshop which was held on the last day of the congress. The Workshop was organised partly by the Society's organising committee and partly by Dr PJ Pieterse. Fifty one delegates from across environmental, pasture, forest and agricultural fields involved in invasive species attended the Workshop. There were nine guest speakers covering veld management with regard to invasive plants in rangeland and its control strategies. Dr Sue Milton, a veteran in her field, gave an informative overview with regard to the differences between invaders and survivors. Typical invader species lack natural enemies, produce abundant seed that can be dispersed over long distances and usually be long-lived for several years. These species also have certain characteristics that can protect or defend them against herbivores and that can provide multiple recovery tactics. Survivor species on the other hand are species that remain after poor or neglected field management. These species are usually unpalatable or poisonous, proliferate seed poorly and have a week seedbed that is not retained in soil for long periods. Prof Nico Smit reported on bush encroachment being one of the biggest problems in the savannah biome. He suggested that the cost effectiveness of chemical control of invasive bush species should be carefully looked at and managed since it depends on the rate of re-establishment of species and the necessary follow-up control which will result in secondary costs. He warned that landowners should rather do nothing, than do the wrong thing since disturbance may only be a trigger to enhance bush encroachment. He emphasised that the management of bush encroachment is a long-term control strategy and where possible should be seen and be approached as a resource rather than a problem.

Dr Pieter Winter from the South African National Biodiversity Institute (SANBI) gave an informative presentation on why it is necessary to identify invasive species correctly. There has to be a knowledge base since invasive biology is dynamic and change over time. The South African National Biodiversity Institute contains various herbarium collections which require constant examination, therefore the expertise of taxonomists should not be overlooked. Dr Seb Rahlao also from SANBI gave an overview of the National Status Report on the biological status of invasive plant species. The Alien and Invasive Species Regulations (2014) and the respective lists of invasive species (559 spp.) are available on the website, www.invasives.org.za. These invasive species are categorised according to the National Environmental Management: Biodiversity Act (NEMBA) into four groups (i.e. 1a, 1b, 2 and 3) according to their invasive status. The ideal is to update these lists every six months, however the feasibility is questionable. The National Status Report gives information on the distribution, rate of spread and risk assessments involved of invasive species.

Dr Graham Harding elucidated the role of herbicides in invasive alien plant management and stated that chemical control is an essential tool in management strategies. He accentuated the importance of understanding the application and use of the different products registered to be used in controlling various invasive species. It is not realistic to ban chemical control from management strategies, rather use less herbicides, but use it correctly, at the right time and adhere to label recommendations of each product.

Dr Helmuth Zimmerman ended the workshop with the exceptional successes with the biological control of invasive Cacti in the north-western grasslands. He gave an overview of the work that has been done to control *Opuntia engelmannii* with four cochineal species (sap-sucking insects). It was a journey with trial and error, but at the end all the research and hard work paid-off. Biological control cannot eradicate invasive species completely, but the main objective with biological control is to get a balance between the host and the predator.

Dr Zimmermann also informed the workshop that new invaders are always on the horizon and gave an update on invaders such as *Opuntaelata Harissiatortuposa, Thephrocactus articulates, Cylindropuntia spinosior* and *C. pallida.*

Other speakers included Mr. Justin du Toit from Department of Agriculture, Forestry and Fisheries who explored invasive plant management strategies in grassland especially where slangbos [*Seriphiumplumosum* (syn. Stoebe vulgaris)] and katbos (*Asparagus* laricinus) were predominant. Mr

Werner Roux (DEA - Limpopo) presented work done on physical or mechanical control methods used in Limpopo's Natural Resource Management Programmes. Mr Andrew Wannenburg (DEA – Working for Water) gave an overview of strategies for invasive plant control and the costs involved. The workshop was informative and relevant discussions were prolific to ensure continuous collaboration between all parties involved. The necessity for such a workshop was emphasised by all delegates who supported the recommendation that such a workshop should be an annual event.

Credit: Justin Du Toit

Mid-Congress Tour: Gondwana Game Reserve

Jono Berry

Gondwana Game Reserve

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Conservation in Practice

I was always told that if one did not like the weather in the Western Cape…. just wait 10 minutes (!) and the mid-congress tour to Gondwana Game Reserve proved this truism. For those congress delegates who braved the first few cold and wet minutes, a sunny afternoon was spent traversing this 11 000 hectare reserve, learning and sharing information about land restoration, alien plant control options and integrated land management. Located between Mossel Bay and Herbertsdale, Gondwana Game Reserve is committed to providing responsible, ethical land management whilst playing host to a successful tourism and hospitality business venture.

Ecologically, Gondwana has both Thicket & Fynbos biomes represented and for management purposes has further divided this broad demarcation into six categories, namely: Fynbos, Renosterveld, Thicket, Pastures, Recovering Pastures and Alien Dominated. Discussions during the tour focussed on the following three main issues: 1) the ongoing eradication/management of alien plants, 2) the importance of the grazing value of the pastures/recovering pastures and 3) the responsibilities/obligations land owners are faced with when dealing with alien plants.

Alien Plants

Gondwana is an Implementing Agent within the Working for Water program and through making use of seven local contractors employing a total of over 70 people. The year 2015 saw 1 400 hectares cleared of all alien plant species including the likes of Black Wattle (Acacia mearnsii), Red-Eyed Wattle (Acacia cyclops) and the Silky Hakea (Hakea sericea). Furthermore, the year 2016 is about consolidating these hard won gains with follow-up treatments and maintaining momentum and employment. Biological control agents have been released and thought has been given to the use of fire in controlling alien species. During the tour, the suggestion was made that perhaps fire could be used prior to a follow-up treatment in order to stimulate the seedbank and increase the value of the herbicidal follow-up treatment. Essentially, disturbance is seen to be a major contributing factor to the spread of these alien species into adjacent, previously stable plant communities and as a management team, we are working towards curbing unnecessary disturbance and if necessary, monitoring for degradation and intervening appropriately.

Grazing value of (recovering) pastures

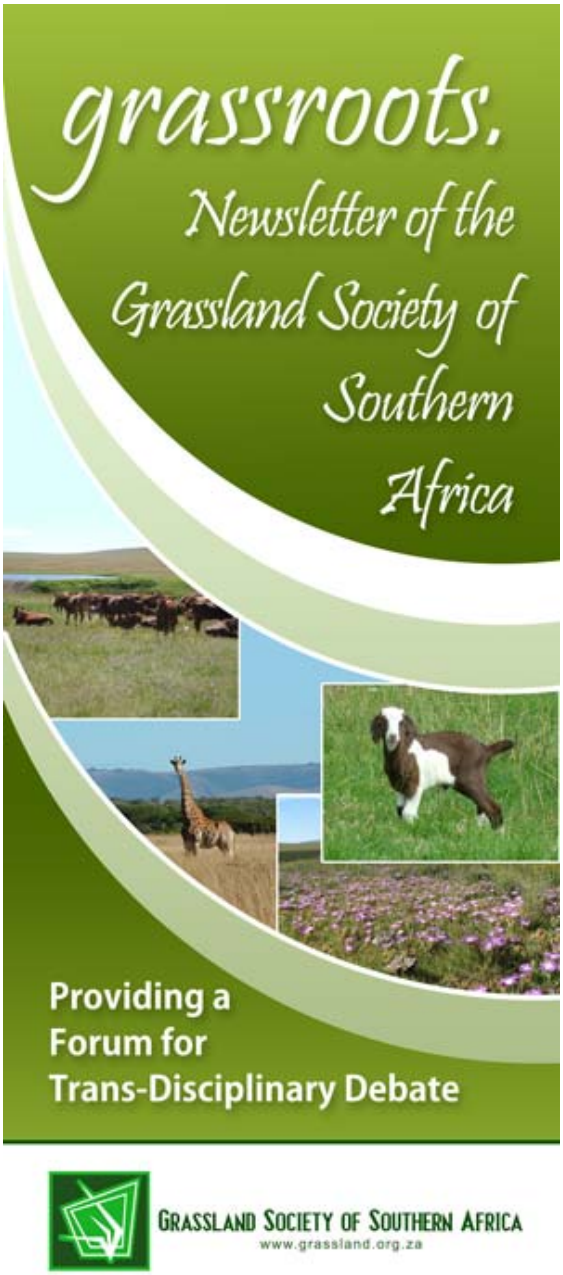
The pastures on Gondwana are a heritage of the agricultural practices prior to our reserve's establishment and although they are heavily modified landscapes, they are critical to the conservation and business model of the reserve. These pastures have the ability to support greater densities of herbivores with good visibility whereby they in turn support the associated predators which are so vital to the tourism products we offer. Simply put, it is our pastures which "fund" our capacity to conserve the threatened Fynbos, Renosterveld and Thicket communities.

Responsibilities/Obligations of Landowners

A recurring theme throughout the day's excursion was the concept of the obligations which landowners are required to abide by when dealing with alien plants and their eradication/management, as legislated by government. The majority of participants seemed to agree that better decisions were likely with improved communication with all relevant stakeholders. Secondly, idealism may have its place but not as the basis for legislating for alien plant management and the expected behaviour of landowners. Rather, the realistic goal of management as opposed to eradication should be legislated for. Landowners should be expected to improve the condition of their properties but to expect and legislate for the eradication of alien plants is unlikely to contribute to a genuine change in attitudes and/or behaviour.

The conservation and responsible ecological management of our Fynbos, Renosterveld and Thicket plant communities is intrinsically linked to the pastures and previously disturbed areas of our reserve. Ironically, it is the alien plants which provide so much employment and it is the so called "degraded" areas of pastures and recovering pastures which add so much to our economic viability. Together these "problem" areas allow us to engage in meaningful conservation and

investment in our community. And therein lies the ultimate goal of Gondwana: measurable improvement in all facets of the landscape in which we occur. I thoroughly enjoyed playing host to this mid-congress tour and thanks to the participants who shared their thoughts, experiences and ideas during our drive.



Mid-Congress Tour: Pasture innovation in the Southern Cape

Sigrun Ammann and Janke van der Colf

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From pure pastures to integrated pasture-cropping systems

The mid-congress tour looking at pastures in the southern Cape was a full day tour enthusiastically attended by some 50 delegates. The first stop on the tour was at the Outeniqua Research Farm, one of seven research farms in the southern Cape funded and managed by the Western Cape Department of Agriculture. The group was welcomed by Prof Robin Meeske, who also gave an overview of the farm and the research that is being conducted. The research programme on Outeniqua is aimed at improving the profitability of sustainability of dairy and beef production from pastures, with both pasture and animal research components. Aside from its research function, Outeniqua also successfully manages a commercial dairy herd on a pasture platform, competing with local producers on an economic level. During the tour, delegates were taken on a farm walk, looking at the various pastures trials from the extensive evaluation and characterization of pasture varieties (Sigrun Ammann) to pasture systems trials including nitrogen fertilization trials focusing on strategic nitrogen application of minimum-till pastures. The pasture systems that are researched and also used on the farm for the production fields for the commercial dairy herd are based on the no-till concept (Janke van der Colf). The whole research team was involved which includes the two technicians, Dalena Lombard and Lethu Zulu as well as the two post graduate students Charne Augustyn and Bernhard Jordaan.

In terms of the animal science research, Josef van Wyngaard discussed research being undertaken on Outeniqua that is aimed at characterising and quantifying methane emission from pasture based systems, with the eventual goal of reducing such emissions. Delegates were also shown the apparatus used to measure these emissions – a cleverly designed device that can be attached to the cows with a harness. This allows measurements to be taken while cows continue with their normal grazing behaviour in an uninhibited way as part of the herd.

The tour then continued to the farms of Van GreunenBoerdery, where we were welcomed by Nelius van Greunen. The Van GreunenBoerdery is an excellent example of enterprise diversification within agriculture. The farming business is based on an interesting combination of farming enterprises including pasture based dairy production, potatoes, maize silage and berries. The dairy pastures, cropping for the potatoes and the maize silage fields are in a large rotation across their various farms. This rotational system is considered a very important component of maintaining the productivity of their system. The dairy pastures, consisting of perennial ryegrass-clover, lucern and kikuyu depending on the characteristics of the field, are grown for a number of years followed by a break crop such as rape mixed with oats. The break crop is then followed with potatoes or maize silage. After the potatoes, the break crop is planted again and then followed with a new pasture establishment phase. The break crop contributes to soil health in terms of parasite control, specifically for the cultivation of potatoes. Nelius van Greunen explained that the tillage associated with the potato production allows them to incorporate lime and other soil amendments deep into the soil profile. They consider this to contribute markedly to the success of maintaining clover throughout the pasture phase, which lasts for a number of years. In addition, pastures are over-sown annually to maintain productivity over years. It was pointed out that in order to have good winter production they always aim to over-sow in late summer/ early autumn, with delayed establishment during late autumn generally avoided. This does result in a grazing shortage during the over-sowing period, but the shortfall is overcome with the rape fields and silage. Another important aspect for van GreunenBoerdery is the maintenance of organic matter content of the soil and soil health, for which they have found the addition of chicken litter beneficial. The marginal areas are planted to more perennial pasture species with deeper root systems that require less irrigation. These areas are used as fodder reserve areas when needed. Excess pasture is made into silage and maize silage is also produced for use in the winter months when pasture growth is slow or during the over-sowing period.

The tour party then enjoyed a good lunch at Arendsrus restaurant (sponsored by Capstone Seed), which provided some warmth from the cold wind. After lunch the tour proceeded to the farm Uitkyk of Alfie Louw. This is also mainly a dairy farm, but the production of macadamia nuts has recently been added to the enterprise. The interesting aspect of Alfie Louw's farming operation is the extensive use of compost and a focus on recycling and utilising all by-products within the system. For example, dry-land and marginal fields dominated by Eragrostisplana are cut to be used for calf pen bedding, which is in turn utilised within compost heaps. He has also invested significantly in specialized equipment to allow for high quality compost to be produced. To process the slurry from the dairy, he uses an extruder which separates out the solids. These manure solids are then incorporated with other organic material such as old grass bale silage and bedding from the calf pens into long compost heap rows. The combination of materials is carefully managed according to a recipe as is the so-called inoculant for optimal composting. The compost is regularly turned using equipment specifically designed for this purpose. The final product is then spread onto the pastures, and will in the future also be utilised in the macadamia production system.

Alfie has a strong interest in biological soil processes and health, with the management of his soil forming the basis of many decision making processes relating to the management of pastures on the farm.

A compost-turner. Compost is turned on a daily basis for the first two weeks followed by turning every second day.

The delegates could see three very different approaches to pasture production in the southern Cape all of which are successful in their own right.

Van Greunen dairy pastures consisting of perennial ryegrass-clover, lucerne and kikuyu depending on the characteristics of the field, are grown for a number of years followed by a break crop such as rape mixed with oats.

Presidential Address 2016

Leslie Brown

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Last year the Grassland Society of Southern Africa (GSSA) celebrated its 50th congress that was held in Pietermaritzburg – where it all started back in 1965 with a few dedicated scientists realising the importance of establishing a society where researchers in this field can share and discuss their ideas and research. Starting with a membership of only 97 people the Society has grown over the years to more than 400 members nationally and internationally.

Starting with a membership mainly focussing on rangelands and pastures, the diversity in membership has increased during the past few years resulting in the Society updating its mission to "Advancing ecology and management of African rangelands and pastures in a changing world". Although not a radical change, with its core focus still on rangeland ecology, it accommodates a more diverse membership. This increased diversity is one of the strengths of the Society which has led to the growth in its members. Our membership consists largely of professionals involved in various fields of natural resource management.

The GSSA is a proud society with a remarkable history and is right up there when compared to other societies from other disciplines. Looking back at this year I can report that the Society is a financially viable organisation with excellent administrative support. We are also recognised by the South African Council for Natural Scientific Professions (SACNASP) as a voluntary organisation and is therefore consulted on and informed of various decisions taken. We have a highly respected journal, African Journal of Range and Forage Science with an excellent editorial team. Due to the hard work of this team and solid scientific contributions by our members the journal's ISA rating has once again improved! The Journal has become a highly respected journal drawing manuscripts not only from southern Africa, but also from various parts of the world. Our newsletter and the mouthpiece of the Society, Grassroots, has grown over years in stature and published articles of a semi-scientific nature that is widely read and appreciated by readers. The latest issue alone had seven new articles and three feature articles. All of this is due to our member's contributions and the dedicated and passionate Grassroots editorial team.

The GSSA has placed emphasis on the development of young scientists in the field of range and forage management. As such we are involved in different public relations activities. These include the Eskom Expo's, the holding of farmer's days and the student awards. Through these and other activities and awards the GSSA creates a conducive environment for the development of young scientists. We have become a society where professionals, technical advisors and land owners are encouraged to openly debate issues relating to their respective fields.

As with any other discipline and society we must never become complacent. It is important that we as a society and all its members actively engage with new policies relating to our respective fields of expertise. By supporting each other and by actively marketing our fields of specialisation at all levels of society we will ensure the continued realisation of the importance of rangeland and pasture science and conservation. We must actively market the Society and register new members. At tertiary-level it is important that we actively engage with departments and faculties and imprint the importance of our science. I am a firm believer that our strength lies in our members and our diversity of interests. It is also my belief that we must become a society that, although based on scientific research and principles, actively engages with the semi-scientist, agronomist, rancher and general public. Our research and findings must be put in such a way that everyone can understand and implement it. If our research/science does not culminate in advice/suggestions/guidelines to the general person involved in rangeland and pasture management and ecology, our research and we as a Society would eventually become obsolete. We have much to learn from these people and so can they from us. It is therefore important that we become a society where everyone feels comfortable to belong to and are able to express their experiences and thoughts.

One of the main reasons for the Society being able to deliver excellent service to its members has always been the splendid administrative support delivered by Freyni du Toit who has over the years become synonymous with the GSSA. Unfortunately Freyni will be leaving the Society at

the end of this year to pursue other paths. I have been working with her for the past eleven years. Her dedication and professional approach has been inspiring. Typical of her as a person she will still assist the Society and the new council for a period of one year to ensure a smooth transitional period with the appointment of a new administrator. I want to thank her on behalf of the GSSA for the years of dedication and support she provided. I wish you and your family all the best on your new endeavours and know that you will be highly successful with your new business.

It has been a privilege and honour to have served as the president of this great and prestigious Society. This marks my 11th year as a council member. During this time I have been fortunate to have worked with many great people on the council who have enriched my life. Their unreserved commitment to the Society and its objectives is an example to all of us. I want to thank them and especially the members of this year's council for their dedication and contributions. The Grassland Society of Southern Africa is what each and every member makes of it and together we have made it great and will continue to do so. Being the President and also serving on council for many years have been a most rewarding experience and I encourage each of you to remain members of the Society and also stand for council. With its vibrant and diverse members I am convinced that the Society is in a position to continue serving grassland and pasture scientists in southern Africa for the next fifty years and more.

Western Cape Government
Agriculture
BETTER TOGETHER.

INFORMATION DAY:

OUTENIQUA RESEARCH FARM
MILK PRODUCTION FROM PLANTED PASTURE

Wednesday, 19 October 2016

Presented by Directorates of Plant and Animal Sciences,
Western Cape Department of Agriculture, Outeniqua Research Farm, George

Programme Director: Dr Ilse Trautmann (Chief Director: Research and Technology Development Services)

08:00-08:50	Registration and viewing of exhibits	
08:50-09:00	Scripture reading and prayer	
09:00-09:05	**Welcoming: Dr Ilse Trautmann**	
09:05-09:20	Maize silage: What can still improve?	Robin Meeske
09:20-09:40	Variety choices and Elite Evaluation trials	Sigrun Ammann
09:40-10:00	The production potential of annual and perennial temperate grass varieties	Janke van der Colf
10:00-10:15	Kikuyu over-sown with temperate grasses and legumes: basic principles and production	Janke van der Colf
10:15-10:30	What potential does chicory and plantain have?	Sigrun Ammann
10:30–11:00	**Tea**	
11:00-11:15	Is carbon tax a reality for dairy farmers?	Josef van Wyngaard
11:15-11:30	How to reduce on farm enteric methane production	Josef van Wyngaard
11:30-11:45	Replacing maize grain with dried apple pomace	Lobke Steyn
11:45-12:00	Essential oil as feed-additive for Jersey cows grazing ryegrass pasture	Zanmari Moller
12:00-12:10	Concluding remarks : Nelius van Greunen	
12:10-13:00	**Visit Research Projects:** Cultivar evaluation, Nitrogen application studies, Methane measurement and mitigation, Apple pomace study.	
13:00	**Lunch**	

For more information contact Hennie Gerber or Machelle Zeelie at 044 8033723/7

52nd Annual Congress

Grassland Society of Southern Africa

incorporating
the 8th Research Skills Workshop
and a
Region-Specific Workshop

23 to 28 July 2016

Swadini, a Forever Resort,
Blyde River, Mpumalanga, South Africa

Advancing rangeland ecology and pasture management in Africa www.grassland.org.za

IMPORTANT DATES & DEADLINES

Workshop and special session proposals	20 JAN'17	C52 & RSW2017 registration closes	7 JUL'17
Early bird payments	3 MAR'17	C52 & RSW2017 payments due	12 JUL'17
Abstracts (platforms and standard posters)	10 MAR'17	Regional Workshop registration closes	17 JUL'17
Student sponsorship applications	10 MAR'17	Regional Workshop payments due	19JUL'17
Abstracts (research proposal posters)	12 MAY'17	Late payments	4 AUG'17

REGISTRATION open Sunday, 09h00-10h30, 23 July, Monday, 14h00-17h30, 24 July, Tuesday to Friday, 07h30-08h30
RESEARCH SKILLS WORKSHOP, Sunday 10h00-18h00, 23 July and Monday, 08h00-17h00, 24 July
ANNUAL CONGRESS opens Monday, 18h00, 24 July, then Tuesday to Thursday, 08h00-17h00
MID-CONGRESS TOURS will be on Wednesday 26 July (Pastures is full day, other tours will be half-day)
REGIONAL WORKSHOP (theme tbc), Friday, 08h00-17h00, 28 July