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Grassroots
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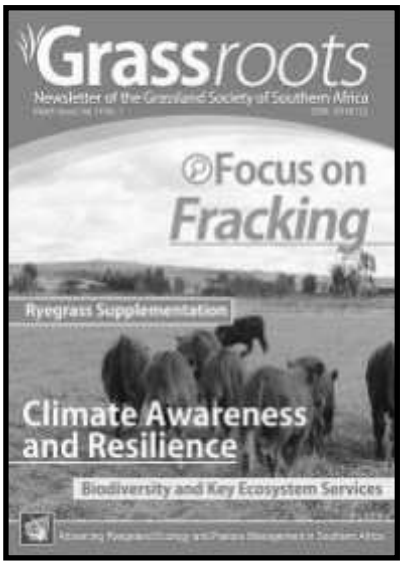

Cover Photo by: Yvette Brits, North West Department of Agriculture and Rural Development

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Editor's Note

Welcome to the first issue of Grassroots for 2014. Grassland and pasture scientists have been exceptional newsmakers over the last three months and this issue is packed with news reports relating to the interest of grassland scientists. This issue contains an interesting report on what Botanists in South Africa aim for in a project to reconstruct a phylogenetic tree at Kew Botanical Gardens in London. This research investigates the influence of the environment on the capacity of plant populations to coexist locally and the historical diversification of lineages that culminates in the botanical taxa that we see today. Within this issue, you will also find news reports on new protected grassland areas in South Africa, updates on the Karoo fracking issue, the work of SAEON Arid Lands Node in the de-proclaimed Vaalbos National Park and much more.

This issue contains two feature articles relating to temperate pastures, one from the dairy producing southern Cape region, and the other on beef production in the North-West province. These articles provide information on supplementation of ryegrass to deliver high quality feed intake all-year round, and the clover or trefoil cultivars best adapted to the local environment and climate and how they fit into specific pasture systems.

Make sure you register on time for the 49th Annual GSSA congress in July this year in Bloemfontein – You will find deadlines and information about registration inside.

Thank you to those who contributed to this issue. Enjoy reading it!

Pieter Swanepoel

WWF hails new protected grassland areas

The World Wildlife Fund (WWF) South Africa is delighted with the recent announcement that two key high-altitude grassland areas have been declared protected areas. The successful declaration of these two sites in northern KwaZulu-Natal represents a milestone for WWF-SA's grasslands programme.

The MEC for Agriculture and Environmental Affairs Dr B M Radebe officially declared the 9251-hectare Pongola Bush Protected Environment and 1387-hectare Ncandu Private Forest and Grassland Reserve on November 19, 2013. The declaration follows years of work with private landowners in partnership with the South African National Biodiversity Institute (SANBI) and provincial conservation authority (Ezemvelo KZN Wildlife). During the campaign, WWF also turned to social media to get members of the public to rally behind the project, gathering more than 2000 signatures of support that were presented to the MEC. WWF South Africa Grasslands Programme Manager Angus Burns said: "Every person who put their name down directly contributed to the successful protection of these critically important water source areas." The resultant formal protection of these high altitude grassland areas is a direct contribution to national and provincial protected area expansion targets. It also secures key water source areas (such as the Pongola and Tugela river system headwaters). Said Burns: "This will ensure that millions of downstream water users have access to a secure water supply in the future thereby enhancing economic development and job creation. Not only is the impact positive for food and water security, but substantial conservation targets are achieved resulting in better protection and management of grassland habitat critical for the unique biodiversity located there.

"The declaration is thus a fitting tribute to the many landowners who had the foresight to formally commit to the protection of their land. Our grasslands work continues to gain momentum which is only achievable through the ongoing support of our partners, private and communal landowners and the general public."

5 things African governments can do to stimulate start-up ecosystems

Jacques Coetzee*

A famous quote by author and New York Times columnist, Thomas L. Friedman goes "every morning in Africa, a gazelle wakes up. It knows it must run faster than the fastest lion or it will be killed. Every morning a lion wakes up. It knows it must outrun the slowest gazelle or it will starve to death. It doesn't matter whether you are a lion or a gazelle. When the sun comes up, you better start running." By this he means that entrepreneurs should be adaptable to whatever environment. We have seen start-ups adapt successfully in tough circumstances in Africa– yes, but governments could also help shape the way entrepreneurs can thrive and not merely survive. In this article we highlight five crucial areas on which African governments should focus in order to improve their start-up ecosystems.

Tech development and digital job creation

In terms of infrastructure, many people have debated the relationship between ICT (Information Communication Technology) development and general economic growth. Start-up culture however, is stimulated by this growth, as communication, information and general practicality of businesses are improved. Rwanda is a classic example where ambition is successfully met by ICT development. The Economist even suggests that Rwanda is Africa's new Singapore. Although there are similar African countries who underwent significant ICT development, Rwanda shows how a landlocked country that lacks an abundance of natural resources, can use innovation to spur growth of a knowledge-based economy.

At the top of this, we find kLab — an innovation hub in Kigali, Rwanda. The innovation hub is part of a host of others across the continent. Among many other things, these hubs mainly stimulate growth of IT entrepreneurs. Although outdone by Mauritius and South Africa, the World Bank ranks Rwanda the third best place in Africa to start a business. Apart from a successful commitment to its ICT sector, the Rwandan government has moulded its ecosystem in a way to encourage start-up culture.

As mentioned in the World Bank Doing Business Report for 2013, Rwanda has improved access to credit, streamlined procedures for starting a business, reduced the time to register property, simplified cross-border trade and made courts more accessible for resolving commercial disputes in the last decade. These, among other policies makes the Rwandan environment attractive for start-ups.

Upgrade skills and motivate

Tech development should go hand-in-hand with skills development. Improving the sector requires more software engineers, for example. Although innovation and focus on ICT can help spur the growth of start-up culture, it still only provides the framework or tools that help stimulate innovation. In a recent communication essay, IBM gives the example where a handful of people who know how to code mobile apps, get together and decide to start a company. That's ambitious and sounds like good news. However, when it comes down to brass tax — running a sustainable company that generates profit — many of those people fail.

Too often start-ups don't understand the fact that it's not a question of if your idea would work, it's a question of how it would work. Managing and building a business requires various skills. These are found through education and experience. As mentioned by Nigeria's minister of finance, the country's graduates need to be "job creators, not job takers." As noted in the Omidyar report, only 7% of tertiary education institutions have an entrepreneurship centre that is dedicated to entrepreneurial development. More so, only 28% offer courses specialising in entrepreneurship, and even less (10%) offer a course in innovation and technology. Governments should promote success stories of Africa's start-ups to inspire younger generations. Also suggested by the report, "Africa needs institutions that are designed from the ground up to prepare young people to be leaders and entrepreneurs."

For example, the Nigerian government is developing training programmes with universities and industrial partners that provide technology and entrepreneurship skills.

Promoting start-up culture through exposure

The continent has made ground-breaking strides in the last decade and is continuing to do so. Africa's culture however, is still very traditional. Many students and families would rather focus time and finances on subjects such as law or medicine than they would on business or entrepreneurship. Start-up competitions like DEMO Africa or innovation hubs such as Afrilabs inspire both potential start-ups and investors to join the scene. LIONS@FRICA is a partnership consisting of organisations such as the US Department of State, Microsoft, DEMO, the African Development Bank and infoDev and focuses on celebrating technology entrepreneurs. The partnership also tries to find ways in which the public and private sector can cooperate to improve Africa's ecosystem. Partnerships and initiatives likes these should be celebrated and encouraged. Exposure can also help attract potential investors both locally and internationally.

Funding can go a long way

One of the most crucial hurdles to overcome is probably funding. It's not just the process of finding willing investors that is difficult, access to government funds and incentives are also rare.

Ventureburn has written a lot on the topic of how difficult it is for start-ups to get their hands on funds. International investors are too often filling this gap. At the same time many of Africa's new businesses are small-scale compared to international big-shots. Investors who'd rather place their money on more familiar, safer and bigger start-ups. According to IBM, venture capitalists usually aim for "US$250 000 and US$1-million. An East African tech start-up with 10 employees can run on US$50 000 for a year." Angel investment should be encouraged and government funding should also be easier available for small-scale businesses. Seed financing can be made more professional to "make investing in small-scale ventures more efficient and cost-effective." Angel networks also offer entrepreneurs access to business experience, as well as capital.

Cutting the red tape

Governments can establish healthy ecosystems and platforms where venture capitalists, entrepreneurs and thought leaders connect.

For example, according to the Omidyar report, Singapore's government has policies that enable investors in startups to receive tax deductions if the company fails. Also, if a company's shares are sold at a loss, new businesses can receive tax exemptions for up to three years.

Government funding is viewed as difficult to access due to bureaucracy and nepotism. Governments can reduce bureaucracy for early-stage companies to access government funding. Cut the red tape. In Rwanda, for example, registering a firm takes three days and is considerably cheap. As the Omidyar report points out, recent improvements to business registration processes have significantly decreased administrative burdens for new businesses in Kenya. On top of that both Kenya and Rwanda have made great strides in improving and focussing on corruption levels in government.

Dear governments, helping startups means helping your country prosper. Hop to it!

* Ventureburn: Startup news for emerging markets. http://venturebirn.com/2013/05/5

Regional stakeholders trained for a climate-resilient future

Claire Davis and Julia Mambo
CSIR Natural Resources and the Environment

The SADC Climate Risk Capacity Building project is aimed at building the capacity of regional stakeholders to understand climate change and climate variability in the SADC region, as well as relevant threats and opportunities, so that these can be integrated into decision-making for a climate-resilient future. This project builds on, and complements, existing initiatives in climate information and dissemination in SADC. Focal countries for the project are Mozambique, Namibia, Zambia and Zimbabwe.

Training courses

In order to build capacity in the face of climate change, a three-day training course was specially developed for Namibia, Mozambique and Zimbabwe based on needs assessment in the three countries. The purpose of the course was to provide stakeholders with access to the latest information on climate variability and change and to improve their understanding, of how to use this information to address climate risk in their planning decisions and strategies. The courses presented in the three countries were all funded and endorsed by USAID, and implemented by the Council for Scientific and Industrial Research (CSIR), Kulima Integrated Development Solutions and the Climate Systems Analysis Group at the University of Cape Town.

Namibia Training Course: 9-11 Oct 2012
The course was presented by Dr Emma Archer van Garderen, Dr Julia Mambo and Claire Davis of the CSIR in South Africa. Guests included Ernst Mbangula of the Africa Adaptation Programme (AAP), Namibia Project Manager Viviane Kinyaga from the Desert Research Foundation of Namibia (DRFN), Dr Justine Braby from the Integrated Environmental Consultants Namibia (IECN), and Guido Van Langenhove from Hydrological Services Namibia.

Mozambique Training Course: 12-14 Sep 2012
The course ran in conjunction with the Instituto Nacional de Meteorologia (INAM) and was presented by Dr Katharine Vincent and Tracy Cull of Kulima Integrated Development Solutions and Claire Davis of the CSIR in SA. Translation (English and Portuguese) was provided by interpreters Marinela Carmo and Fernanda Jones.

Zimbabwe Training Course: 3 - 4 April 2013
The course was run in partnership with Zimbabwe Regional Environment Organisation (ZERO). Presented by Dr Julia Mambo of the CSIR, with guests, Shepard Zvigadza and Joseph Madzvamutse from ZERO, and Abie Jiri from Bio-HUB. Participants were members of the Zimbabwe Climate Change Network, which is comprised mainly of non-governmental organisations, local and international.

Course objectives

The course was intended to equip decision makers with up-to-date information - appropriate for country-level planning - on the impact and risk of climate change and variability. Participants also learnt how to apply the information in practice.

Feedback and recommendations

Most expectations of participants matched with the training objectives. The participants stated that they were acquainted with the full range of models used and the impacts of climate change, and that they found the handbook a very useful source of information for the region. The course clarified issues, misconceptions and terminology such as "climate change" versus "global warming".

The participants felt that the course gave them a better understanding of meteorological concepts (droughts and floods) and the various adaptation options available.

NOTE: The Climate Risk and Vulnerability Handbook for Southern Africa can be downloaded from www.rvatlas.org/sadc.

Participants from the climate change workshop held in Zimbabwe.

Participants from the climate change workshop held in Windhoek, Namibia.

Boaventura Cuamba from the Universidade Eduardo Mondlane presents at the climate change workshop held in Maputo, Mozambique.

Growing a giant phylogenetic tree at Kew Gardens

Genevieve Thompson
SAEON Fynbos Node

The current patterns of botanical diversity in any region are a reflection of two major dynamics over the ages**:** the influence of the environment on the capacity of plant populations to coexist locally; and the historical diversification of lineages that culminates in the botanical taxa that we see today. Determining the Who, What, When, Where and Why of these two processes is incredibly challenging (even in species-depauperate environments) and is unlikely to be completely resolved during any of our lifetimes. Nevertheless, as scientists we have to start somewhere, especially when we are privileged enough to live in a country that houses one of the most botanically renowned floras in the world.

Unfortunately our flora, and many other species-rich environments across the globe**,** is being threatened by a myriad of impacts including habitat destruction, species introductions and global change as a consequence of human activities. Understanding these impacts and predicting vegetation responses in species-rich, heterogeneous landscapes requires a holistic approach that "tackles eco-evolutionary dynamics in a multispecies and a spatial context and therefore provides a more realistic, and potentially more accurate approach to predicting future changes" (Urban *et al*., 2012).

A baseline for natural change

An approach that concurrently considers a range of driving variables (e.g. evolutionary, environmental or stochastic drivers) will help to establish a baseline for what would be considered natural change, versus change that is human induced. To establish such a baseline, we need to have a better understanding of the natural change in floral diversity in South Africa. Our aim is to produce a map of South Africa detailing the distribution of plant phylogenetic diversity relative to priority conservation areas, protected areas, areas of high human density and a range of other impact-related variables. Phylogenetic diversity, or the cumulative evolutionary history of a species, can be measured using phylogenetic trees built with genetic sequence data, and mapped in space using occurrence records from a range of South African databases (e.g. PRECIS and POSA).

Potential correlations of phylogenetic diversity can then be identified by comparing the spatial distribution of phylogenetic diversity to a range of environmental variables such as temperature, rainfall and soil type. This information has a range of applications, which range from the development of networks for monitoring and detecting global change impacts**,** through to conservation planning.

Reconstructing a phylogenetic tree

The reconstruction of a phylogenetic tree that encompasses such a diversity of species requires a range of technical and theoretical expertise. This brought together a team of people including Félix Forest (Kew Gardens, UK), Jonathan Colville (South African National Biodiversity Institute - SANBI), Tony Verboom (University of Cape Town), Jasper Slingsby and Genevieve Thompson (SAEON Fynbos Node). Genevieve visited the Jodrell Lab at Kew Royal Botanical Gardens to work with Félix on the technical analyses associated with the construction of large phylogenetic trees. Félix is the Head of the Molecular Systematics Lab at Kew, and is a well-published plant phylogenetics guru, with an excellent knowledge of South African flora. The June research trip was funded by SANBI (thanks to Jonathan Colville and John Donaldson for facilitating this).

Genevieve arrived ready to soak up some science, armed with a swath of genetic data that needed to be refined and processed. During the visit, almost three and a half thousand genetic sequences were processed, representing the bulk of the two and a half thousand native and introduced genera that occur in South Africa. Genetic data of two gene regions commonly used in DNA barcoding were employed (matK and rbcL) to construct a phylogenetic tree. The measurement of phylogenetic diversity requires a tree that is calibrated (has an evolutionary time scale) using fossil records. Eighteen speciation events, linked to well-studied fossil records, were used to create a calibrated phylogenetic tree and calculate phylogenetic diversity for the sampled South African genera. The next steps in the project continue back at the Fynbos Node in Cape Town, and the project is due to be completed in December 2013. Overall, a wealth of information was gained during the trip to Kew, and good progress was made on the project.

Reference

Urban, M.C., De Meester, L., Vellend, M., Stoks, R. &Vanoverbeke, J. (2012). A crucial step toward realism: re sponses to climate change from an evolving metacommunity perspec tive. Evolutionary Applications, 5, 154-167.

A wing of the Jodrell Laboratory at Kew Royal Botanical Gardens in the UK, with an artist's interpretation of the DNA double helix in the foreground. The steel installation was built in 2003 to commemorate the discovery of the double helix by James Watson and Francis Crick.

Félix Forest, Head of the Molecular Systematics Lab at the Jodrell Lab, Kew Gardens.

Plant material is processed for DNA analysis inside the Jodrell Lab at Kew.

Biodiversity key for feeding the future, researchers say

James Hutton Institute Newsletter

"We must mine the biodiversity in seed banks to help to overcome food shortages," urge Susan McCouch and colleagues, including the James Hutton Institute's Robbie Waugh, as they called on plant scientists to make an effort to domesticate new crops and increase the sustainability of crop-production systems in a comment titled Agriculture: Feeding the future, published in Nature. Humanity depends on fewer than a dozen of the approximately 300,000 species of flowering plants for 80% of its caloric intake. And we capitalise on only a small fraction of the genetic diversity of each of these species.

But food availability must double in the next 25 years to meet demand in the face of climate change, soil degradation, and water and land shortages. More than 1,700 gene banks throughout the world hold hundreds of thousands of seeds from crop species, primitive varieties called land races, crop wild relatives and modern varieties that are no longer in use. Such plants have survived repeated and extreme environmental challenges, yet their resilience and adaptive capacity remain poorly understood. Co-author Robbie Waugh, from the James Hutton Institute and University of Dundee, commented: "The overall purpose of the discussion was to chart a way forward for the use of crop wild relatives in addressing the food security agenda, and to raise the awareness of governments, the general public and – most importantly – possible funders of the enormous potential held within these materials for addressing this critical global challenge."

The authors call for a massive sequencing effort on seed bank holdings so that researchers may "predict plant performance and target field experiments strategically", making plant breeding faster, more efficient and cheaper. They also call for an internationally accessible informatics infrastructure to bring together data that are currently managed independently by gene bank curators, agronomists and breeders. The estimated cost for such a systematic, collaborative global effort to feed the future is around US$200 million annually. This, they conclude, seems like great value, given that as a society we spend about $1 billion each year to run CERN's Large Hadron Collider near Geneva, Switzerland and up to $180 million on a single fighter jet.

Karoo fracking: Water, wealth and whites

The sparse and evocative Karoo, a place for artists and soil-tillers, may soon become a place for geologists, scientists, and fracking.

Ed Cropley
Reuters Southern Africa

Stretching across the heart of South Africa, the Karoo has stirred emotions for centuries, a stunning semi-desert wilderness that draws artists, hunters and the toughest of farmers. It is now rousing less romantic passions. If energy companies and the ANC get their way, it will soon be home to scientists and geologists mapping out shale gas fields touted as game-changers for Africa's biggest economy, and working out whether fracking will work here. As with other prospective sites around the world, especially in Europe, the process is meeting significant opposition, some of it thrown up by Mother Nature, some not.

The result is likely to be a lengthy delay before any exploration starts. Fracking, or hydraulic fracturing, involves digging wells up to 4km deep, then pumping in large amounts of water mixed with chemicals under high pressure to crack the shale rock and release the gas. Not only does the Karoo have very little water – the mighty Kalahari desert lies just to its north – but the oil companies are up against a well-organised grass-roots lobby opposed to anything that could upset its fragile environment.

Violated property rights

Amid the usual array of greens and "not in my back yard" campaigners sits South Africa's richest man, Cartier billionaire Johann Rupert, who is promising to take a legal fight up to the highest court if Pretoria rushes into granting exploration licences. A lack of proper consultation with landowners over exploration, he and his legal team argue, has already violated property rights enshrined in the constitution. They also say that a number of "significant unknowns" about fracking and the geology of the Karoo must be answered before any green light can be considered legally sound. "We do need electricity. I'm not a troglodyte," Rupert, who is worth an estimated $6.6-billion, told Reuters this month after mining minister Susan Shabangu made clear she was keen to give the go-ahead.

"We just want to know that they are doing it in a safe way," he said. "If they do not abide by the law and by the constitution then we'll have to remind them that we do have a constitution." Pro-fracking activists concede that a lengthy legal fight is inevitable. "After the licence has been granted, there is going to be legal battle after legal battle after legal battle," said Vuyisile Booysen, chairperson of the Karoo Shale Gas Community Forum.

Gas hunt

The first formal interest in shale gas in the Karoo began in 2008, with an application for exploration rights – as yet ungranted – by Bundu Oil and Gas, a subsidiary of Australia's Challenger Energy. Shale really made the headlines three years later, when Shell applied for an exploration licence covering more than 95 000 square kilometres, almost a quarter of the Karoo. An outcry from farmers and landowners including Rupert ensued, prompting the government to freeze all new and existing applications while it assessed the risks and rewards of allowing exploration and ultimately production to go ahead.

During that time, the pro-fracking lobby, led by Shell, has laid out its stall. Its key argument is that technically recoverable gas reserves, estimated by the US Energy Information Administration at 390-trillion cubic feet, could transform an economy that has always been a big oil and gas importer. The estimate gives South Africa the world's eighth biggest shale reserves, with nearly two-thirds the deposits estimated in the United States.

Struggling

A Shell-commissioned study by Cape Town-based consultancy Econometrix suggests extracting 50-trillion cubic feet, or 12.8% of potential reserves, would add $20-billion or 0.5% of GDP to the economy every year for 25 years and create 700 000 jobs. With an election in six months, that argument has gained traction, especially as the ruling ANC is struggling to come up with answers for the millions of impoverished black citizens for whom life has changed little in the two decades since apartheid. "By embarking on this process presented by hydraulic fracturing for the production of shale gas, we bring the country a step closer to the achievement of our objectives," Shabangu said this month as revised minerals laws were submitted to parliament. Shell and its effervescent South African chairperson, Bonang Mohale, are convinced their charm offensive will work. He insists Shell will frack safely and with minimum intrusion. "We will get the licence. You can see the frenetic work the government is doing," Mohale told Reuters. "Why would they go to so much work if the intent is not to properly regulate hydraulic fracturing?"

What about the water?

However, the fact remains that the Karoo's environment – particularly its water supply – is very fragile, and local suspicion runs high. In Nieu-Bethesda, a village of 1 500 people some 750km south of Johannesburg, the only permanent water supply since it was founded by frontiersmen in the mid-1800s has been a spring that wells up from deep within the surrounding mountains. Any interruption to that spring's flow or quality and the town of Nieu-Bethesda risks dying out, making it an extreme example of the threat to water safety that has sparked concern at fracking sites around the world. "Shell must stay away from here," said 59-year-old Molly Nikelo, an unemployed grandmother who supplements her meagre monthly state hand-out by cultivating a small plot of rare purple garlic for sale in expensive eateries in Durban.

"What about the water? It supplies everybody and only comes from one place. People drink it, wash in it and grow vegetables with it. I've drunk this water every day of my life and I've never been to hospital."

The racial issue

Emotions are also being stirred by the legacy of white-minority rule that has left a handful of wealthy whites in control of most of South Africa's land, and blacks in dead-end townships waiting for jobs that never arrive. "It has become a very nasty racial issue," said Samuel Zakay, a church minister who came down against fracking after "considerable thought and prayer". "People have accused us black ministers of siding with these rich white people," he said in Graaff-Reinet, a typical Karoo town of quaint, white-washed cottages and Cape Dutch-style buildings with their distinctive rounded gables. The pro-fracking lobby are adamant that whites are going to have to give some ground for the greater good, but insist they have nothing to fear. The people against this project are a few wealthy white residents "who fear losing out", according to Booysen, the pro-fracking activist. "But this is not Zimbabwe where you take farms without compensation. And we are also concerned about the environment. I live here as well, you know."

High stakes

For Shell too, the stakes are high. Having missed out on the US shale gas revolution, South Africa offers a catch-up play and if it can pull off the technology in the Karoo, the firm will be well-placed to tackle the shale gas lodestone – China.

The world's most populous nation has the biggest estimated reserves, at 1 115-trillion cubic feet, most of it thought to sit beneath remote, semi-desert regions similar to the Karoo. Analysts say Shell will likely conquer the technological challenge of fracking in the Karoo, but some are less certain that it can make money out of it. To minimise the visual impact and its physical footprint, Mohale says Shell is looking to build 32 wells on each 100-metre-by-100 metre fracking "pad", compared to the six wells per pad widely used in North Dakota in the United States.

Shell is also adamant it will not compete with people in the Karoo for water, but can avoid trucking it in – often several thousand trips are needed per well – by drilling down to brackish aquifers as much as 4km underground, sucking up the water, cleaning it, and then using it to frack. However, all this pumping and purifying imposes significant costs, and the 10-year outlook for global gas prices is not in Shell's favour, analysts say. "One of the things about shale is that it is a manufacturing process. It's not an exploration and production process," said Philip Verleger, an independent US energy analyst. "It doesn't work if you have to spend huge sums of money finding water, sand or other material."

"However, the fact remains that the Karoo's environment, particularly its water supply, is very fragile"

Climate threat to Southern Africa's crops

The study, published by the International Food Policy Research Institute (IFPRI), and with contributions from scientists in countries across the southern Africa region, uses available data and a variety of models to examine likely agricultural developments, particularly related to crops, in the period to 2050. Agriculture is the primary source of employment and income for most of the rural population in southern Africa. In Malawi about 40% of gross domestic product (GDP) comes from agriculture. In Zimbabwe, about 80% of the population depends directly on agriculture.

More than 50% of agricultural land in the area is devoted to cereal crops, with maize accounting for more than 40% of the total harvested area. Millet and sorghum are also important crops, especially in drier areas. Some countries in the region, such as Botswana and Lesotho, already struggle to meet demand for maize and sorghum and have to import large amounts, mainly from South Africa. The study says climate change, with rising temperatures and increasingly erratic rainfall patterns across much of the region, will likely cause a decline in average maize and sorghum yields. However, some areas, such as southern Mozambique, will see a growth in harvests. Wheat harvests could be particularly vulnerable to rising temperatures.

Extreme weather events – such as droughts, floods and changes in the frequency and intensity of dry spells – already negatively affect agriculture in most parts of Africa, says the study.

"Higher temperatures tend to reduce yields of crops by reducing soil moisture content and the length of the growing season, and in most places they tend to encourage weed and pest proliferation." Most farming in the region is carried out by smallholders who depend on rainfall to water their crops. "Greater variations in precipitation patterns increase the likelihood of crop failures and long-run production declines," says the study. Across much of southern Africa, increasing numbers of people are migrating from rural to urban areas in search of work.

This movement of people could intensify with changes in climate, the study says. Adaptation is key, increased adaptation measures such as planting more drought-resistant crops will help mitigate the impact of climate change. Rising incomes across much of the region will help alleviate some of the problems expected. Governments in many of the countries investigated – Botswana, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Zambia and Zimbabwe – are already undertaking various schemes aimed at helping farmers adapt to climate change.

"Successful agricultural adaptation to climate change is not just about better seeds and practices but building better roads and education systems, which give farmers greater access to markets and the background necessary to make fully informed decisions about new agricultural practices," says the study. However, continuing population growth, along with changes in climate, are likely to worsen food insecurity in the region. According to medium range estimates, the overall population of the southern Africa region is expected to increase by about 70% between now and 2050 – from 142 million to more than 240 million people – with Angola, Malawi, Mozambique and Zambia all more than doubling their populations. However, continuing population growth, along with changes in climate, are likely to worsen food insecurity in the region.

According to medium range estimates, the overall population of the southern Africa region is expected to increase by about 70% between now and 2050 – from 142 million to more than 240 million people – with Angola, Malawi, Mozambique and Zambia all more than doubling their populations.

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SAEON Arid Lands Node takes on monitoring of de-proclaimed Vaalbos Park

Tshililo Ramaswiela, Yolandi Els and Hugo Bezuidenhout
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Named after the dominant Camphor bush (*Tarchonanthus camphoratus*) or regional Afrikaans name "Vaalbos" in the area, the de-proclaimed Vaalbos National Park (VNP) is situated 70 km south west of Kimberley. The Vaal River meandering through the northern, eastern and western side of the park adds to the scenic splendour of the area, which encompasses about 18 000 ha and varies in altitude from 1011-1175 m above sea level. The intermingling of Savanna and Nama Karoo biomes at the Gras-Holpan section makes this park unique. Only a few years back large herds of buffalo and a number of rare and endangered animals such as black rhino and roan antelope roamed the area. The park was once a tourist attraction that featured a wide range of activities including game viewing, a bird hide and a picnic area.

Land claim

Vaalbos National Park was proclaimed in 1986. In 1998 documents were received of a land claim lodged against the park by the adjacent claimant community. In 2002 the land claim was officially gazetted and SANParks accepted the validity of the claim. The VNP was subsequently de-proclaimed in 2006. In March 2006 the first animals were translocated to Mokala National Park, which was proclaimed in 2007.

Long-term observation

A vegetation map of VNP was generated in 1991 as part of a monitoring programme aimed at improving management's understanding of vegetation dynamics in reaction to abiotic (i.e. rainfall) and biotic (i.e. herbivores) impacts, ultimately ensuring the successful management of fauna and flora in the park. The monitoring programme was initiated by Dr Hugo Bezuidenhout from SANParks, who conducted annual surveys at the end of April or beginning of May between 1993 and 2003. In 2011, the decision was made by SAEON's Arid Lands Node to continue monitoring the vegetation of all the plots, using the original methods proposed by Bezuidenhout. The wheel point method was used to determine herbaceous layer to estimate the canopy cover and plant species composition, while the belt transect method was used for the shrub and tree layers - to estimate the plant species composition and density of the woody plant species.

Understanding land use change

In the early 1920s the alluvial diamond mines along the Vaal River were in operation, but all mining activities ceased when a cattle farm was established in the area in the 1960s. The claimant community is expected to change the land use into a mixture of conservation, livestock ranching and crop farming, while small companies are once again mining the floodplain of the Vaal River. Long-term monitoring is vital to understand the interaction between vegetation change and land use.

Preliminary results: Climate

Plot 131 forms part of 30 permanently marked transects in the de-proclaimed VNP where changes in vegetation have been monitored over a period of 19 years. This plot forms part of *Chloris virgata* grassland, which is restricted to the floodplains (adjacent to the Vaal River) along the north-westerly part of the VNP. Vegetation changes (plant cover and composition) in this plot were monitored using wheel point and fixed point photographs.

Plot 131 evolved from a *Chloris virgata* dominated grassland to a *Cynodon dactylon* grazing lawn. Current trends in rainfall might be favouring the dominance in cover of *Cynodon dactylon*. Although there has been a shift in species dominance over the years, the plot did not undergo drastic changes in species composition. The uncertainty surrounding the land claim led to a high stocking rate between 2001 and 2005, which might have put pressure on the *Chloris virgata* grassland.

The specific grass species is known to be sensitive to heavy grazing and the high concentration of game on the floodplain could have influenced the decline of this grass species. The results show that the change in the species dominance and cover of Plot 131 is a combination of increased rainfall and grazing pressure. Monitoring is a long-term process and this study will continue in order to determine trends with expected land-use and changes in climate. Vegetation dynamics in all plant communities of VNP will be analysed (herbaceous and woody components).

The Vaal River meandering through the northern, eastern and western side of the park adds to the scenic splendour of the area

The de-proclaimed Vaalbos National Park was named after the dominant Camphor bush (regional Afrikaans name "Vaalbos") in the area

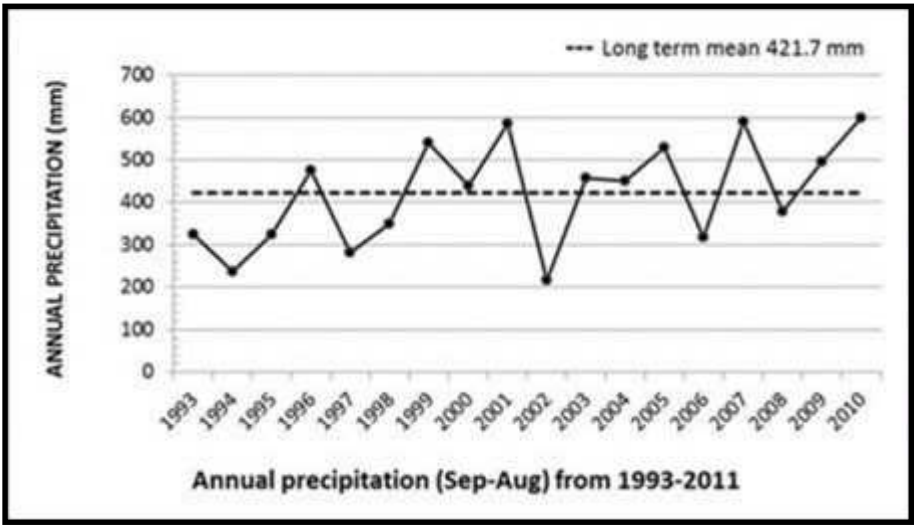

Figure 1. Long-term rainfall trends show an increase in total annual rainfall, with a clear wetter cycle during the last ten years

Figure 2. Fixed point photography reveals a marked change in species cover. In 1993 (photo left), the plot was covered by dense *Chloris virgata* and *Aristida adscensionis* grass species. Nineteen years later the same plot (photo right) is dominated by the *Cynodon dactylon* grass species.

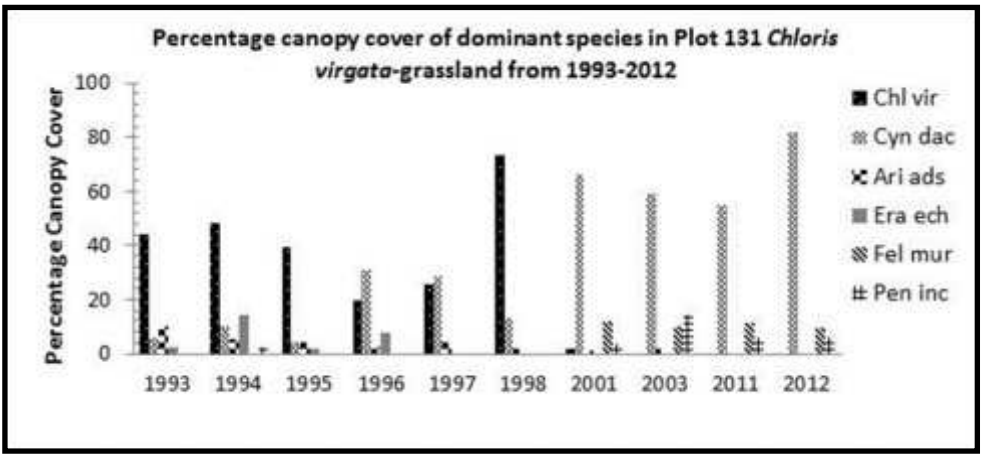

Figure 3. Change in species canopy cover (%) over sampling periods (year) of plot number 131 (Chl vir – *Chloris virgata*, Cyn dac – *Cynodon dactylon*, Ari ads – *Aristida adscensionis*, Era ech – *Eragrostis echinochloidea*, Fel mur – *Felicia muricata* and Pen inc – *Pentzia incana*)

Figure 4. Stocking rate over years in Vaalbos National Park

Revitalising Agricultural Education and Training in South Africa

ASSAf has constituted a 13-member panel to undertake a consensus study on revitalising agricultural education and training (AET) in SA. The consensus study panel is chaired by Professor Frans Swanepoel, Deputy Director of the African Doctoral Academy at the Stellenbosch University, and includes three international panelists. The inaugural meeting will be held on 1-3 October 2013 at the Stellenbosch Institute for Advanced Studies (STIAS). The panel seeks to identify the challenges facing the AET sector in South Africa and to provide recommendations that will ensure efficient and effective education and training.

The agricultural sector is integral to development and a new generation of trained African agricultural scientists is critical in this respect. This necessitates the revitalisation of agricultural education and training in Africa. Agriculture, which includes all economic activities from provision of farming inputs, farming and value adding, remains an important sector in the South African economy. Primary agriculture, although declining, still accounts for approximately 3% of the Gross Domestic Product (GDP) of South Africa, while the larger agro-food complex accounts for another 9%.

South Africa's primary agricultural sector is characterised by dualism: a modern commercial farming sector using hired farm workers, alongside small-scale farmers, mostly in the former homeland areas. In addition, land reform is creating thousands of new farming opportunities for emerging black farmers throughout the country and across the scale from large commercial to smallholder production. Food security has been identified by the South African government as one of its essential programmes and is specifically linked to another essential development programme, namely land reform and rural development.

The success of these two programmes, namely food security, and land reform and rural development, depends on the provision of a human resource base of qualified and skilled agriculturists, which in turn is linked to a need to increase the number of young people interested in agriculture as a career. The main aim of this consensus study is to identify the challenges facing the agricultural education and training sector in South Africa and to provide recommendations that will ensure efficient and effective education and training.

This study intends to:

- Provide a situation analysis of the current South African agricultural education and training system across all levels from secondary schools to universities.
- Identify the challenges faced at each of these levels and provide a set of recommendations to address these challenges, to enhance the attractiveness of agricultural education and training and increase the number of students studying these courses successfully.
- Determine where agriculture graduates get employed after graduation and the roles they play in society and in the economy in the short, medium and long-term and make recommendations to enhance employment opportunities.
- Assess the relevance of curricula to current global challenges of food security, climate change and poverty alleviation and propose relevant interventions, if applicable.
- Assess the role of agriculture in rural development and land reform.
- Relate these findings to best international practices and compare with the situation and needs elsewhere in Africa.

SAYAS Report highlights Challenges of South African Postgraduates

Funding, future opportunities and support regarding mentorship, career guidance and financing are the main concerns and challenges of postgraduate students in South Africa. This emerged in a report of the South African Young Academy of Sciences (SAYAS), entitled The Research Experience of Young Scientists in South Africa. The report analyses a survey conducted by SAYAS on the general needs of young scientists and provides insights into some of the reasons for the low production rate of doctoral students in the country.

The survey focused on the profile and research experience of postgraduate students and postdoctoral fellows in South Africa - Honours to post-PhD. A total of 1 021 young scientists took part in the survey. A key finding of the survey is that 43% of participants indicated that the reason for pursuing postgraduate studies was the desire to pursue an academic career. This proportion increased to 58% among PhD students and postdoctoral fellows. While career opportunities in the tertiary education sector may not be sufficient to satisfy these aspirations at present, the report highlights that young scientists may not know about the developmental needs of the country and other career opportunities. Another finding is that the majority (64%) of young scientists afforded their studies through bursaries. Participants emphasised the need for adequate financial support at all levels. "Arguably, if more bursaries are not made available, the number of postgraduate students in South Africa will not increase," the report states. In a section of the survey inviting specific concerns from respondents, the majority voiced unease about funding of postgraduate studies. Since many respondents were bursary holders, the concerns may have been about funding the next level of study. The second key focus of the open-ended responses was on the need for more opportunities following completion of the current degree with the third a focus on support. The latter include financial support, career guidance and mentorship. A total of 82.5% of respondents indicated that they see the need for, or the value of, having a mentor in addition to their supervisor. Other findings include awareness among participants of the importance of quality - teaching institution choice, supervisor choice, high-quality teaching - and the need to publish research results. The majority of responses were from white respondents (65%), with one fifth of responses from black respondents, indicating over-representation of white and under-representation of black respondents based on national enrolment figures at institutions of 19% and 59%, respectively. Representation from female students (56%) and Masters students (46%) were in line with national enrolment figures, but respondents enrolled for natural sciences (39%) were higher than the national enrolment of 11%. Approximately 70% of the respondents originated from four of the largest tertiary institutions in South Africa.

Chinese are becoming more protective of African wildlife

Li Lianxing

China Daily publishes the e-mail addresses of its reporters along with their articles, which means I receive plenty of feedback, criticism and suggestions on the various issues I write about. In most cases, I receive just a few comments, but one cover story I wrote last year on African conservation and China has prompted a continuous supply of e-mails, demonstrating the interest readers have in this topic. Many of them are from outside China, saying that I should tell the Chinese people what is happening in Africa and raise their awareness, so as to prevent poaching here. But if one can read Chinese and examine Chinese social media, one will see that public awareness and education on wildlife conservation has greatly improved, largely thanks to online social media. Last week, the Tanzanian government detained three Chinese suspects for illegally possessing a huge haul of 706 elephants tusks in their residence in Dar es Salaam. Tourism Minister Khamis Kagasheki said, "It means 353 elephants were killed to get all those tusks."

That was the front page and headline news for all major media in Tanzania, and African people again became angry about the poaching and smuggling. But this time, Chinese people are getting even angrier, especially with their compatriots living and working in Africa. "I really have no idea what they are thinking about, and the image of the Chinese community is being ruined by such people, "wrote one Tanzania-based Chinese businessman on Sina Weibo, China's version of Twitter. Since the microblog became popular in China in 2009, it has turned into a significant platform for public discussion on many social issues, as well as a means of disseminating information. By the end of 2012, more than 500 million users had registered with Sina Weibo.

As soon as the news of the ivory haul had been released in Tanzania, it was translated into Chinese and posted on the Internet. The story was read by more than 10,000 users in just one day, and many netizens left messages expressing their anger over the smuggling. Some of the messages were quite extreme, such as one saying, "Their teeth should be taken away and they should be put in the zoo". Others called for prison sentences for the suspects, similar to the 31-month jail term handed down to a Chinese woman in August for smuggling ivory products in Kenya. Chinese expatriates working in Africa are probably the most disappointed and angry group, as they were normally perceived as the main buyers of ivory products, although most of them are innocent. I'm a member of an online chat group organized by Chinese expatriates in Kenya. It has around 500 members, representing almost all business communities in the country.

Any member asking how to buy ivory products and take them back to China is immediately banned from the group. While the Internet has become a place for exchanging opinions, it also serves as a public education platform in terms of wildlife protection in China. Influential Chinese celebrities like former NBA star Yao Ming and actress Li Bingbing have visited Africa and learned how serious the poaching is. They have been publicizing their views within Africa and calling on their millions of followers to stop buying ivory products. According to statistics provided by Weibo, the platforms recent online discussion on the topic "Save the Elephants" generated more than 11.4 million messages.

Not only has the Chinese community in Africa become more aware of anti-poaching efforts, but the younger generations in China are helping to raise awareness in their own country. Zhuo Qiang, a Chinese conservationist living in Africa, told me that a recent lecture he gave on wildlife protection was very popular with college students in China and he has helped them establish many campus associations focusing on wildlife protection and conservation across the country. But of course, this is not and should not be a unilateral effort. Zhuo, who is director of the Eastern Africa Wildlife Society, said that African governments should also collaborate with international players to stop poaching at the very start of the supply chain.

A Kenya Wildlife Service ranger inspects and numbers a confiscated ivory consignment at the Mombasa Port on Oct 8. The Kenya Ports Authority intercepted a container with illegal ivory packed between bags of sesame seeds. [Ivan Lieman / Agence France-Presse]

Outeniqua Research Farm celebrates 60 years of excellence

Dr Ilse Trautmann
Chief Director: Research and Technology Development Services, Department of Agriculture Western Cape

The Outeniqua Research Farm of the Department of Agriculture Western Cape celebrated 60 years of excellence in pasture and dairy research on the 29 October 2013. This farm boasts the only pasture and dairy research group of its kind in South Africa, resulting in Outeniqua being a centre of excellence for pastures-for-dairy research. It is also the only research institution with pasture and animal capacity and infrastructure to carry out research on the scale where animal production and economics can be evaluated and a benchmark set for producers.

The Western Cape Minister for Agriculture and Rural Development, Minister Gerrit van Rensburg, congratulated the Outeniqua research team for their contributions to the industry and emphasized the significance of high research standards and its relevance to the agricultural sector. During the event, the Department launched 3 publications (compilations of research papers and posters of trials conducted at the Outeniqua Research Farm and the celebratory book "Outeniqua Research Farm 60 years of excellence: A snapshot of research (1953-2013)"). These publications were published in partnership with Agriconnect.

The day programme included the opening address of Minister van Rensburg, a keynote presentation by Prof. Leopoldt van Huyssteen, Chief Operating Officer of the University of Stellenbosch, highlighting the challenges of research for the 21st century, and information sessions disseminating current research findings presented by researchers and students at the farm. Mr. Nelius van Greunen, one of the leading farmers in the Southern Cape, expressed his gratitude to the research effort at Outeniqua in his presentation titled "Outeniqua research farm: the farmers' partner to success".

Four hundred people attended this event. A DVD on Outeniqua Research Farm, its research focus and partnerships with industry and tertiary institutions, to name but a few, was also launched at this event. The DVD can be obtained at Outeniqua Research Farm. The celebrations ended with the 60 year anniversary gala dinner, to celebrate the achievements of the Outeniqua Research team with staff, management and farmers, better together!

Eco-Logic award winners announced

Following a nail-biting month or so for finalists, the Eco-Logic Awards ceremony for 2013 took place on Thursday, 26 September at Maropeng in the Cradle of Humankind, Gauteng. Hosted by The Enviropaedia, in association with SABC3, the glittering event focuses on Eco-Logic – a mindset and value system that goes beyond products and manufacturing to include how we run our businesses; how we live in society and our communities and the application of natural law to our politics and economy. The following category winners personified these values.

Water Conservation Award (sponsored by Rand Water) Hotel Verde – claiming the title of "Africa's Greenest Hotel", Hotel Verde is harvesting and saving water on all fronts.

Energy Saving Award (sponsored by SMA Solar Technology South Africa) Pick 'n Pay – Pick 'n Pay's ambitious energy efficiency initiatives target both operational and behavioural changes and these have achieved an impressive 8.7% improvement in energy usage during the past year.

Recycling Award (sponsored by Collect-a-Can) GreenOffice – greenABLE is a non-profit company that employs previously disadvantaged persons with physical disabilities to dismantle printer cartridge waste into their recyclable components. This process enables them to enables them to earn a salary whilst gaining work experience and furthering their education through AET and learnerships. greenOffice was instrumental in the establishment of greenABLE, the first and only facility in Africa to have a recycling solution for printer cartridge waste.

Biodiversity Award (sponsored by Exxaro) The JNF Walter Sisulu Environmental Centre – a centre that serves as a resource of learning for the community and schools of Mamelodi. The centre hosts demonstrations of best practice on important environmental themes including Biodiversity, Water, Energy and Waste – to educate and mobilise learners from schools and the broader community to actively participate in active change towards a more sustainable environment.

Climate Change Award (sponsored by Paarl Media) Coca Cola SA – has completed building its new filling plant in Heidelberg for the water brand, Valpré. The office block achieved Gold Leadership in Energy and Environmental Design certification in 2012 and in March 2013, the production facility achieved Silver status. The plant boasts the lowest Environmental Impact in Africa.

Municipalities Award (sponsored by Santam) George Municipality – the municipality does not only strive to deliver excellent quality services to its residents,

but to do so in a sustainable and environmentally sensitive manner. George has received numerous environmental awards in recent years and aims to be a leader in the field of sustainable city management.

Youth Award (sponsored by Pick 'n Pay) Birches Pre-Primary Eco School – The Birches is a small Eco-school in Pinetown. Struggling financially over the years; the school made a determined effort to become environmentally self-sustainable. The environmental initiatives implemented at the school have included; recycling; water harvesting and re-use; food gardens and fruit forests. Whilst it has taken 20 years of ongoing dedicated and intelligently applied effort, in an exercise done recently in Grade R; the students confirmed that as a result of all the work done, they can now live on the premises comfortably and sustainably as if it were an island - for the rest of their lives.

Eco-Angel Award (sponsored by ACSA) Margaret Roestorf – SANCCOB – As CEO of the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Margaret talks penguins, gannets, cormorants, pelicans, petrels and albatrosses. Wherever she goes in the world she warmly encourages people to support marine conservation projects that protect and conserve these precious seabirds and the marine environment they depend on. Her committed and dedicated efforts bring conservation dollars and euros into Southern Africa, and her enthusiastic interaction with conservationists and governments around the world is successfully raising the profile of these highly threatened birds.

Eco-Warrior Award (sponsored by RISO) Jeunesse Park – Food & Trees for Africa - a visionary ecopreneur and change agent who started Food & Trees for Africa (FTFA) in 1990, which since then has distributed 4.2 million trees, facilitated the development of thousands of natural food gardens, several bamboo plantations and organic farms for disadvantaged communities. Jeunesse's pioneering vision and leadership has also included: Introducing Permaculture to South Africa, lobbying for and contributing to the inclusion of urban forestry, urban agriculture and Permaculture in South African government policy, envisioning and enabling the first online South African carbon calculator and motivating the first bamboo programme registered for carbon offset under the Verified Carbon Standard in 2011. Jeunesse is also the founder of the Carbon Protocol of South Africa and the Climate Change Leadership/Climate Hero Awards. As a dedicated and tireless eco-warrior, Jeunesse is also currently a Climate Leader, Mentor and African Branch Manager for Al Gore's Climate Reality Project.

Eco-Innovation Award (sponsored by Standard Bank) Era Architects - House Jones – An Island Home: The house is a carefully designed energy efficient system to create comfort both inside and outside harnessing its natural environment and climate. It mediates between the indoor and outdoor environments with planted "green bubbles" of space.

It supplies its own water and recycles all its waste. A comprehensive energy strategy using solar thermal, PV, and gas ensure independence.

Eco-Community Award (sponsored by SABC3) Usizo Thuso Community Centre - The aim of Usizo Thuso Community Centre is to create a sustainable living for the people of Lawley. They take a holistic approach to wellbeing and address the need for sustainable livelihoods by developing their bio energy farmers and supporting local agro processing to ensure local economic development.

Transport Award (Sponsored by Toyota) FindaLift - FindaLift encourages and enables South Africans to make better use of cars by providing simple online tools that securely matches members on similar routes, making carpooling easy to arrange.

Says David Parry-Davis, editor of The Enviropaedia and co-host of the Eco-Logic Awards: "The entries this year were of a very high quality and it was a tough judging process to decide on a winner for each category. The 2013 Awards included new categories (such as the Municipality category), networking events and sponsors and we are growing at a faster pace than we initially envisaged. We are proud to be part of this thriving Eco-Logic community and look forward to 2014." The ceremony awarded many recipients in various sectors, and was culminated with the Eco-Logic 2013 Lifetime Achievement Award, which was awarded to Dr. John Hanks.

Dr. John Hanks' Lifetime Achievement Award – Acceptance Speech

"It is a very great honour to receive this Lifetime Achievement Award - thank you so much. In accepting it, I must in turn give recognition and say a very big thank you to so many wonderful people I have had the privilege to know and work with over the last 50 years, far too many to mention by name in a few minutes. Anything I have achieved would have been impossible without their enthusiastic support. One however I must mention – my wife Carol, who deserves an award of her own for putting up with me for nearly 50 years and giving me her constant encouragement. It's so interesting for me to look back and see how issues and priority concerns have changed. My first job in Africa in 1965 was as the biologist in the Kafue National Park (KNP) in Zambia, a wonderfully wild and remote part of Africa.

In 1965, the word biodiversity was not in use, and our focus was very much on the large mammals. Armed with a pencil, notebook, binoculars, it was amazing how much we achieved. In the 1960s, nobody thought about the communities living outside the Park. Terms like Community Based Natural Resource Management (CBNRM), were unknown. If anyone had suggested that one day KNP would be part of a massive Transfrontier Conservation Area (TFCA) linking together national parks and game reserves in Zambia, Zimbabwe, Botswana, Namibia and Angola into one contiguous entity, it would have been unimaginable. We did some of the first pioneering work with the drug M99, and were very pleased when we marked our first elephant to study its movements,

with paint on the ear and a tin plate strapped around its tail. Unfortunately it was never re-sighted. Nobody could have imagined that 40 years later elephants would be fitted with collars that would send a signal to a satellite, and that information would come back to a thing called a laptop where each elephant's movements could be plotted on a map in real time. In 1961, an estimated three billion people lived on the planet. Fifty years later the human global population exceeded seven billion, a staggering increase of four billion! With the related massive demands for food production and living space, land transformation has taken place at an unprecedented rate in that relatively short time, with natural habitats being destroyed and biodiversity lost in every continent. The conservation challenges we face today are very different to those in 1965. I have no doubt that the multitude of problems linked directly and indirectly to human population growth are by far and away the greatest threat to African wildlife, as was recently stressed by the respected broadcaster and naturalist, Sir David Attenborough. For various reasons there is reluctance on the part of most conservation NGOs to put human population growth in Africa on their agendas of issues threatening the continent's biodiversity. The rate of land transformation should be a real concern on its own, but when coupled the drop in funding for virtually every protected area in every country in Africa as governments struggle to meet demands for social services, health facilities, education and job creation, and with accelerating human encroachment into these areas, isn't it time we woke up and put population growth as a priority concern? In accepting this award, I must echo the words of Sir Peter Scott, the Founder Chairman of WWF, who said: "The conservationist's most important task, if we are to save the earth, is to educate." I was reminded just the other day of the importance of those words when I was asked by a prominent business leader why he should donate funds for conservation projects. Surely there are more important things to support?

So here is the challenge for all of us today. We must get across the message that environmental conservation is not a luxury, but instead a vitally important prerequisite for building a sustainable future for South Africa. There is not a single industry or business that can have a sustainable future without well conserved and managed natural systems. We MUST get across the vital importance of protecting biodiversity and ecosystems that support life (clean water and air, soil genesis, pollination, and other key ecosystems services). The priority then is to move biodiversity conservation right up on the national agenda where it will receive the required funding and political support so urgently needed. The identification, nurturing, mentoring and encouraging of the conservation champions and leaders of the future must receive priority attention. All of us can help here particularly the prize winners today, and there are three most important attributes you must embrace to do this, namely passion, optimism and enthusiasm. You can all change the world, put environmental conservation as one of our greatest priorities, and make the world a better place. What a wonderful opportunity you all have."

What's on the menu? Ryegrass (*Lolium multiflorum var. Westerwoldicum*) & Supplementation

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The utilization of irrigated pasture to finish off weaners is a practice explored especially during times of high maize prices. Limited data are available for the production potential of beef weaner calves that are finished off on irrigated annual winter crops with molasses based supplementation on the highveld of South Africa with an economic analysis. The aim of this study was to evaluate the effects of different supplementation, namely phosphate, protein and energy (all molasses based), on the economical production on weaner calves grazing irrigated annual *Lolium multiflorum var. westerwoldicum* and to develop strategies for best management practices for such a system. Key objectives were to determine the economic viability of finishing off calves on annual grazing and the advantages, if any, of using the supplementation in conjunction with winter grazing.

Action Plan

Locality

The trial was carried out at Potchefstroom Agricultural Development Centre in the central part of South Africa. The area is characterised by a level landscape mixed land use activities. It is a summer rainfall area, with cold winters. Irrigation is a common land use activity in the area.

Pastures

The trial was conducted on annual monoculture irrigated ryegrass. A tetraploid Westerwold cultivar was used (Energa). Standard irrigated pasture establishment, fertilisation and utilisation practices were applied during the trial. Pastures were utilised 24 hours of the day. Utilisation started at 9.7 oxen per hectare. Haybales were available for the oxen on the pastures as roughage.

Trial animals

Weaner cross oxen calves (Simmentaler + Afrikaner + Bonsmara) available locally from Potchefstroom LIC's extensive veld herd, born during spring 2010 were weaned in autumn 2011 (May), being about 7 months of age. The calves were also branded, castrated, dehorned, tattooed and dipped by the weaning date, 3 May 2011. The animals were slaughtered at the end of the trial for carcass evaluation.

Treatments

The animals were divided randomly into 3 groups of 12 animals each, marked with tags corresponding with different supplementation licks awarded to each group. The supplementations included:
A. Control (phosphate supplementation)
B. Energy – Protein supplementation
C. Pure Energy supplementation. (See Table 1 – Supplementation Scheduling)
Animals were managed in the groups according to the colour ear tag.

Data

All the animals were weighed once a month, beginning and end mass on an empty stomach. Notes on all supplementation intake per group were recorded on a weekly basis. Representative pasture samples were taken over the production period, to determine dry matter production. Records were kept on any abnormalities, (e.g. sick animals and their treatment.) At the end of the trial the animals were slaughtered and subjected to carcass grading.

Results

General

Autumn of 2011 was characterised by very wet conditions, influencing the establishment of the pastures, which only took place 2-3 weeks later than planned, on 25 March 2011. However, it was still estabished within the normal recommendation period. Initially, establishment was good and utilisation started on 25 May 2011. Over-utilising of the pastures occurred at a stocking rate of 9.7 calves per hectare and was adjusted to 8.1 calves per hectare, which was more sustainable. Because of the lower production of the ryegrass during the late winter, together with the extremely long cold periods which impaired production even more, the animals were taken off the pastures from 4 July 2011 up until 28 August 2011, when grazing continued on the pastures. Figure 1 is a diagramatic representation of the fodder flow. During the withdrawal period, the animals received Smuts finger hay in the kraal as feed. The total utilisation period, as from 25 May 2011, extended over 191 days, until 2 December 2011, including the hay period of 55 days. The hay supplemented to the animals on the pastures, was utilised initially, but as the pastures matured, the hay was left unutilised.

Growth data

Figures 2, 3 and 4 respectively indicate the average daily gain (ADG) in grams between the weighings, progressive ADG and mass between weighings, progressive ADG and mass changes of the herd over time. The initially high ADG which drastically decrease and then increase during May – June is a result of the first weighing on empty stomach, after which full stomach weighings took place. The actual adjustment was reflected during early June. During spring, Figure 2 shows ADG performance of 1 600 grams per day, but it was not sustainable over the entire period. The variation between weighings clearly indicates that the data should be viewed with caution over short periods of time.

Figure 1: Fodder flow

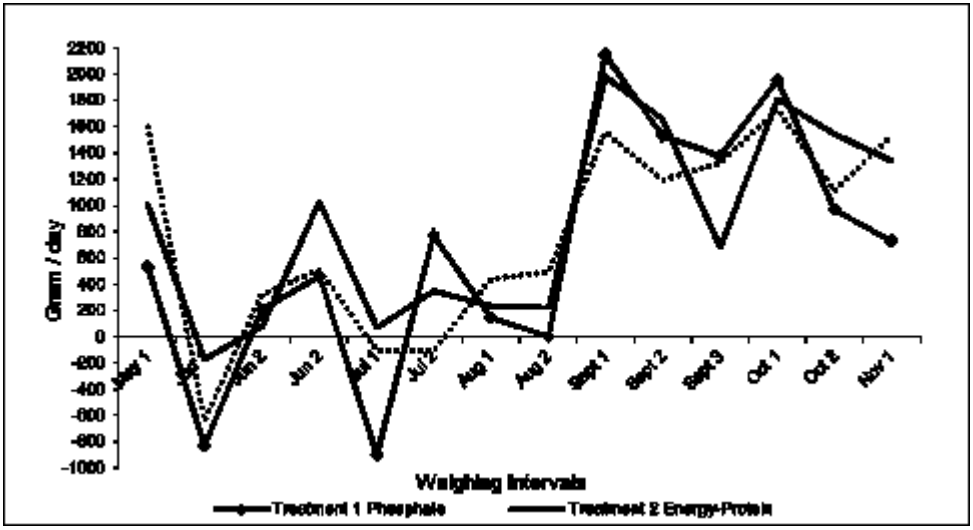

Figure 2: Average Daily Gain (ADG) of the oxen on irrigated ryegrass

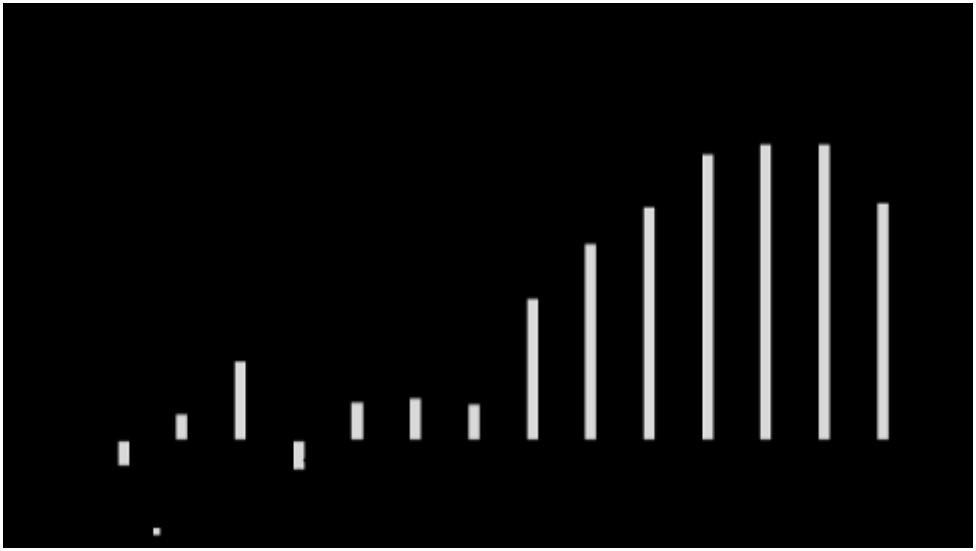

Figure 3: Progressive ADG of the oxen on irrigated Ryegrass pastures

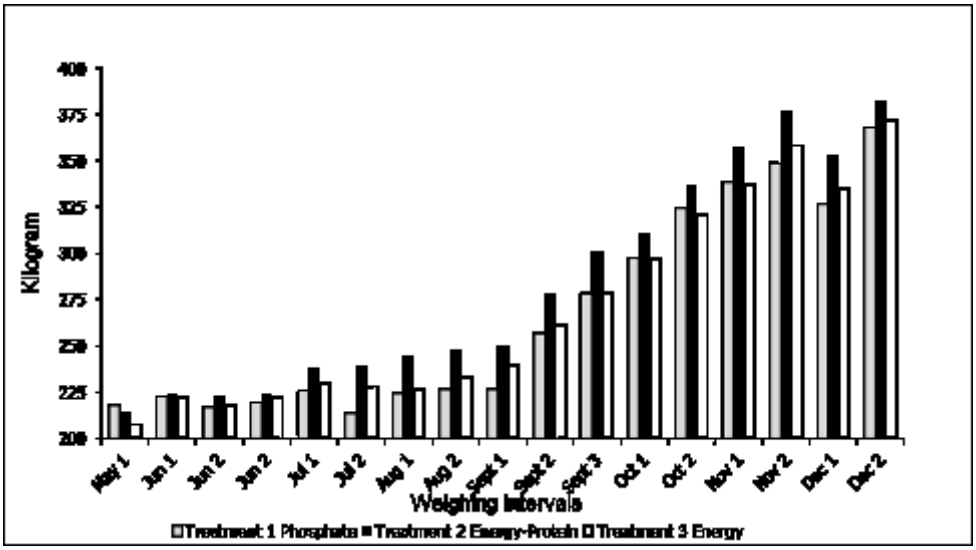

Figure 4: Weight changes of oxen on irrigated Ryegrass

The empty stomach data at the beginning of May, was left out in Figure 3, as ADG figures of higher than 1600g were noted, which formed a skew depiction of the data. The same reason is responsible for the fall in progressive ADG at the end of the period (Nov) which is the actual to progressive empty stomach ADG. Note the ADG of Treatment 1 versus 2 and 3 during May – June in Figure 3, indicating the positive impact energy supplementation has on adjustment. The respective progressive ADG figures from empty stomach to empty stomach are reflected in Table 2, during the hay, ryegrass and total phase. The restrictive effect of the ryegrass deficit (hay supplementation) resulted during July, can clearly be seen in the progressive ADG figures of 700g/day, compared with only the ADG on ryegrass, of over 900g. Figure 3 indicates a reliable picture of the performance of various treatments in general.

Figure 4 gives a good indication of the mass increases of the respective groups. The decrease in the mass towards the end of the period was a result of the effect between empty stomach and full stomach weighings. Table 3 shows the effect of empty and full stomach weights on data. The average for all the groups was 8%, that can influence data significantly, when empty stomach data is not used throughout. The difference is as high as 12% when animals reach maturity. Figure 5 shows the supplementation intake of the various treatments. After the adaption phase, a clear increase in supplementation intake was reflected, during June, when the pasture production decreased. A clear increase of supplementation intake was noticeable during this period when animals were fed on Smuts finger hay, with a 4.62% protein content. In September, the supplementation intake decreased, with the shift back to the ryegrass pastures. A gradual increase was shown as the pastures matured and resulted in weight gain of the animals. Treatment 1 (phosphate) intake, remained low, as expected, with Treatment 2 (energy-protein) and 3 (energy) clearly reflecting pasture quality. Table 4 is an explanatory summary of the supplementation intakes. Should Table 4 be interpreted with the growth data, it is evident that the energy-protein combination supplementation showed the best production results. Supplementation intake during the maximum intake only just exceeded 1 kg per day and was *ad lib* available.

The slaughtering data of the various treatments are shown in Figure 6. All the animals had a carcass grading of A2, without any carcass penalisation for abnormalities. Animals were finished off, despite the final average mass of 374 kg. All the organs were healthy with no injuries or parasite infestations. The official slaughtering percentage is cold carcass mass ÷ empty stomach live mass. The full stomach slaughtering percentage is included in order to demonstrate how misleading the results can be when incorrectly calculated. Table 5 is a summary of the production data with the economic performance achieved. Supplementation costs were calculated from the average supplementation prices for 2011, delivered at Potchefstroom. Purchase hoof price during May 2011 was R 17.17/kg and carcass selling price during December 2011 was R32.50/kg.

Table 1: Supplementation Scheduling of 2011

	Gram / day		
Treatment	**Hay only**	**Rye grass only**	**Total phase**
Treatment 1 Phosphate	7	799	571
Treatment 2 Energy - Protein	167	944	720
Treatment 3 Energy	62	907	664

Table 2: Progressive ADG of the respective treatments

	Trial start			
Treatment	Empty Stomach (kg)	Full Stomach (Kg)	Difference (kg)	%
Treatment 1 Phosphate	216	222	5	2.20%
Treatment 2 Energy-Protein	215	224	9	4.20%
Treatment 3 Energy	206	222	14	6.90%
	Trial ends			
Treatment	Empty Stomach (kg)	Full Stomach (Kg)	Difference (kg)	%
Treatment 1 Phosphate	327	368	41	12.70%
Treatment 2 Energy-Protein	352	383	30	8.60%
Treatment 3 Energy	335	372	37	11.10%

Table 3: Effect of empty and full stomach mass of cattle

Table 4: Explanatory summary of supplementation intakes

The figure of around 1000 kg live weight produced per hectare is slightly lower than figures of 1200 kg of meat, but the extremely cold winter, and the clay soil type on which the pastures were established, had an inhibitory effect on production. Given the circumstances, performance was satisfactory. It must be recognised that the pastures were fully utilised and not over utilised, reflecting the increase in supplementation and sometimes the increased production figures, which is not a genuine reflection of the grazing capacity.

The principle of the diminishing returns is observed in the production performance of Treatment 2 (1041 kg/ha) which is better than Treatment 3 (1000 kg/ha). The cost of the performance in Treatment 2 amounts to R 2369/ha lick costs, resulting in a nett income of R6464/ha. The supplementation costs of Treatment 3 totalled to R1531/ha, at the slightly lower performance of animals, with the nett income realising to R6833, which is better by R369 of 6%. Due to the many variables that play a role in animal performance, the difference is not very big, and the message should be that the energy supplementation, favours economic performance more than energy-protein in this study.

Conclusion

From the above mentioned data it is evident that the animals can be economically successfully finished off on irrigated annual ryegrass. The supplementation of energy both lead to increased animal performance, as well as economically viable performance.

Energy supplementations benefit growth rapidly, especially in the adaption phase. Energy-protein supplementation leads to increased animal performance, but not necessarily to higher economic performance. Supplementation intake levels in Treament 2 and 3 were lower than expected, but there is an interaction between the grazing pressure and intake level. Higher grazing pressure will lead to higher supplementation intake. The decrease in ryegrass production during the winter is clearly shown, resulting in a R2000/ha cost, due to hay that was supplemented. If the pastures should have been sufficient for the winter months, carcass mass could have been higher. Price trends during the year benefits the system and according to industry, must not be marketed before the first week in December. The system is extremely product price sensitive. A three percent shift in carcass price (R1/kg shift) leads to a 30% variation in nett income per hectare (R1600/ha shift). A 15% price shift in lick costs (± R330/ton) results in a 5% shift in net income (R350/ha).

Recommendations

- Provision should be made for the decline in dry matter production during the winter by attempting to establish the pastures before end February.
- Provision should be made for hay utilisation.
- Supplementation should mainly be energy supplementation, with a maximum protein value of 10%.

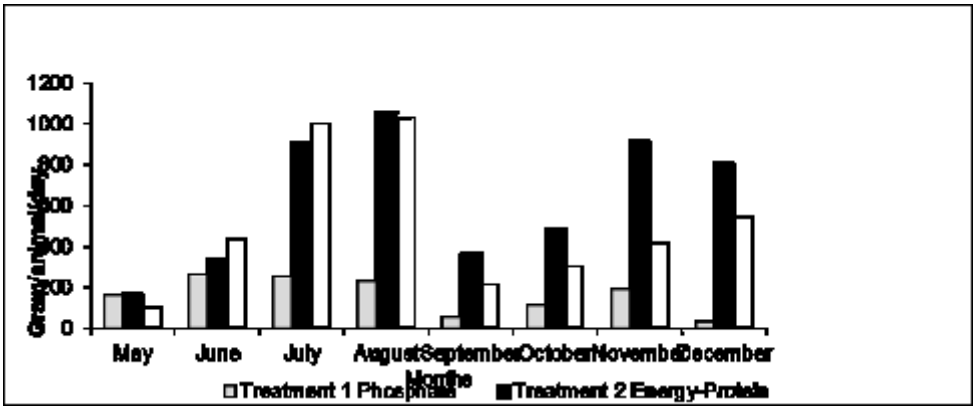

Figure 5: Supplementation intake by the respective treatment groups on irrigated ryegrass

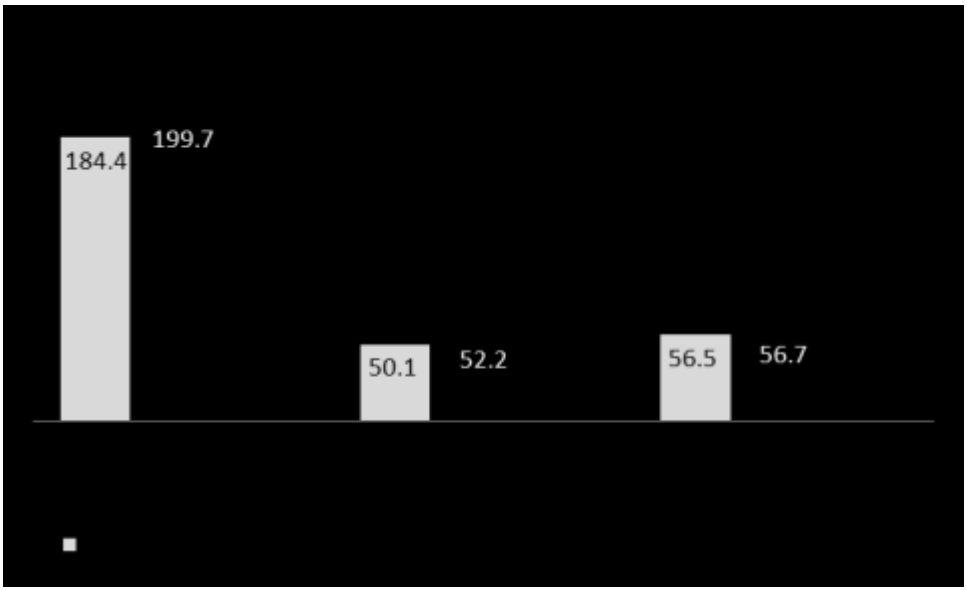

Figure 6: Summary of slaughtering data

Production data			
	Treatment 1: Phosphate	Treatment 2: Energy-Protein	Treatment 3: Energy
Average Purchase mass (Kg)	219	223	219
Mass increase/animal (kg)	109	138	127
Selling Carcass mass (kg)	184	200	195
Slaughtering %	56.50%	56.70%	58.30%
GDT (Gram/day)	571	720	664
Kg Living mass production/ha	881	1041	1000
Supplementation intake (Gram/dag)/ha	183	684	570
Rand/ha			
Total start livestock value (R17.7 hoof price May 2011)	R 31 543	R 32 119	R 31 471
Total supplementation costs (Suppl @ 2011 floor price Potchefstroom)	R 993	R 2 369	R 1 531
Total hay cost (R900/ton)	R 1 970	R 2 143	R 2 029
Process cost (@ R80/animal)	R650	R650	R650
Pasture cost (@R9027/ha)	R9027	R9027	R 9 027
Total expenses (Rand)	R 44 184	R 46 308	R 44 709
Carcass income (R 32.50 A2 carcass price Dec 2011)	**R 48 724**	**R 52 772**	**R 51 542**
Nett Income (Rand)	**R 4 540**	**R 6 464**	**R 6 833**
Interest on investment	**9.30%**	**12.20%**	**13.30%**

Table 5: A summary of production data with the economic performance achieved.

- Supplementation feeding is highly recommended, especially during the adjustment phase.
- Supplementation must be palatable and *ad lib* available.
- Depending on resource and management skills, the stocking rate of 8 – 9, 220 kg weaners during the autumn is a realistic figure.
- Price margin management of the animals is the single most important factor that needs to be managed.

Reference

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The Production Potential of Red Clover, White Clover, Strawberry Clover and Trefoil Culivars

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Introduction

Grain and forage legumes occupy 12% to 15% of the Earth's arable land (Graham and Vance 2003). Mixed pastures containing legumes have the advantage over grass pastures in that they are often of high quality and add N to the cropping system (Brock and Hay 2001, Graham and Vance 2003, Dahlin and Stenberg 2010). Biologically fixed nitrogen is derived from solar energy, whereas N fertilizer requires significant amounts of fossil fuels and other commercial energy sources to produce, with perennial legumes the most economical way of decreasing the reliance on these expensive sources of inorganic nitrogen (Neal *et al*. 2009). The inclusion of perennial legumes and grasses is thus the most likely base whereby to improve the sustainability and long term survival of pasture systems (Cransberg and McFarlane 1994).

Clovers and trefoil are some of the most important forage legumes worldwide (Graham and Vance 2003). The variation in the spread of seasonal production between different cultivars and species, accompanied by the broad range of genetic resources available necessitate different cultivars of perennial clovers and trefoil under the local climatic and environmental conditions of the Western Cape. The aim of this study was to evaluate and compare the production potential of different perennial legumes such as white clover, red clover, strawberry clover and birdsfoot trefoil.

Materials and Methods

The study was carried out on the Outeniqua Research farm near George (Altitude 201 m, 33° 58' 38" S and 22° 25' 16" E, rainfall 728 mm year^{-1}) in the Western Cape of South Africa on an Witfontein soil form (Soil Classification Workgroup 1991).

The study area was under permanent overhead sprinkler irrigation, with irrigation scheduling undertaken by means of a tensiometer. Irrigation commenced at a tensiometer reading of -25 kPa and was terminated at a reading of -10 kPa (Botha 2002). Soil samples were taken prior to establishment to a depth of 150mm and analysed for Ca, Mg, Na, K, P, Cu, Zn, Mn, B, S, and C levels. Fertiliser was applied according to the soil analysis to raise soil P level to 35 mg kg^{-1}, K level to 80 mg kg^{-1} and pH (KCl) to 5.5 (Beyers 1973).

Table 1. The scientific name, common name, cultivar name and seeding rate of perennial legumes that were evaluated

	Scientific name	Common name	Cultivar name	Seeding rate (kg ha^{-1})
1	*Trifolium repens*	White clover	Haifa	6
2	*Trifolium repens*	White clover	Huia	6
3	*Trifolium repens*	White clover	Agrimatt	6
4	*Trifolium repens*	White clover	Agridan	6
5	*Trifolium repens*	White clover	Riesling	6
6	*Trifolium repens*	White clover	Dusi	6
7	*Trifolium repens*	White clover	Klondike	6
8	*Trifolium repens*	White clover	Alice	6
9	*Trifolium pratense*	Red clover	Quinequeli	8
10	*Trifolium pratense*	Red clover	Tropero	8
11	*Trifolium pratense*	Red clover	Amos	8
12	*Trifolium pratense*	Red clover	Red gold	8
13	*Trifolium pratense*	Red clover	Kenland	8
14	*Trifolium pratense*	Red clover	Suez	8
15	*Trifolium pratense*	Red clover	Rajah	8
16	*Trifolium pratense*	Red clover	Lemmon	8
17	*Lotus corniculatis*	Trefoil	Sao Gabriel	5
18	*Trifolium fragiferum*	Strawberry clover	Palestine	6

Table 2. The mean monthly growth rate (kg DM ha^{-1} day^{-1}) of perennial legume cultivars during year 1.

Species	Cultivar	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
WC	Haifa	6.83^{a}	37.1^{fgh}	55.9^{defg}	44.4^{bc}	75.7^{abcd}	6.29^{b}	3.31^{abc}	21.6^{b}	20.9^{d}	18.2^{bc}
WC	Huia	3.89^{abcde}	49.8^{bcde}	56.6^{defg}	52.1^{abc}	59.3^{cd}	14.5^{b}	7.70^{a}	33.9^{a}	22.8^{cd}	26.6^{ab}
WC	Agrimatt	5.95^{abcd}	42.2^{efg}	57.2^{defg}	50.8^{abc}	61.9^{bcd}	12.7^{b}	3.74^{abc}	24.7^{b}	34.0^{a}	24.9^{ab}
WC	Agridan	6.51^{ab}	45.9^{def}	64.0^{bcde}	46.0^{bc}	78.1^{abcd}	13.9^{b}	7.92^{a}	27.6^{ab}	25.0^{cd}	25.5^{ab}
WC	Riesling	5.18^{abcd}	49.1^{bcdef}	60.3^{cdef}	54.0^{ab}	62.4^{bcd}	11.7^{b}	1.54^{bc}	22.0^{b}	27.5^{bc}	25.7^{ab}
WC	Dusi	6.77^{a}	60.7^{abc}	77.6^{a}	62.1^{a}	74.7^{abcd}	14.9^{b}	4.20^{abc}	26.0^{b}	23.1^{cd}	19.6^{abc}
WC	Klondike	5.04^{abcd}	56.0^{abcd}	52.8^{efg}	43.3^{bc}	57.5^{d}	1.71^{b}	2.00^{bc}	27.4^{ab}	26.4^{bcd}	28.1^{a}
WC	Alice	6.32^{abc}	59.7^{abc}	61.6^{bcdef}	55.6^{ab}	66.4^{bcd}	11.0^{b}	6.61^{ab}	28.2^{ab}	31.2^{ab}	27.9^{a}
RC	Quinequeli	2.97^{cde}	61.3^{ab}	65.0^{bcd}	37.7^{c}	82.1^{abcd}	8.60^{b}	3.07^{abc}	2.53^{d}	2.74^{f}	3.95^{d}
RC	Tropero	5.40^{abcd}	59.1^{abc}	71.1^{abc}	51.9^{abc}	73.1^{abcd}	6.65^{b}	3.30^{abc}	2.35^{d}	2.70^{f}	6.06^{d}
RC	Amos	2.72^{de}	29.7^{gh}	58.9^{def}	38.0^{c}	62.3^{bcd}	3.89^{b}	0.74^{c}	0^{d}	0^{f}	0.25^{d}
RC	Red gold	5.82^{abcd}	63.2^{a}	58.0^{def}	47.8^{abc}	76.0^{abcd}	7.68^{b}	4.89^{abc}	2.78^{d}	2.61^{f}	2.85^{d}
RC	Kenland	5.05^{abcd}	58.9^{abc}	65.1^{bcd}	51.2^{abc}	87.9^{ab}	12.6^{b}	5.22^{abc}	4.69^{cd}	3.11^{f}	4.23^{d}
RC	Suez	3.58^{abcde}	53.5^{abcde}	71.3^{abc}	53.6^{ab}	99.0^{a}	9.67^{b}	1.30^{bc}	0.54^{d}	0.49^{f}	0.51^{d}
RC	Rajah	3.71^{abcde}	48.9^{bcdef}	72.5^{ab}	53.1^{ab}	80.2^{abcd}	14.1^{b}	1.90^{bc}	4.59^{cd}	2.72^{f}	2.47^{d}
RC	Lemmon	5.21^{abcd}	48.6^{cdef}	64.9^{bcd}	48.5^{abc}	77.8^{abcd}	15.4^{b}	6.02^{abc}	5.06^{cd}	3.95^{f}	4.44^{d}
Trefoil	Soa Gabriel	0.85^{e}	28.3^{h}	51.3^{fg}	46.7^{bc}	79.0^{abcd}	40.3^{a}	2.09^{bc}	6.26^{cd}	0.57^{f}	0^{d}
SC	Palestine	3.25^{bcde}	45.4^{def}	46.1^{g}	16.6^{d}	84.2^{abc}	10.0^{b}	1.69^{bc}	11.4^{c}	14.9^{e}	15.7^{c}
		3.357	12.69	11.89	15.04	26.41	13.71	5.423	7.429	5.899	9.181

WC: white clover
RC: Red clover
SC: Strawberry clover
LSD (0.05) compares over cultivars within months
^{abc}Means with no common superscript differ significantly

The species that were evaluated include white clover (*Trifolium repens*), red clover (*Trifolium pratense*), Strawberry clover (*Trifolium fragiferum*) and Birdsfoot trefoil (*Lotus corniculatis*). A total of 18 cultivars were evaluated in the form of a randomized block design, with three replicates per cultivar (total of 54 plots). The scientific name, common name, cultivar name and seeding rate of the legumes evaluated are given in Table 1.

The trial was established on the 5th of May 2011 on a paddock previously planted to perennial ryegrass-clover pastures. The paddock was sprayed with herbicide during January and tilled during February to remove the existing sward. Three subsequent herbicide applications (up to establishment) were aimed at eradication of emerging weeds. Prior to establishment the trial area was tilled with a disk harrow and kongskilde and rolled with a light landroller to create a firm seedbed and eradicate any remaining weeds. The various cultivars/species were planted according to commercially recommended seeding rates and adapted for germination percentages. Plots were 2.1 m x 6 m per treatment (12.6 m^2), with 14 rows that were 15 cm apart. All seed was inoculated with species specific *Rhizobium* a maximum of 2 hours before planting and kept in a cool place until it could be planted. Seed was also treated with pesticide and fungicide prior to establishment. Immediately after establishment, each plot was raked lightly to cover seeds and maintain inoculant activity. Plots were harvested using quadrats every 28 days to determine growth rate (kg DM ha^{-1} day^{-1}) and dry matter (DM) production (kg DM ha^{-1}). Three quadrats of 0.25 m^2 were randomly placed per plot and cut to a height of 50 mm. The samples were pooled and weighed. A grab sample of approximately 500g green material was taken from the pooled sample, weighed, dried at 60^0C for 72 hours and weighed to determine DM content. After sampling plots were cut to a uniform height of 50 mm above ground level using a Honda Lawnmower. Plots were only fertilised when deficiency symptoms become apparent or if deficiencies were identified in the soil analysis. Weed control was exercised mainly by mechanical means. A Student LSD (least significant difference) at 5 % significance level was performed to compare the treatment means (Ott 1998). The STATS module of SAS version 9.2 (2008) was used to analyze the data. Data from various cultivars were also combined according to species to determine the mean production of the different species.

Results and discussion

The mean monthly growth rate of perennial legume cultivars during year 1 and year 2 is shown in Table 2 and Table 3 respectively. During year 1 the white clover cultivar Dusi and red clover cultivars Tropero and Suez had the highest ($P<0.05$) or similar ($P>0.05$) to the highest growth rate from August to December. From March to May during year 1 all the red clover cultivars had the lowest ($P<0.05$) or similar ($P>0.05$) to the lowest growth rate. Red clover and trefoil cultivars were terminated after year 1 due to low production. During year 2 the strawberry clover cultivar Palestine had the highest ($P<0.05$) or similar ($P>0.05$) to

Table 3. The mean monthly growth rate (kg DM ha^{-1} day^{-1}) of perennial legume cultivars during year 2.

Species	Cultivar	June	July	Aug	Sept	Oct	Nov	Dec	Jan
WC	Haifa	8.00^{cd}	11.1^{cd}	14.3^{bc}	23.7^{bc}	24.3^{c}	29.0^{bc}	18.5^{c}	5.27^{bc}
WC	Huia	10.4^{b}	6.88^{de}	7.46^{d}	24.1^{bc}	29.1^{bc}	28.7^{bc}	30.7^{a}	7.21^{abc}
WC	Agrimatt	18.2^{a}	15.5^{bc}	18.4^{ab}	20.6^{bc}	28.6^{bc}	34.1^{b}	16.3^{c}	8.82^{ab}
WC	Agridan	18.0^{a}	16.9^{b}	17.8^{ab}	22.9^{bc}	24.1^{c}	28.2^{bc}	15.7^{c}	6.29^{abc}
WC	Riesling	8.72^{bc}	6.34^{e}	8.01^{d}	14.8^{d}	28.2^{bc}	26.5^{c}	31.0^{a}	13.4^{a}
WC	Dusi	6.88^{cd}	8.74^{de}	14.0^{bc}	17.9^{cd}	27.7^{bc}	31.9^{bc}	35.1^{aa}	11.7^{ab}
WC	Klondike	8.85^{bc}	6.84^{de}	2.97^{de}	19.5^{bcd}	27.3^{bc}	25.9^{c}	17.1^{c}	7.00^{abc}
WC	Alice	10.8^{b}	10.6^{de}	8.36^{cd}	26.7^{b}	32.1^{b}	28.4^{bc}	33.6^{aa}	12.3^{ab}
RC	Quineiqueli	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Tropero	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Amos	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Red gold	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Kenland	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Suez	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Rajah	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
RC	Lemmon	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
Trefoil	Soa Gabriel	0^{e}	0^{f}	0^{e}	0^{e}	0^{d}	0^{d}	0^{d}	0^{c}
SC	Palestine	5.87^{d}	22.7^{a}	22.8^{a}	36.7^{a}	40.1^{a}	48.3^{a}	41.1^{a}	11.1^{ab}
		2.387	4.503	5.950	7.388	6.247	7.485	9.127	7.385

WC: white clover

RC: Red clover

SC: Strawberry clover

LSD (0.05) compares over cultivars within season

^{abc}Means with no common superscript differ significantly

Table 4. Total seasonal and annual dry matter production (kg DM ha^{-1}) of perennial legume cultivars during year 1

Species	Cultivar	Winter	Spring	Summer	Autumn	Annual
WC	Haifa	758^{a}	3879^{ef}	2502^{bcd}	1874^{a}	9014^{bcde}
WC	Huia	432^{abcde}	4495^{bcde}	2432^{bcd}	2332^{ab}	9690^{abcd}
WC	Agrimatt	660^{abcd}	4263^{def}	2319^{bcd}	2341^{ab}	9583^{abcd}
WC	Agridan	722^{ab}	4427^{bcde}	2965^{abc}	2187^{abc}	10302^{abc}
WC	Riesling	575^{abcd}	4636^{bcd}	2233^{bcd}	2107^{abc}	9550^{abcd}
WC	Dusi	752^{a}	5689^{a}	2778^{abcd}	1926^{bc}	11145^{a}
WC	Klondike	560^{abcd}	4313^{cdef}	1785^{d}	2294^{abc}	8952^{bcde}
WC	Alice	702^{abc}	5016^{abc}	2488^{bcd}	2444^{a}	10649^{ab}
RC	Quineiqueli	329^{cde}	4657^{bcd}	2754^{abcde}	258^{e}	7999de
RC	Tropero	599^{abcd}	5168^{ab}	2437^{bcd}	311^{e}	8515^{cde}
RC	Amos	302de	3605^{fg}	1955^{cd}	6.90^{e}	5868^{f}
RC	Red gold	646^{abcd}	4791^{bcd}	2605^{abcd}	231^{e}	8273de
RC	Kenland	560^{abcd}	4971^{abcd}	3119^{ab}	337^{e}	8986^{bcde}
RC	Suez	398^{abcde}	5068^{abc}	3222^{ab}	43.0^{e}	8730^{bcde}
RC	Rajah	412^{abcde}	4961^{abcd}	2839^{abc}	274^{e}	8486^{cde}
RC	Lemmon	579^{abcd}	4601^{bcde}	2939^{abc}	376^{e}	8495^{cde}
Trefoil	Soa Gabriel	94^{e}	3589^{fg}	3648^{a}	191^{e}	7522^{ef}
SC	Palestine	361^{bcde}	3071^{g}	2815^{abcd}	1175^{d}	7422^{ef}
LSD (0.05)		372.6	740.7	1053	452.4	1939

WC: white clover

RC: Red clover

SC: Strawberry clover

LSD (0.05) compares over cultivars within season

^{abc}Means with no common superscript differ significantly

Table 5. Total seasonal and annual dry matter production (kg DM ha^{-1}) of perennial legume cultivars during year 2

Species	Cultivar	Winter	Spring	Summer	Annual
WC	Haifa	865^{b}	2443^{bc}	679^{bc}	3987^{bc}
WC	Huia	694^{bc}	2579^{bc}	1085^{ab}	4358^{bc}
WC	Agrimatt	1464^{b}	2625^{bc}	712^{bc}	4801^{b}
WC	Agridan	1477^{b}	2383^{bc}	625^{c}	4484^{b}
WC	Riesling	649^{bc}	2166^{c}	1261^{a}	4077^{bc}
WC	Dusi	840^{b}	2438^{bc}	1335^{a}	4612^{b}
WC	Klondike	515^{c}	2279^{bc}	679^{bc}	3473^{a}
WC	Alice	829^{b}	2742^{b}	1306^{a}	4877^{b}
RC	Quineiqueli	0^{d}	0^{d}	0^{d}	0^{d}
RC	Tropero	0^{d}	0^{d}	0^{d}	0^{d}
RC	Amos	0^{d}	0^{d}	0^{d}	0^{d}
RC	Red gold	0^{d}	0^{d}	0^{d}	0^{d}
RC	Kenland	0^{d}	0^{d}	0^{d}	0^{d}
RC	Suez	0^{d}	0^{d}	0^{d}	0^{d}
RC	Rajah	0^{d}	0^{d}	0^{d}	0^{d}
RC	Lemmon	0^{d}	0^{d}	0^{d}	0^{d}
Trefoil	Soa Gabriel	0^{d}	0^{d}	0^{d}	0^{d}
SC	Palestine	1439^{b}	3963^{a}	1492^{a}	6895^{a}
LSD (0.05)		257.8	509.8	420.3	975.8

WC: white clover

RC: Red clover

SC: Strawberry clover

LSD (0.05) compares over cultivars within season

^{abc}Means with no common superscript differ significantly

The total seasonal and annual DM production of perennial legume cultivars during year 1 and year 2 is shown in Table 4 and Table 5 respectively. During year 1 the white clover cultivar Dusi and red clover cultivars Kenland, Suez and Rajah had the highest ($P<0.05$) or similar ($P>0.05$) to the highest seasonal DM production from winter to summer. During autumn of year 1 all the red clover cultivars and the trefoil cultivar Soa Gabriel had the lowest ($P<0.05$) DM production. The white clover cultivar Dusi had a similar ($P>0.05$) annual DM to other white clover cultivars Huia, Agrimatt, Agridan, Riesling and Alice, but higher ($P<0.05$) than the rest during year 1. During year 2 the strawberry clover cultivar Palestine had the highest ($P<0.05$) or similar ($P>0.05$) to the highest seasonal DM production from winter to summer and the highest ($P<0.05$) total annual DM production.

Conclusions

1. The red clover cultivars Tropero, Suez and Rajah had high growth rates from August to December, but showed a marked decline in growth from January to May during year 1.

2. The white clover cultivars Dusi had the highest annual dry matter production during year 1 and also maintained a high growth rate from August to December. During year 2 the growth rate of white clover cultivars was lower than strawberry clover during all months except June, August and January.

3. White and red clover had the same production from winter to early summer, but red clover production declined from late summer during year 1 to very low rates during autumn.

4. Due to the ability of white clover to remain productive during autumn, it achieved a higher total annual dry matter production than red clover during year 1.

5. The majority of white clover cultivars showed a higher persistence than red clover. If planted in mixtures the early growth of red clover and persistence of white clover could complement each other in the fodder flow program.

6. Strawberry clover was more productive than white clover in year 2.

7. Perennial legumes show poor persistence in this region.

Message to the Farmer

- The white clover cultivar Dusi had the a similar total annual dry matter production to that of Huia, Agrimatt, Agridan, Riesling and Alice during year 1, but higher than the rest.
- The poor persistence of red clover indicates that its growth pattern represents that of an annual in this region.
- Strawberry clover has the potential to out-yield white clover during the second year of production.
- The selection of complementary species and cultivars can improve fodder flow.

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Strawberry Clover

The role of fire in bush encroachment in Ithala Game Reserve

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The spread of trees into grasslands has become a common threat to biodiversity all over the world. The habitats of grassland and savanna plant and animal species are being altered as these habitats are converting into closed thickets and evergreen forests. Fire has been a principal tool to control bush encroachment. However, with the continuing encroachment of trees, the effectiveness of fire has been questioned.

This study found that even in areas that were burnt annually, problematic thicket species such as Sickle bush (*Dichrostachys cinerea*) and Sweet thorn (*Acacia karroo*) survive. These thicket species are vigorous resprouters and some have thick bark layers to protect them from fire.

In Ithala Game Reserve, the density of encroaching species in areas burnt annually was greater than in areas burnt less frequently. Experiments showed that managers had to use more intense (~hot) fires to reduce the density of trees and keep them short. A high fuel load (dry grassy biomass) as well as hot, dry and windy conditions is required to fuel more intense fires.

Regarding fire frequency, a fire every 2 – 4 years (depending on fuel load accumulation) was found to be most effective in controlling bush encroachment. Managers should aim to promote fuel load accumulation for more intense burns. Failing this, forest precursor species (e.g. *Euclea* and *Searsia*) will succeed the thicket species and a fire-resistant evergreen thicket may develop within a decade.

Topographical units and soil types prove more efficient for vegetation sample site placement than Land Type units in semi-arid savannah, North West province, South Africa.

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A corridor linking Pilanesberg National Park and Madikwe Game Reserve has been proposed in north-western, South Africa. Currently termed 'The Heritage Park' this proposed corridor comprises a 90 000 ha strip of Central Bushveld savanna. Baseline studies were carried out in the area including a standard veld condition assessment of the vegetation in the proposed corridor.

Prior to sampling, Land Type Maps were used for stratification purposes, and 109 sampling sites were placed in eight Land Types. Ae57, Ae61, Ae237, Ae251, Ea70, Ea155, Fa293 and Fb147. This paper examines the efficacy of Land Type mapping units for vegetation sample site placement. Detrended correspondence analysis (DCA) was used to analyse the floristic data.

Overlap of the DCA diagram polygons indicates that the floristic data did not correlate with the eight Land Types (Figure 1).

The ordination diagram displaying the groups stratified using topographic units (classified using 1:50 000 topographical maps) showed no overlap between the three floristic groups (Figure 2). To confirm the results determined by the multivariate analyses, a mean similarity test was used to determine the percentage similarity between the floristic samples as grouped by the two DCA comparisons.

This analysis showed that the percentage similarity between the eight different Land Types and three topographical units were 42% and 29% respectively. The broad-scale topographical units (steep slopes, valleys and flats) provided the most effective method to stratify the study area into relatively distinct floristic units.

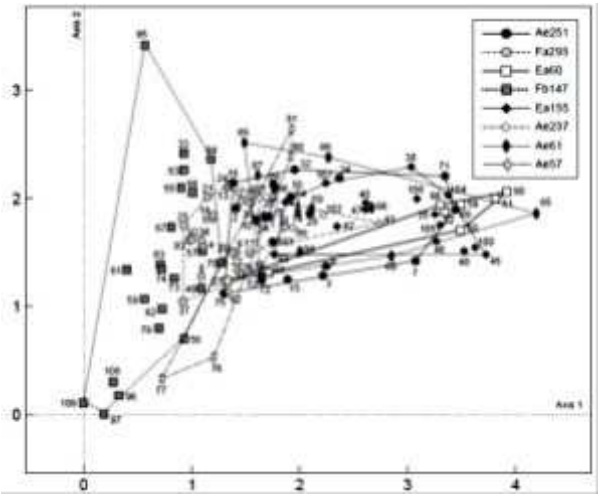

Figure 1: DCA ordination diagram of the floristic data classified into their eight different Land Types (presented in the key). The numbered symbols represent the vegetation assemblages of each site, and proximity between the symbols.

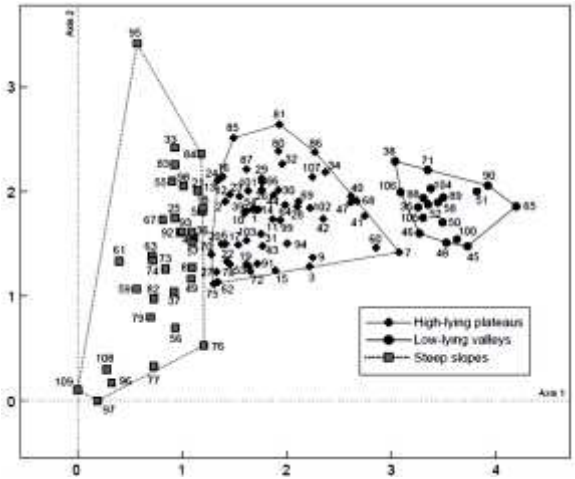

Figure 2: DCA ordination diagram of the floristic data classified. The symbols represent the vegetation assemblages of each site, and proximity between the symbols indicates similarity.

Vegetation change in Zululand, KwaZulu-Natal since the Anglo-Zulu War of 1879: local or global drivers?

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Major changes have occurred in the environmental history of KwaZulu-Natal (KZN). Significant vegetation change will have an impact on current land use as well as on long-term planning for future land use. There are numerous landscape photographs that exist from the time of the Anglo-Zulu War (1879) in northern KZN. These photographs have been used for direct comparison with the current landscape, using repeat fixed-point photographic techniques. Floristic sampling provided a bench mark for any future work and gave an indication of the impact that land-form and land-use may have on vegetation structure and composition. Rainfall and temperature trends were also analysed. Initial perusal of the ground photographs show that there has been a significant increase in the density of woody species in the study area since 1879. The study suggests that, while there may have been local drivers (e.g. rainfall, temperature, fire) influencing the recorded changes in the vegetation, the overriding driver may well be the increasing atmospheric CO_2 concentration.

L'armée anglaise entre au Zululand. gravure de 1879*
* Public domain image courtesy - Wikimedia Commons

Lawn Bowls: Green Management

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Compiled by Dr Charles Louw
Bowls South Africa
460 pages, softcover
ISBN 978-3-16-148410-0

Publications with regard to turf management and greenkeeping in South Africa focus mainly on the construction and maintenance of golf courses. Similar skills are however necessary for the construction and maintenance of other sporting facilities. The publication, *Lawn Bowls: Greens Management* is the first of its kind focussing specifically on aspects relating to the maintenance of lawn bowls greens. Every bowler knows that the green is usually just as good as the skipper's last wood, but very little thought however is given to the complexities of managing a green within South Africa's varying climatic conditions.

Usually greens are managed by volunteers who dedicate much of their time to the process, but often without a source of guidance to give them the skills to achieve the outcomes they would like. The book covers every important aspect of greenkeeping for lawn bowls, starting with an introduction to the different grass species used on bowling greens in South Africa. It also mentions the rules and requirements of the game that might affect management.

Chapter two provides a general introduction on grass morphology and physiology and ways in which play and players might influence grass growth. The third chapter proceeds to provide information on the grasses' interaction with the growing medium, as well as the effect of extreme climatic conditions on the grass plants and general vegetation cover of the green.

Chapter four gives an in depth discussion on primary cultural practices which influence the condition of the green, such as mowing, irrigation and fertilization, while chapter five deals with supplementary cultural practices such as aeration, rolling, topdressing and levelling of a green. Both these chapters provide a clear discussion as well as a step-by-step "how-to" guide, which makes it invaluable to all greenkeepers.

As with any monoculture, greens are threatened by a variety of pests, diseases and weeds. These problems are discussed in detail in chapter six, with reference being made to the effect of the various threats on the green and ways in which to control and eradicate these threats. The last chapters are devoted to general turf management with certain aspects and procedures being highlighted and discussed in depth.

Lawn Bowls: Greens Management is a definite "how-to" book for every lawn bowls greenkeeper in South Africa. All the information contained in the book delivers on the promise of imparting well-grounded principles that can be applied to create and manage greens that are long-lasting, visually attractive – and eminently playable. This book is of direct relevance to all lawn bowls greenkeepers and I would recommend that every club in South Africa obtain a copy.

"Every bowler knows that the green is usually just as good as the skipper's last wood, but very little thought however is given to the complexities of managing a green within South Africa's varying climatic conditions."

Member Profiles

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Tunde Adegoke Amole (Ph.D, Forage Production & Utilization) was born in Nigeria where he attended the Federal College of Agriculture Akure and Ibadan (Moor Plantation) and later the Federal University of Agriculture, Abeokuta. He is currently a Research Fellow at the Institute of Food Security, Environmental Resource and Agricultural Research, Federal University of Agriculture, Abeokuta Ogun State Nigeria.

His research interest over the years has been on integration of forage into arable crops to enhance herbage yield as ruminant feed resources. He is also involved with production of feed towards the dry season in the forms of hay, silage, pelleted hay and fodder banks. He also focuses on determination of appropriate stocking rates for local breeds of cattle, sheep and goats with respect to different forage species and their mixtures. He lives happily in Abeokuta Ogun state Nigeria with Olajumoke (wife) and Hadassah (daughter).

Movers and Shakers

Edson Gandiwa
Chinhoyi University of Technology,
Zimbabwe

Edson Gandiwa is currently an Associate Professor in the Department of Wildlife and Safari Management at the Chinhoyi University of Technology, Zimbabwe. He finds this a very energetic department with enthusiastic staff that aim at contributing to the training of high quality wildlife ecology students. Previously he held the senior ecologist position in the Zimbabwe Parks and Wildlife Management Authority. His current research interests include: bushmeat hunting and trade dynamics, community-based natural resources management, media framing of wildlife conservation, plant ecology, population ecology and biodiversity conservation.

Leana Nel
Advance Seed
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I've been appointed as Research Manager at Advance Seed. As this company is involved in the local and international markets for forage seed, turf seeds, popcorn, legumes, pulses and confectionary seeds for human consumption, my new job is ever evolving. As my field of expertise is in the pasture sciences, I currently contribute to the research in the use of seed coating in rehabilitation of mines and planted pastures. With the support from my colleges, I am sure this will be the beginning of something great.

New and Resigned Members

New Members

Barbara Maasdorp, University of Zimbabwe
Cathrine Odendaal, Agricultural Research Council / University of the Free State
Devan McGranahan, University of KwaZulu Natal
Florence Nherera, Agricultural Research Council
Fusi Kraai, Free State Department of Economic Development and Tourism
Jock McMillan, Mabula Private Game Reserve
Jonathan Swart, Welgevonden Game Reserve
Marnus Smit, University of the Free State
Matthew Becker, South African Environmental Observation Network
Mike Braack , KwaZulu Natal Department of Agriculture and Environmental Affairs
Tamara Hiltunen, Ezemvelo KZN Wildlife
Aerisha Ramkalawan, IMFS - eThekwini
Izak Smit Dr, South African National Parks
Freddy Milambo

Resigned Members

Mrs Annelene de Beer
Prof Dave Cumming, Percy FitzPatrick Institute for African Ornithology
Mr Gus Le Roux, Anglo Coal Environmental Services
Mr Moses Oliphant, Taung Agricultural College
Mr Vhali Kavhagali, Department of Environmental Affairs
Prof Ruth Hall, Programme for Land and Agrarian Studies
Mr Shaun MacGregor, Ecoleges Environmental Consultants

Council News

GSSA's fourth Strategic Review

Council kicked off the New Year with the first council meeting which took place on the 21st of January. As always, the upcoming 49th Annual GSSA Congress was high on the agenda. Hosted by the Free State, the congress will take place at Phillip Sanders Resort & Conference Centre near Bloemfontein. Members can look forward to a very stimulating and packed congress program organised by an enthusiastic and competent organising committee headed by Paul Malan (University of the Free State).

For the first time the congress will run back-to-back with the Society's fifth *Research Skills Workshop* as well as a *Short Course on Fire Management in South Africa*. Some highlights include exceptional keynote speakers, special sessions on *Curriculum Development in Grassland Sciences* and *Soil Carbon for Sustainable Pasture Production*, as well as the launch of our journals' 2014 Special Issue on Bush Encroachment. The most important news to report on however is that the council and selected members took part in the Society's fourth Strategic Review in October last year. The society is required to do such a review and produce an updated Strategic Plan once every five years. The recent two-day review was excellently facilitated by Owen Henderson, Director of Business Presentation Group (Pty) Ltd.

The review process addressed aspects such as what works and what does not work in the Society, as well as what likely scenarios we will be facing in the future. A Strategic Plan implementable for 2014 to 2018 was produced with the following priority outcomes:

1. Increase the number of papers published in the **African Journal of Range and Forage Science** (AJRFS).
2. Create a forum for **policy debate** and a session on **curriculum development** in Grassland Science at each Annual Congress.
3. Establish a self-fuelling **mentorship programme** that recognises both mentors and mentees.
4. Increase **feedback and interaction from non-council members** in all GSSA channels (e.g. Facebook, satellite functions).
5. Improve the quality of our **Annual Congress to become the congress of choice** in South Africa.

6. Develop and implement an **accreditation system** for delegates attending specific congress presentation and/or special sessions.

7. Leverage **additional funds** for the Society from our existing financial and administrative resources.

8. Highlight and disseminate the **value and advantages of being a Society-member.**

9. Highlight and implement modern and innovative methods of **disseminating credible information** through all channels (e.g. social media, website, print media)

10. Improve the **impact factor** of the AJRFS

11. Increase the Society's number **of international members.**

The new Strategic Plan will be circulated to all Society members for comment before being finalised and formally accepted at this year's Annual General Meeting. Steered by our President, Dr Igshaan Samuels, council members are already working hard at implementing the above-listed objectives, with exciting new initiatives such as a Planted Pastures Special Edition planned for the AJRFS as well as a Membership Referral Incentive. Please keep an eye on *Grassroots* as we reveal more during the rest of the year. We look forward to a very exciting and productive 2014!