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Grassroots

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On The Cover: Another wonderful cover photograph by our Honorary Treasurer: Justin du Toit

Left: This gorgeous image was taken by Rob Southey last year, in Mozambique

Editor's Note



Welcome to the first edition of the Grassroots newsletter for 2012. Let's work together to make sure that 2012 becomes a better year for GSSA. At the beginning of every year scientists and students have very good plans for the year ahead. For instance, to submit peer-reviewed papers, Thesis or even apply for SACNASP. But by the end of the year, one or none is achieved and that's a problem. Time is running fast, let's buckle down and ensure that all our plans are fulfilled.

I would like to take this opportunity to congratulate the parents of children who passed grade 12. Especially those who will be studying towards Agriculture at Universities and Agricultural colleges.

Remember the 47th GSSA Congress in the Western Cape. What have you done for to prepare for it? We are pleading for submissions of reports, articles or even pictures of experimental sites.

I hope you will enjoy this issue of Grassroots.

Julius Tjelele

Toxic Mine Dumps Threaten Johannesburg

By Sheree Bega

The 380 mine dumps and slimes dams in Gauteng could be a far bigger threat than acid mine drainage (AMD).

They are causing radioactive dust fallout, toxic water pollution and soil contamination, according to the final draft of a new report by the Gauteng Department of Agriculture and Rural Development (GDARD) on mine residue areas (MRAs), called for by Premier Nomvula Mokonyane “as a potential provincial priority”.

It warns that if the province doesn’t act, “Joburg will eventually be seen as an old mining town that has reached the end of its working life”, with banks redlining (refusing) to finance any homes or development near the dumps.

The report found that most MRAs – including mine dumps, waste rocks dumps and water storage facilities – in Gauteng are radioactive “because the Witwatersrand gold-bearing ores contain almost 10 times the amount of uranium in gold.

“These radioactive tailings co-exist in these MRAs alongside the iron sulphide mineral pyrite, which reacts in the presence of oxygen and water to form a sulphuric acid solution – the main cause of acid mine drainage,” says the report, Feasibility Study on Reclamation of Mine Residue Areas for Development Purposes:

Phase II Strategy and Implementation Plan, co-written by water scientist Anthony Turton. But it says that the broader issue of “diffuse sources” of pollution represented by the mine dumps and slimes dams and their possible interactions with rainfall, seepage, surface water runoff and shallow groundwater “is possibly more important than the impact of AMD” in Gauteng.

In February 2011, the Saturday Star revealed how the National Nuclear Regulator (NNR) had recommended the relocation of residents of Tudor Shaft informal settlement, on an old radioactive mine dump, in Krugersdorp. The report suggests that this NNR ruling is “likely to become a watershed ruling likely to be relevant for a number of other sites” and that high-risk informal settlements will need to be relocated to minimise human health risks.

It singles out the dangers of ground instability and the collapse above abandoned mine workings and around open mine shafts that present a danger to nearby informal settlements as well as the danger of wind-blown mine dust being inhaled, damaging lung tissue, resulting in respiratory diseases.

Independent Newspaper



Why Research and Development Does Not Turn Into Income?

South Africa has been extraordinarily unsuccessful at turning innovations that have resulted from academic research into commercial opportunities. To address this need, the Innovation Hub in Pretoria has been establishing appropriate capacities and initiatives to enable it to play an enabling role in changing this.

The Innovation Hub is a subsidiary of Blue IQ, which is an agency of the Gauteng Department of Economic Development. “We see many initiatives countrywide where entrepreneurs are identified, supported and incubated but we seldom see initiatives directed at identifying R&D results from research institutes and higher education institutions and matching these to the market or entrepreneurs ready to take them to the market,” says McLean Sibanda, CEO of The Innovation Hub.

“No-one opens R&D results up to the public and we have a huge number of shelved innovations & technologies that could assist with creating jobs, establishing new enterprises and building our economy...”

“ Many Researchers
Want to Commercialize
their Research Results
but don’t have the
Entrepreneurial Skills to
do so.”

“Most of these ideas never get to a commercialized state largely because researchers are not entrepreneurs and commercialization requires different skills to those that create R&D results. At the end of 2009 the total number of researchers per 1000 South Africans was 1.4 * which means a lot of research is being published and then left on a shelf to gather dust,” he says.

The Innovation Hub, together with partners like the CSIR and others, want to help bring discoveries to the market place by giving R&D results with applied focus and social relevance a chance to be commercialized. Many researchers want to commercialize their research results but don’t have the entrepreneurial skills to do so.

“There is the Problem of Finding Feasible and Researched Ideas to Take to Market.”

The Higher Education Institutions as well as the research institutes are now establishing Offices of Technology Transfer (OTTs). Through The Innovation Hub's incubation, entrepreneurship, skills and leadership development unit relevant partnerships with the OTTs and industry can be forged to commercialize new research results. There is a shortage of skilled entrepreneurs in South Africa and to add to the challenges of overcoming economic obstacles, there is the problem of finding feasible and researched ideas to take to market.

The Entrepreneurship Day where entrepreneurs get to hear about and see feasible research projects intends to provide part of the solution. Government officials, research institutions, entrepreneurs and funders all gather to see the showcase of research results or projects.

As part of the Global Entrepreneurship Week taking place from 14 - 20 November 2011, The Innovation Hub is launching their road show which will culminate in this Entrepreneurship Day at The Innovation Hub on the 18th November. As part of the Global Entrepreneurship Week, The Innovation Hub is launching their road show which will culminate in this Entrepreneurship.

“We need entrepreneurs to help researchers take their research results and inventions to the market place. Consequently the intention of The Innovation Hub is to turn the Gauteng economy into an innovation-driven economy that is able to compete on the global stage. Part of our strategy is the staging of an Entrepreneurship Day twice a year, through which we hope to see an increase in the pipeline of high quality business ideas linked to research results, and create more networking opportunities for researchers, commercialization partners and industry players,” says Sibanda.

Although commercialization of publicly financed research results might seem to be in conflict with the ideals of independent and academically 'pure' scientific work, without it, new techniques or tools with the potential to save lives and find economically sustainable solutions, might remain on the proverbial shelf, collecting dust.

This sentiment is echoed in the Intellectual Property Rights from Publicly Financed Research and Development Act, 2008, which seeks to ensure that intellectual property from publicly financed research, is identified, protected and commercialized to the benefit of the people of South Africa.

Gadget Newsletter

2011 Arid Zone Ecology Forum a Raging Success

The small Hantam Karoo town of Niewoudtville set the scene for 2011's annual conference of the Arid Zone Ecology Forum (AZEF). The conference took place from 3-6 October and was a raging success, with many long-time members declaring it was the best AZEF to date.

A network of exceptional scientists, students and practitioners assembled around this year's theme "Interactions in the Arid Zone", which highlighted the complexity and inter-dependence of ecological systems and social dynamics. The opening keynote speaker was SAEON's own Observation Science Specialist, Professor Tim O'Connor, who gave a fascinating talk addressing interaction complexity in the context of arid environments.

Professor Bob Scholes (CSIR Fellow), discussed the benefits of diverse ecosystems, and Dr Wijnand Swart (University of the Free State), used agro-ecological perspectives to address food security in water-scarce regions.

Globally Relevant Presentations

Various poster presentations addressed global change aspects, such as invasive and encroaching species (*Prosopis spp.* and *Acacia mellifera* respectively), and land use. It was, in fact, a poster on land use impacts by Claire Davis (Climate Change Group of the CSIR) which won the prize for "Best Poster Presentation".

Claire's poster was entitled "Recent trends in land cover change across the arid and semi-arid winter rainfall region of southern Africa".

This year's theme, "Interactions in the Arid Zone", highlighted the complexity and inter-dependence of ecological systems and social dynamics.

A number of speakers presented their research on the restoration of degraded veld and the rehabilitation of mined areas – valuable findings which improve scientists' understanding of how these systems function, a very important aspect for the arid zone.

Another vital aspect, especially from a land manager's perspective, is problem animals. Fascinating talks by keynote speakers Professor Justin O'Riain (University of Cape Town) and Dr Quinton Martins (Co-founder and Project Manager of the Cape Leopard Trust) addressed this issue. Professor O'Riain discussed mammalian (mole-rats, meerkats and baboons) adaptations to life in arid environments, while Dr Martins discussed the use of camera traps as a tool to highlight trophic imbalances in different land-management systems.

Social ecological aspects were covered as well, among which Professor Maitland Seaman's (University of the Free State) talk on the training of environmental managers in water-scarce areas, and Igshaan Samuels'

(Agricultural Research Council) prize-winning paper entitled “Integrated land use management on the commons of Namaqualand: the process and the plan”

The Conservation Biology session included talks on the management of Clanwilliam Sandfish and Wetland Conservation in arid regions, as well as a talk by Christy Bragg on the critically endangered Riverine Rabbit’s interaction with its habitat.

Field trips Showcase Biological Wealth

This year’s theme was inspired by the unique biological wealth of the Bokkeveld Plateau, a wealth which was fittingly showcased by the variety of mid-conference field trips offered to delegates.

Mr Adrian Fortuin (Conservation Manager from CapeNature) and Dr Ute Schmiedel (University of Hamburg) guided an excursion to the fascinating and unique Knersvlakte – an extensive dry plain in the centre of the Succulent Karoo biodiversity hotspot. Also referred to as the “land of the blooming pebbles”, the Knersvlakte’s quartz fields house 1 324 species of which 266 is endemic to the Succulent Karoo and almost half of these endemic species are classified as globally threatened. A visit to the Kokerboom Forest was guided by Professor Timm Hoffman (University of Cape Town), who presented his research findings at the conference. This stimulated interesting discussions around the use of *Aloe dichotoma* as an indicator for climate change

who presented his research findings at the conference. This stimulated interesting discussions around the use of *Aloe dichotoma* as an indicator for climate change.

Delegates who visited the Avontuur Conservation Area had an opportunity to participate in active restoration efforts currently underway on the property. Oom Willem van Wyk guided a tour to various sites of interest on his farm Papkuilsfontein, which included vegetation transition areas associated with the variety of soil types present, wetlands and a viewpoint of the Niewoudtville waterfall and Oorlogskloof gorge.

Porcupine Viewing Excursion

A few delegates also took part in a porcupine viewing excursion led by Christy Bragg, who conducted her PhD research on the foraging ecology of this shy nocturnal rodent. Most of her experimental research was done in the Hantam National Botanical Garden, where long-term exclosures and experiments have been set up to study porcupine-geophyte interactions – an area reported to boast as many as 20 000 geophytes persquare metre.

The SAEON Arid Lands Node provided funding for this year’s conference and has laid the foundations of a long-standing partnership with AZEF. The invaluable scientific contributions of its members enable better understanding and prediction of the complex systems at play in arid environments.

SAEON Newsletter



Waste Management Strategy to Create new Jobs

By Brindaveni Naidoo

South Africa's National Waste Management Strategy (NWMS), which Cabinet approved for implementation, would generate and sustain jobs, as well as formalise existing jobs in the waste economy, Water and Environmental Affairs Minister Edna Molewa said "The NWMS aims to create 69 000 new jobs in the waste sector and have 2 600 additional small and medium-sized enterprises and cooperatives participating in waste service delivery and recycling by 2015."

The NWMS is structured against a framework of eight goals with set targets for 2016. The eight goals included promoting waste minimisation, reuse, recycling and recovery of waste; ensuring effective and efficient delivery of waste service and growing the contribution of the waste sector to the green economy.

With regard to ensuring an effective and efficient delivery of waste services, 95% of urban households and 75% of rural households must have access to adequate levels of waste collection services and 80% of waste disposal sites must have permits by 2016.

Some of the tools identified for the implementation of the NWMS include a waste classification and management system, norms and standards, licensing, industry waste management plans, extended producer responsibility, priority wastes and economic instruments. Further, the strategy seeks to extend the current environmental management inspectorate's capacity to enforce the National Environmental Management: Waste Act.

Minister Molewa has welcomed the approval of NWMS, adding that it was important, particularly with regard to the process of implementing the Act and in establishing an integrated approach to waste management across government and broader society.

"South Africa faces particular challenges in relation to waste management that require a coordinated effort by government and stakeholders. "Addressing these challenges will not be easy, given the capacity and resource constraints we face as a developing country with large income inequalities and competing development priorities," Molewa said.

Implementing the waste management hierarchy and achieving the objects of the Waste Act, she said, would require coordinated action by households, businesses, community organisations, nongovernmental organisations, parastatals and the three spheres of government.

Partnerships around effective waste management, Molewa believed, must have concrete expression in local collaboration around initiatives to improve waste management. Other goals of the NWMS include ensuring that people are aware of the impact of waste on their health, well-being and the environment; achieving integrated waste management planning and ensuring sound budgeting and financial management for waste services.

Further, it must also provide measures to remediate contaminated land and establish effective compliance with and enforcement of the Waste Act.

Creamer Media's Engineering News

GSSA Trust

Our focus is to promote:

- Development
- Student Participation
- Mentorship Programmes
- Growth for Young Scientists

The Council of the GSSA, as well as paid up GSSA members can apply for funding from the Trust for attending national and international congresses, or for other GSSA matters.



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CLIMATE CHANGE

Soon every African Village will Know what the Weather may bring

Johannesburg, 2 November 2011 (IRIN) - Information about how climate change may affect any city, town or village in Africa until the next century will be available by mid-2012 as scientists localise global climate data.

The Coordinated Regional Climate Downscaling Experiment (CORDEX), an initiative of the World Meteorological Organization and the World Climate Research Programme is now able to render the data from regional climate models to the scale people live in, and decision makers work at. The information will not only help countries but also communities in their efforts to adapt to changing weather patterns, and to tailor their disaster risk reduction plans. The effort is geared to feed into the next assessment report of the Intergovernmental Panel on Climate Change (IPCC), due to be released in 2014.

Although CORDEX aims to “downscale” the data for all regions of the world, Africa has been identified as the most vulnerable by the IPCC and a priority for the initiative. Historically the continent has been under-researched, but for the next two years will be a focus for the program.

Chris Lennard, a scientist at the Climate Systems Analysis Group at the University of Cape Town (UCT) in South Africa, which has one of the only two climate modelling groups downscaling the projections in Africa, said by mid-2012 climate data for people living within 50 kilometres from each other will be available across Africa. The other African group, also in South Africa, is based at the Council for Scientific and Industrial Research (CSIR) in Pretoria.

“There are climatologists outside the project who are downscaling up to a 22 km resolution as well,” said Lennard. “Although this means data at the scale of cities will be available, when assessing vulnerabilities to climate change in a place like Johannesburg there are many other factors that need to be considered external to the city, such as water and food security and power provision, for example.”

How it Works

Projecting the impact of climate change is a complicated process that takes into account changes in the long-term averages of daily weather patterns and many other factors.

Climate models are used to simulate processes that occur in the atmosphere, such as the movement of moisture and heat as well as the possible impact of increasing concentrations of greenhouse gases on these processes.

During two meetings in 2011, over 20 African climate scientists met to analyse CORDEX produced data. They decided to divide Africa into three regions for analysis - Southern, East and West. They then sub-divided the regions according to the common characteristics of the rainfall patterns in them. For instance, West Africa has been split into a Southern and Northern region because the south has two peaks per rainy season and the north has only one.

Climatologists often split regions according to common rainfall patterns because the variables that affect rainfall - movement of air, pressure, temperature, radiation, moisture content - also drive climate change. Unfortunately, not all African countries can be assessed because of a lack of adequate scientific support and observational data. So, for example, model-based physical impacts in the Netherlands look similar to those in Bangladesh - in part because the two countries share a similar topography, both being low-lying deltas - but in reality the impacts on people, and the options for adapting to these, are likely to differ widely.

During the first stage of CORDEX, scientists tested the ability of the various regional climate models to generate data based on actual climate statistics for the period 1988-2010. "The selected historical timeframe is too small to look at any long-term trends," said Lennard. "We wanted to see how the regional climate models simulated the past so we can say something about how they might simulate the future."

The 14 regional climate models also include factors like the level of small-scale convection, and the interaction between the land surface and the atmosphere. The scientists then work on a consensus position based on the results generated by all the models. "We have completed this stage and are busy writing up our results so they can be included in the IPCC 5th assessment report,"

The teams are now awaiting results of global projections of climate change from 12 global climate modelling groups already at work in Europe, the US and elsewhere. These groups - including the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy; the Swedish Meteorological and Hydrological Institute; the Danish Meteorological Institute; and the Iowa State University - are among the world's foremost global climate modelling institutions. They have simulated the earth's climate as far back as 1950 and look as far forward as 2100.

"Once the global climate model data become available we will start downscaling them, and the downscaled results will be shared with the African teams for analysis. We expect to have the first downscaled model data early in November," Lennard said.

Making Sense of the Numbers

The projections are critical for communities that must adapt to a moodier climate with limited resources. Initial IPCC assessment reports tended to focus on global climate models and predictions that did not factor in underlying socioeconomic conditions or the vulnerability of communities, writes Saleemul Huq, one of the IPCC's lead authors. "So, for example, model-based physical impacts in the Netherlands look similar to those in Bangladesh - in part because the two countries share a similar topography, both being low-lying deltas - but in reality the impacts on people, and the options for adapting to these, are likely to differ widely," Huq notes in a briefing paper for the International Institute for Environment and Development (IIED).

Climate Change In Depth

"The Netherlands is technologically and financially rich and can adapt to rising sea levels by raising dykes. Bangladesh, on the other hand, cannot afford to build dykes around its entire coast,

even if that was the best adaptation solution." More recent IPCC reports have gone for a "more rounded picture of which countries and regions are at highest risk from climate change".

One of the unique characteristics of the CORDEX Africa campaign is that African climatologists will meet with other African scientists who study vulnerability, adaptation and the impact of climate change on people, to translate the model numbers into meaningful, usable information. Experts from countries that include Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Niger, Nigeria, Senegal, South Africa, Swaziland, Uganda, Zambia and Zimbabwe will analyse the data.

"These scientists, who study humanitarian impact of climate change know for example what thresholds, which, if crossed more frequently would impact detrimentally on communities, so whether the people in a certain area are more vulnerable to five days or eight days of continuous rainfall," said Lennard. "We are coming together so that the impacts scientists can ask climatologists their questions, who will then analyse the model output with these questions in mind and provide them with information they can use." Their answers will also inform the analysis included in the IPCC's fifth assessment, devoting four chapters to adaptation.

IRIN News



The 14th Annual L'ORÉAL-UNESCO Awards For Women in Science Honour Five Exceptional Women Who Move Science

The L'ORÉAL-UNESCO for Women in Science partnership announced the five exceptional women scientists from around the world who will receive the 2012 L'ORÉAL-UNESCO Awards in Life Sciences.

An international network of nearly 1,000 scientists nominates the candidates for each year's Awards. The five Laureates are then selected by an independent, international Jury presided by Pr. Günter Blobel, Nobel Prize in Medicine 1999.

Professor Blobel said: "The work of the 2012 Award Laureates yielded remarkable insights into human health issues, such as diabetes, brain seizures, bacterial and viral infections, and extending to the cultivation of plants in arid areas. Their research is truly original and each is among the best in five distinct regions of the world."

Faced with global issues such as diminishing resources, increasing and aging populations, and the consequent medical and social challenges, L'Oréal and UNESCO are convinced that these women researchers will have a major impact on society and help light the way to the future.

The 2012 Laureates in Life Sciences are:

Africa and the Arab States

Professor Jill Farrant
Research Chair – Plant Molecular Physiology, Department of Molecular and Cell Biology, University of Cape Town, South Africa
"For discovering how plants survive under dry conditions."

“ One of the Unique Characteristics of the CORDEX Africa Campaign is that African Climatologists will Meet with other African Scientists ”



Cultivar Names and Origin of Some Well-Known Planted Pasture Species in Southern Africa.

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Any Planted Pasture Scientist travelling through the south of Zambia will stop immediately at the sign post “Welcome to Katombora” shown in Figure 1. The name *Chloris gayana* cv. Katombora will automatically flash through your mind. However there is a difference; the sign post reads Katombora and the cultivar name is Katambora. An information document by the FAO, published on internet, reads: “*Rhodes Katambora grass originating from the banks of the Zambesi River, in Zimbabwe*”. The first theory is that this mentioned collection site is close to the area where the sign post is, just on the Zimbabwe side of the Zambesi. The second theory is that somebody made a typing mistake and use Katambora instead of Katombora.

With reference to the Zambia site, the FAO document reads: “*The area of Katombora, in the southern Province of Zambia, lies along the northern banks of the Zambezi River, about 50 km west of Livingstone, home of the mighty Victoria Falls World Heritage Site. The Katombora area is situated in the Kazungula District*”.

It should also be kept in mind that Zimbabwe (southern Rhodesia) and Zambia (northern Rhodesia) was earlier one country and for that reason the same area name on both sides of a present international border.



Figure 1: The Katombora School
Kazungula District



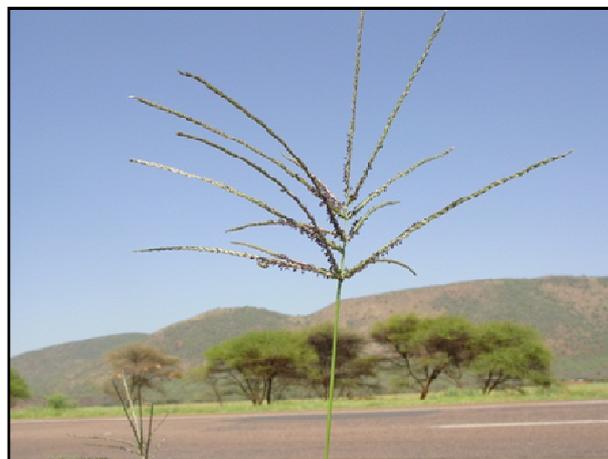
Figure 2: *Chloris gayana* cv. Katambora

Setaria sphacelata

Kazangula rings another bell! De Bruyn did a physiology study on the grass *Setaria sphacelata*. The author described the advantages of this species as a good candidate for reclamation work, for ley cropping in agronomy and for veld improvement. He mentioned three varieties and the most popular one was the “Kazungula” variety from the wetlands near Kazungula in northern Rhodesia (Zambia). This is the same area where the photo was taken.

Digitaria eriantha

During 1924 Genl. JC Smuts informed Ms SM Stent, grass taxonomist at the National Botanical Gardens (Pretoria), about a group of extraordinary *Digitaria* grass tufts on his farm Doornkloof, near Irene, Pretoria. According to the General it was clear that the cattle prefer this group of grass tufts more than other tufts of the same species (For those uninformed, Genl. Smuts was Prime Minister of South Africa and an enthusiastic, self-trained Botanist). Material was collected (Figure 3) and after investigation it was described as a new taxon, *Digitaria smutsii* Stent (Dannhauser, 1985). Further investigations resulted in the registration of three cultivars of *D. smutsii* in the 1930's and one of them was “Irene” (SARCUSS 1961), which still on the South African National cultivar list.



Cenchrus ciliaris

It is not clear who collected *Cenchrus ciliaris* cv. Molopo for the first time, however Anon (1996) quoted that it was collected along the Molopo River in “Western Transvaal” (North West/Northern Cape). The same source reports that the cultivar was “introduced from South Africa to New South Wales in 1940”. A second cultivar, Gayndah, is also used in South Africa and it is very popular because of its fine stems and high palatability, although the production is lower than that of Molopo. According to Anon (1996) *C. ciliaris* cv. Gayndah derived from a small sample of seed that was collected near Nairobi, in Kenya, in 1930.



Figure 4: *Cenchrus ciliaris* cv. Molopo

**Left:
Figure 3:
*Digitaria
eriantha* cv. Irene**

Anthephora pubescens

Donaldson (2001) reported that he collected a few seeds of this grass in 1962 in the road reserve, about 30 km west of Vryburg and multiplied it for research purposes. The first research was done in 1994 on the farm Buttermere, near Vergeleë, Vryburg district. The results of these experiments resulted in *A. pubescens* becoming an important pasture species in SA, although no cultivar was officially registered. For all the years it was used as a “Common” type, until Agricol Seed Company, registered the cultivar “Wollie”.

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Copper Deficiency in Waterbuck: a Disease of Affluence?

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Gorongosa National Park, situated largely within the tail end of the Great Rift Valley in the heart of Mozambique, was renowned for its vast herds of wildlife before Mozambique's devastating civil war. Most of the wildlife was eliminated during two decades of warfare and is only now beginning to recover, with help from the Gorongosa Restoration Project.

The centre of the park, geographical and ecologically, is the shallow Lake Urema and the surrounding floodplain which is inundated every summer. Apart from the floodplain, the park contains around twenty vegetation types, including miombo woodlands, acacia savanas, grasslands and forest (Stalmans and Beifuss).

During July 2011, I visited the Gorongosa National Park, partly to investigate a phenomenon that several staff had mentioned as a possible pathological sign for the post-catastrophic ecology of the Park. There is a large population (approx. 13,000) of waterbuck (*Kobus ellipsiprymnus*) on the Urema floodplain, with a proportion of the waterbuck reputedly showing bleached fur, and several territorial males with only one horn

(Franziska Steinbruch, pers. comm.) Here is possible nutritional explanation for these abnormalities, from a partly veterinary perspective. During my visit I confirmed that waterbuck seen on the edge of the floodplain include several or many pale-looking individuals, in which the full pigmentation of the pelage is not expressed. I also noticed a remarkably great incidence of one horned territorial males. Both symptoms could have the same cause. It is well-known that deficiency of copper can lead to bleaching of the fur, in both domestic and wild hoofed mammals. Copper-deficiency also affects bone formation and could possibly explain breakage of horns at the base during normal sparing among males.

So it appears, at least superficially, that there may be some incidence of copper-deficiency among the waterbuck at Gorongosa today, which would be consistent with the fact that the total population of this species is now about fourfold what it was at the heyday of the Park in the late sixties or early seventies.

This could fairly easily be tested by sampling: copper is stored in the liver and any carcasses of waterbuck could be sampled for liver copper concentration.

It could also prove consistent with experience at Lake Nakuru in Kenya, which has had extremely dense populations of waterbuck in a similar geological and ecological setting (Great Rift Valley). Maskall and Thornton (1989 and subsequent publications) documented deficiencies of trace elements including copper in waterbuck and impala at Lake Nakuru. If tissue samples are taken at Gorongosa it would be wise to include cobalt and molybdenum in the list of elements analysed because they are part of the same nutritional complex as copper, and in the case of Lake Nakuru cobalt was deficient while molybdenum was excessive, antagonizing copper (Maskall and Thornton 1989).

How could copper deficiency occur on the rich alluvial soils of the Urema Floodplain, with their rich grasses? The answer is based not on soil poverty but on overpopulation, as Ellen Dierenfeld (of Novus International) with her extensive experience of trace element deficiencies in zoo animals has helped to explain to me.

The waterbuck at Gorongosa today are overpopulated in the sense that this is the only species of large herbivore (> 60 kg body mass) that is so much more numerous than originally that a decrease in its population in the future seems inevitable; i.e. the current numbers of waterbuck at Gorongosa are unsustainable as the populations of other floodplain grazers such as hippo, buffalo, zebra, and wildebeest build up again. Given free access to all the best grazing, the waterbuck is able to eat a greater-than-usual proportion of its diet in the form of sulphur-rich plants such as herbaceous legumes.

These legumes include native genera such as *Rhynchosia* and *Tephrosia* and possibly also the exotic and invasive but very palatable *Mimosa pigra*, which is known to be common on the floodplain and which is known to be eaten by hippo (*Hippopotamus amphibius*), impala (*Aepyceros melampus*), and other grazers. This leads to relative richness of rumen contents in sulphur, which can be thought of as leading to a disease of affluence for the waterbuck because in a balanced community of grazers the nutrient-rich leguminous species would have been shared.

Sulphur antagonises copper in the rumen, leading to reduced absorption of copper from the small intestine. This is because sulphur, released by foregut fermentation, binds to copper to form insoluble copper sulphide, which tends to be defaecated. Although this hypothesised induced copper deficiency is not a problem in the sense that it is likely to prove self-correcting with the current rapid increase in the numbers of impala at Gorongosa, it is a sign that the waterbuck population is at its top and has nowhere to go but down, at least in the floodplain habitat. It remains to be seen whether the waterbuck will continue to expand into savanna and woodland in the Park in lieu of buffalo (*Syncerus caffer*), zebra (*Equus quagga*), and wildebeest (*Connochaetes taurinus*).

At the moment there is a sprinkling of waterbuck in woodland (e.g. seen by me between the main camp, Chitengo, and the Park gate) and I suspect that copper deficiency symptoms are not to be found in this vegetation type despite the abundance of forage.

If it is true that the waterbuck at Gorongosa are currently clinically or subclinically copper-deficient, then it remains unclear whether this would have occurred in the absence of an invasive alien presence of *Mimosa pigra*, an acacia-like woody species originating from South America, in the Park.

The overpopulation of waterbuck on the floodplain highlights the remarkable reluctance of the lion (*Panthera leo*) population at Gorongosa to congregate at the lake edge and to exploit the waterbuck, which could theoretically support an exponential increase in the lion population. This presents a once-in-a-lifetime opportunity for research for anyone interested in the relationship between waterbuck and lion, which has been ambivalent and remains controversial in view of a hypothesised chemical antipredator defence in the glandular skin of the waterbuck.

References

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Figure 1: One-horned Waterbuck at GNP Picture taken by Adolfo Macadona



Figure 2: Waterbuck herds on the floodplain at GNP - Picture taken by Alan Short

SAEON's Pre-COP17 Schools' Awareness Initiative

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During November last year, SAEON organized six schools' awareness events to raise awareness among learners about environmental change and of the causes and impact of environmental change in South Africa and the global environment. The significance of the 17th Conference of Parties (COP17) under the United Nations Framework Convention on Climate Change (UNFCCC) was also highlighted during these events which were held at the locations of the six SAEON nodes, namely Phalaborwa, Kimberley, Pietermaritzburg, Grahamstown and Cape Town.

Presentations by a wide range of scientists from various organisations were followed by interactive workshops to drive home the message of climate change, the impact of human activities on the environment and the possible interventions to reduce this impact. The various activities at the events ranged from debates where learner groups represented developed and developing countries affected by environmental change, to learners calculating the carbon footprint associated with local versus imported produce.

Of note is that learners had the opportunity to be addressed and interact with a number of scientists who are members of the GSSA. At the Phalaborwa event Dr Tony Swemmer (SAEON Ndlovu Node) shared the concerns associated with the rise in global temperatures due to Climate Change. Learners were shown graphs of Phalaborwa's temperature trends and had the opportunity to engage in hands-on activities using thermometers and downloading data from a weather station.

At the Kimberley event, Dr Hugo Bezuidenhout (SANParks) and Dr Loraine van den Berg (Department of Agriculture, Forestry and Fisheries), the current GSSA Vice-president, was part of a group of Northern Cape-based scientists addressing high school learners about the current and expected Climate Change impacts on various environmental themes, such as biodiversity and hydrology. Dr van den Berg specifically addressed how the agricultural sector will be impacted; focusing on food security and the important role agricultural scientists has to play.

SAEON would like to Thank:

All the partners involved in the various events for their valuable contribution and sharing of knowledge;

The sponsors – the Department of Science and Technology and the Applied Centre for Earth Systems Science (ACCESS); and

The Department of Education – without the Department’s permission and support it would not have been possible to organise these events



Figure 1: Some of the scientists who addressed educators and learners at the event. From left to right: Mr Erik Hermann; Dr Loraine van den Berg and Dr Hugo Bezuidenhout



Figure 2: Feedback session from the school kids

Local Farmers to Feel the Effects of Climate Change

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Prolonged drought, aseasonal cold spells and extreme temperature highs in occasional years all negatively impact farmers by reducing agricultural production through a loss of livestock or crops. What then, are the possible impacts of global climate change; which predicts temperature increases of between ~ 2 to 4°C and more variable rainfall by the end of the 21st century?

What is certain is that the negative impacts of climate change will not be felt equally around the world, with the greatest production losses expected in developing countries due to their limited capacity to adapt.

It has been estimated that in some African countries yields from rain-fed agriculture could be reduced by as much as 50% by 2020, and that Africa as a whole could suffer from as much as a 17% reduction in agricultural output potential by 2080 (sourced from the 2007 Fourth Assessment Report issued by the Intergovernmental Panel on Climate Change).

Such projections mean that farmers need to be aware of the likely changes, and be open to the possibility of planting alternative (more suitable) crops more suited to the new environment.



Figure 1: The recent drought in the Eastern Cape negatively impacted both the quantity and quality of oranges produced during the 2010/2011 season. The small, blemished fruits produced were rejected as unattractive' by the export market. Increased variability in rainfall and prolonged droughts in the future are just one of the symptoms of climate change (Photo Dave Thompson)

It is also important to understand *how* climate change can act to reduce yield and profit in agriculture. Depending on the crop and the severity of the changes in climate, the worst case scenario will be outright plant death. However the more likely consequences will be more subtle and could include, amongst others, changes in flowering times, failure to open buds, skewed gender ratios and inhibited or delayed maturation. Current understanding of these effects is based mainly on studies undertaken in the temperate regions of Europe, and as such little is known about the effect climate change is having on African (and southern African) crops.



Figure 2: The ratio of male to female flowers produced by mango trees is dependent on temperature. Changes in temperature could decrease the number of female flowers produced, thereby compromising the potential number of fruits matured (Photo Dave Thompson)

Now local researchers from the Ndlovu Node of the South African Environmental Observation Network (SAEON) in Phalaborwa and the School of Geography, Archaeology and Environmental Studies (University of the Witwatersrand) are working together to address the questions surrounding climate change and crops in the local context. The objective is to compare crop production data (for example bud opening dates, full flowering dates, full or partial petal drop dates, spraying dates, harvest dates, yield data, etc) with temperature and precipitation records across southern Africa over the past several decades to determine what impact climate change is having on the timing and success of the various reproductive stages (termed phenophases) of crop production, and on the eventual yields.



Figure 3: The timing of different reproductive stages, such as fruit filling in these avocados, is driven by temperature and can be linked to specific management practices. Shifts in these dates, as is likely under climate change, will require operational adjustments within the agricultural sector (Photo Dave Thompson)

Increasing the number of crop types (but with an emphasis on fruit) that are included in this project, together with analysing as much crop production and climate data as possible from as long a time period as possible (at least 2 decades or more would be ideal) will help scientists understand climate change as relevant to agriculture in South Africa.

Each data record shared is a piece in this puzzle and with improved understanding of how the world is responding, we will be better placed to face and react to the challenges of the future climate. Anyone in possession of crop production data (anything from the dates of specific reproductive events to management practices and overall yields) is encouraged to please contact one of the researchers to discuss adding their information to a growing project database.

Grassland Society of Southern Africa



Advancing
Rangeland Ecology
and Pasture Management in
Africa



GRASSLAND SOCIETY OF SOUTHERN AFRICA
www.grassland.org.za

Upcoming Events

International Conference on African Indigenous Research and Development Initiatives

Date: 14-16 March 2012

Venue: Goodnews Convention Centre, Muldesdrift, Johannesburg

Website: www.ircabfoundation.org

11th International Conference on Goats

Date: 24-27 September 2012

Venue: Canary Isles (Spain)

E mail: jcapote@icia.es

Website: www.iga-goatworld.com

NAMPO Harvest Show

Date: 14-19 May 2012

Venue: Bothaville, South Africa

Website: www.agrifica.co.za

Agricultural Research Council-Animal Production Institute Courses Poultry Production

Date: 29 May – 01 June and 02-05 October 2012

Venue: ARC, Irene

Royal Show

“Hosted by the Royal Agricultural Society of Natal since 1851”

Date: 25 May – 03 June 2012

Venue: Pietermaritzburg, South Africa

Website: www.royalshow.co.za

Beef Cattle Management

Date: 28 - 31 August 2012

Venue: ARC, Irene

Fynbos Forum 2012

Theme: “East meets West: transcending political, ecological and social boundaries in the fynbos”

Date: 16-19 June 2012

Venue: cape St Francis

E mail: w.paisley@sanbi.org.za

Small Stock Management

Date: 21 - 25 May 2012

Venue: ARC, Irene

Contact: Annetjie Loubser

Tel: 012 672-9153

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PHD SCHOLARSHIPS FOR AGRICULTURE-RELATED STUDY COMMENCING IN AUSTRALIA IN 2013

The Australian Government is offering 20 PhD-level Australia Awards (Scholarships) to candidates from eligible African countries for agriculture-related studies commencing in Australia in 2013. The scholarships are for study in Australia at an Australian university however it is preferred that any field research is undertaken primarily in Africa.

The research topics of successful applicants will demonstrate a contribution to improving food security in Africa through increasing agricultural productivity, improving rural livelihoods through functioning of markets and trade, and/or building the resilience of communities most vulnerable to food insecurity.

In addition, topics should demonstrate direct relevance to the research or development objectives of one or more of the three Australia-Africa Agricultural Partnerships being funded under the Australian Food Security Program in Africa (ACIAR - CIMMYT; CSIRO - CORAF; and CSIRO – BecA). Information on these programs can be found at the following websites:

AusAID-BecA,
<http://hub.africabiosciences.org/>

AusAID-CORAF
<http://www.csiro.au/Organisation-Structure/Flagships/Sustainable-Agriculture-Flagship/African-Food-Security-Initiative.aspx>

ACIAR-CIMMYT
<http://aciarc.gov.au/projects/multilateral/2012>

Applicants may download the application form and other documents from the Agriculture PhD page of the Australia Awards in Africa website, www.adsafrica.com.au or by sending an e-mail to enquiries@adsafrica.org

Consult **www.adsafrica.com.au** for more information

The International Foundation for Science (IFS)

Call for Research Applications from Developing Country Scientists

The International Foundation for Science (IFS) provides support to young scientists of merit in developing countries by awarding research grants and providing grantees with additional services such as travel grants and purchasing assistance.

The IFS supports research related to the renewable utilisation of biological resources in areas such as crop and animal production, forestry, food science, natural products, and fisheries, as well as research on the sustainable utilisation and conservation of natural ecosystems, including themes such as water and biodiversity. Proposals for projects may address biological, chemical, or physical processes as well as social and economic relationships important in the conservation, production, and renewable utilisation of the biological resource base.

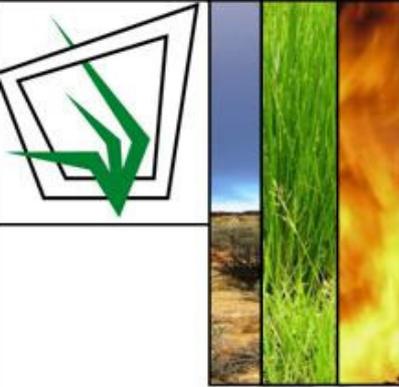
Research grants are awarded up to a maximum value of USD 12,000 for a period of one to three years and may be renewed twice. They are intended for the purchase of equipment, expendable supplies, and literature.

Applicants must be citizens of, and carry out the research in, a developing country. They should be attached to a university or national research institution in a developing country. Specifically excluded are countries in Europe, including Turkey and Cyprus, as well as countries of the former Soviet Union. Argentina and Uruguay are also not eligible to receive support. As well as being under the age of 40 (under 30 for applicants from China) and at the start of their research career, candidates must possess a higher academic degree, which should be at least an MSc or equivalent.

Applications are made on the application form, in English or French, which is available from the IFS Secretariat or can be downloaded from the website:

www.ifs.se

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Active members of the GSSA can apply for funding from Trust for activities which will elevate the disciplines of rangeland and pasture science together with the mission and objectives of the GSSA in South Africa and internationally