GRASSROOTS

Newsletter of the GRASSLAND SOCIETY of SOUTHERN AFRICA

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Profile:
President of the Grassland Society of Southern Africa

- Climate change impacts on plants
- Root studies
- Conservation status of temperate grasslands
- Eco-hydrological changes

Advancing rangeland ecology and pasture management in Africa

GRASSROOTS

Editor JULIUS TJELELE

Dear Readers

Welcome to the first edition of Grassroots, and to those we haven't talk or met this year, complement of the New Year. I would like to wish you a productive and healthy 2011. It is that time of the year, were we have to prepare abstracts for the up-coming 46th Annual GSSA Congress to be held in Grootfontein Agricultural Development Institute, Middelburg, Eastern cape from the 10 to 15 July 2011. Early preparation of abstracts, research papers or posters will help us maintain or improve the good standard of papers presented in last year's GSSA Congress. Most important, let's not forget to submit our research papers and/or research notes to AJRFS, it is our Journal let support it. We hope you will enjoy this issue of Grassroots.

Julius Tjelele

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The Grassland Society of Southern Africa is dedicated to the advancement of the science and practice of range ecology and pasture management.

We welcome any contributions to the Grassroots, in the form of news, informative articles, reports, short research notes, scientific papers and letters to the Editor.

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On the cover: Dr. Sikhalazo Dube at one of his study sites.

SAEON camp exposes learners to diverse career opportunities in science

N HAMBAZE
Education Outreach Officer, SAEON Elwandle Node

At the official launch of National Science Week in Alice earlier this year, the Minister of Science and Technology, Naledi Pandor re-emphasised the dire need for young Black South African Scientists.

SAEON, together with engineering company Murray & Roberts identified this gap early on and took the initiative to run an education outreach programme that directly addresses the need for young Black South African scientists. Through this outreach programme learners are encouraged to opt for careers in science.

A highlight of the education outreach programme is the annual science camp, which is aimed at equipping learners with the knowledge and skills to apply scientific methodology, and to expose them to a variety of careers and environments in science, engineering and technology. This year's science camp took place at The Willows, a beachfront resort in Port Elizabeth, with 19 of the top science learners from the previously disadvantaged schools in Grahamstown and four from Phalaborwa.

The programme was packed with presentations by experts in the field of science, engineering and technology, visits to various science institutions in Port Elizabeth as well as science experiments. "At Nelson Mandela Metropolitan University we were exposed to microscopes and learned how to use them," commented Mihlalikazi Swartbooi, a Grade 11 learner from Mary Waters High School. "At school we are taught about microscopes and microscopic organisms, but we never get to see or use microscopes," she added.

Monitoring the rocky shores

Learners were tasked with monitoring the rocky shores at The Willows and this exposed them to new scientific skills. "I learned how to identify different species and how they are adapted to live on a certain part of the shore," Mihlalikazi said. "I particularly enjoyed the fieldwork because I wish to pursue a career in science one day," said Sanele Nthsingana, a Grade 11 learner from Nathaniel Nyaluza High School.

The objectives of the camp were achieved in that several learners indicated that they were interested in pursuing a career in science and that the camp had made them realise that career opportunities in science, engineering and technology abound.

Learners monitor the rocky shores. Picture: Joe Sibiya

All life forms observed are identified and recorded.
Picture: Joe Sibiya

SAEON Newsletter

People, policy and climate change predictions in Mpumalanga: Local solutions for global challenges

DR D THOMPSON
Biodiversity Scientist, SAEON Ndlovu Node

The impacts of climate change are current and more severe than previously thought (IPCC 2007). They pose an increasingly serious risk to ecosystems and ecosystem services, food security and the realisation of sustainable development.

No part of the globe - whether developed or developing; rich or poor - is without impact. In acknowledging the seriousness of climate change, the South African Government approved the framework for the development of a National Climate Change Response Policy in July 2008.

It is against this backdrop that provincial and local governments are responsible for incorporating mandates that deliver on both climate change adaptation (measures taken to reduce the vulnerability of natural and human systems to actual or expected climate change effects, and climate change mitigation (measures to reduce the sources or enhance the sinks of greenhouse gases, into their respective policy frameworks, and to develop appropriate strategies for which they are legislatively responsible (Figure 1).
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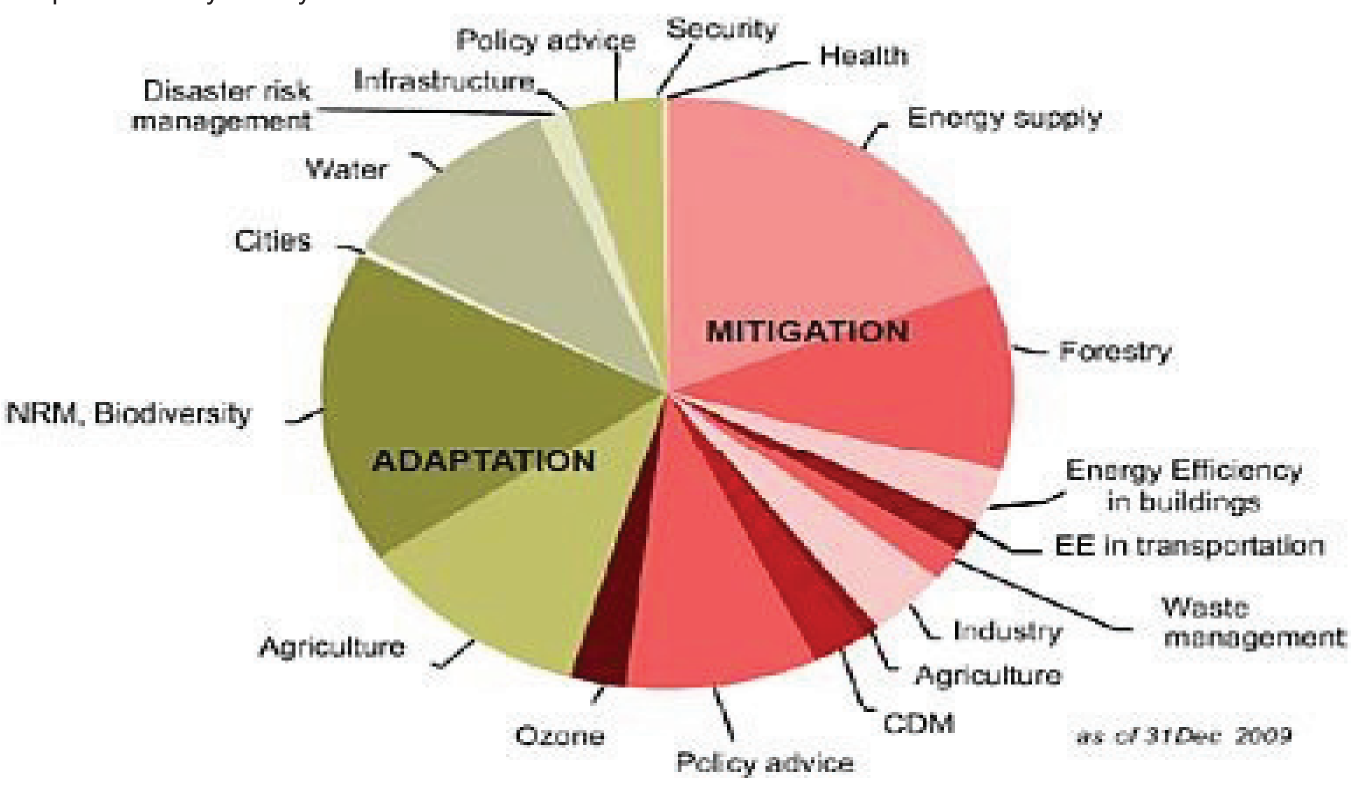

Figure 1. Provincial and local governments in South Africa are required to implement mandates that deliver both climate change adaptation and climate change mitigation strategies. The sector distribution of climate-related projects supported by the German Technical Co-operation (GTZ) reveals the enormous scope and cross-cutting nature of the required response. CDM = Clean Development Mechanisms, NRM = Natural Resource Management. Courtesy of M. Glück, GTZ South Africa.

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Climate change response strategies

One of the biggest challenges in developing such climate change response strategies, at least during the preliminary phases, is the divide that exists between science and policy. The tragic significance of this 'information gap' is that the majority of people remain unaware, misinformed and therefore somehow removed from the reality of the local and global causes and consequences of climate change.

Recently the author was invited to participate in a number of information-sharing forums organised within the various levels of the Mpumalanga provincial government. The first of these forums was a workshop facilitated by the Mpumalanga Tourism and Parks Agency (MTPA) that brought together experts from various academic (University of Pretoria), research (Agricultural Research Council; Council for Scientific and Industrial Research; SAEON) and governmental agencies (Department of Economic Development, Environment & Tourism; Department of Environmental Affairs; Ezemvelo KZN Wildlife; MTPA; South African National Biodiversity Institute) in order to promote knowledge-sharing and to capacitate the MTPA across the board.

Discussions ranged from defining climate change (as opposed to global warming or global change) and down-scaled temperature and precipitation predictions for Mpumalanga), through the probable impacts on regional biodiversity, to the contribution of the tourism industry to the climate crisis and carbon-stock trading. The author led discussions during which he unpacked the role of scientists in helping to bridge the science-policy gap and outlined the value of education and public participation or 'citizen science' activities in personalising climate change for the man on the street.

Eskom teams up with WRC on water-for-energy R&D

South Africa's Water Research Commission (WRC) and power utility Eskom have entered into a strategic partnership to fund and jointly research issues relating to energy and water use.

Eskom is a major water consumer and is currently expanding its 40 000 MW-strong fleet by 12 300 MW, which would result in even greater water consumption by 2017.

Divisional executive for corporate services Dr Steve Lennon said that further research was required to ensure that the utility became more innovative in the way it accessed, treated and used water, especially given the expectation of even greater water stress in future, owing to climate change.

WRC CEO Dr Rivka Kfir said that, in light of South Africa's water challenges, it made sense to combine resources in a way that would grow the research capacity pool.

Topics likely to be tackled following the signing of a memorandum of agreement and the formation of a joint research committee include, climate change, water resource availability and accessibility, water quality, operation and maintenance, water conservation and demand management, technology development, excess water and acid mine drainage, residue management, including ash, brine and sludge management, ecosystems and remediation and groundwater impact, as well as vulnerability and remediation

Creamer Media Reporter

Nedbank acknowledges Diamond Route for its ‘many benefits

The Diamond Route was recently recognised by Nedbank for the benefits it offers to a range of people and organisations; including school and university students, mine employees, scientific researchers, local communities and the public.

Judges cited the following as some of the many benefits:

- The creation of 261 permanent jobs;
- Company staff have access to all properties and all staff are familiar with the Diamond Route;
- All properties are open to the public, which benefits national and international tourism;
- The training of 14 cultural and bird guides;
- Some of the properties have been conserved for over 100 years – these areas provide important reference sites which are invaluable for scientific research;
- More than 120 research projects have been conducted to date on the various properties. These relate to mammals, birds, insects, reptiles, amphibians, plants, general ecology and archaeology;
- Benfontein has successfully preserved the most important herd of pure, un-hybridised black wildebeest, which, according to scientists, is the single most important conservation effort that will save these animals from genetic extinction;
- A variety of new insect species have been recorded on the Diamond Route properties, including a new genus;
- Four universities are currently running research projects on the different properties;
- Every year between 10 and 15 school groups from disadvantaged communities visit the reserves and every group receives a full day of environmental education from professionally qualified staff;
- A section of the Ezemvelo Nature Reserve has been donated to the Maharishi Institute to run its Youth Development Programmes;
- An Endangered Wildlife Trust partnership has been established with the Diamond Route, which includes an MOU being signed to utilise facilities at Ezemvelo Nature Reserve and Telperion near Bronkhorstspruit by the Endangered Wildlife Trust’s Conservation Leadership Programme.

This programme aims to give practical training to aspiring young conservationists from disadvantaged backgrounds. One of the strongest aspects of the Diamond Route Programme, the citation added, was the partnerships formed with universities, research organisations, NGOs and schools. This extended to research, experiential learning, sound environmental and sustainability management, leadership, organic farming and the provision of learning materials.

The adjudicators were particularly impressed that the Diamond Route extended beyond conservation and research by making the sites accessible to all – thus providing an excellent example of sustainability.

Profile of the President of Grassland Society of Southern Africa (GSSA)

Sikhalazo Dube

Nationality:	Zimbabwean (South African Permanent Resident),
Job title:	Senior Researcher
Date of Birth	7 June 1971

Overview:
Dr Sikhalazo Dube is a Senior Scientist at the Council for Scientific and Industrial Research (CSIR) in Pretoria, South Africa where he is an Ecosystems Modeler in the Ecosystems Processes and Dynamics Research Group. His research, student supervision and policy inputs focus on rangelands ecology: the dialogue between science, resources users and policy formulators, development of decision support tools and mapping of resources in light of a changing world. He is a member and current President of the GSSA. His publications include over 40 articles in scientific journals, proceedings, books and chapters in books. He is an author and co-author of several technical reports. His work has been presented in over 20 papers at local and international conferences.

He has experiences from South Africa; Zimbabwe; Namibia; Queensland, Australia; Texas, USA; Mozambique; Uganda and has travel extensively around the world.

He is a proud husband to Elizabeth Dube and father to Melina and Hope

Education
Ph.D. Rangeland Ecology and Management (2005), Texas A&M University, College Station, M.Phil. Science (1999), BSc (1994), University of Zimbabwe, Harare, Zimbabwe.

Employment Record
2009-present: Council for Scientific and Industrial Research South Africa.

2008-2009:	Department of Geography, University of Fort Hare, Alice South Africa. (Senior Lecturer - Part-time).
2005-2009:	Department of Livestock and Pasture Science, University of Fort Hare, Alice, South Africa (Senior Lecturer).
2005-2005:	Department of Range Ecology and Management Texas A&M University. (Postdoctoral Research Associate).
2002-2004:	Department of Range Ecology and Management Texas A&M University USA (Teaching Assistant).

Selection of Research Funding obtained

2006	Kellog Foundation Management of communal grazing areas of the Eastern Cape: Influence of management strategy, policies and practices. (US$) 399 950

Research / Consultancy Record (partial)

2010-2011	Building sustainable agrarian social ecological systems: an integrative landscape approach: CSIR PG Funding
2006-2009	Management of communal grazing areas of the Eastern Cape: Influence of management strategy, policies and practices. Funded by Kellogg Foundation
2006-2010	Water Harvesting funded by the WRC:
2006-2009	The contribution of municipal commonages to sustainable environmental management as well as the livelihoods of poor people in small towns and settlements in South Africa Funded by SANPAD
2006-2009	Restoration of degraded land at the Tsolwane Game Reserve in the Eastern Cape Funded by GMRDC:

2007-2009 Bush control funded by the NRF

2006-2009: Integrated control of Acacia mearnsii in the Tsomo valley Funded by GMRDC

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Climate change impacts on plants

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Introduction

Climate change is one of the greatest environmental, social and economic threats that the planet faces at the moment. Scientists from different fields have acknowledged the rise of earth's average surface temperature by 0.76° C since 1850 when reliable records began. Eleven of the 12 warmest years worldwide since 1850 occurred between 1995 and 2006. While climate change has global repercussions, the most vulnerable organisms will experience the greatest impacts from climate and disaster risk. Climate change is threatening the lives and livelihoods of plants and animals, including human beings, reducing natural resources making it impossible for sustainable utilization of limiting resources. Generally, climate change threatens biodiversity, ecosystem services and natural processes by increasing hazards, vulnerabilities and anthropogenic disturbances.

What is climate change?

According to the Intergovernmental Panel on Climate Change (IPCC), climate change is any long-term significant change in the "average weather" that a given region experiences (IPCC 2001a). Average weather may include average temperature, precipitation and wind patterns. It involves changes in the variability or average state of the atmosphere over durations ranging from decades to millions of years. These changes can be caused by dynamic processes on Earth, external forces like variations in sunlight intensity, and more recently by human activities (IPCC 2001a).

It is predicted that the continuation of these activities will result in a 1.8 - 4°C average temperature increase over the next century (IPCC 2001a), causing changes in weather patterns (NEAA). Changes in climate patterns may cause extreme weather events such as heat waves, floods, storms, droughts and bushfires (IPCC 2001a). Climate change and its impacts has been reported in different parts of the world including the United States (Smith and Tirpak 1989, Adams et al. 1990, NAST 2000), Australia (Hughes 2003, Braasch 2008), UK (Harry et al. 2001, Berry et al. 2002), Europe (Arnell 1999, Thuiller et al. 2005, Pompe et al. 2008) and Africa (Desanker and Justice 2001, Midgley et al. 2002, Turpie et al. 2002, Lukman 2003, McClean et al. 2005).

What causes climate change?

Basic climate change science explains that climate change may occur naturally as a result of a change in the sun's energy or Earth's orbital cycle, or it could occur as a result of persistent anthropogenic forces. The Earth is warmed by solar radiation, and in turn, the Earth radiates energy back to the outer space. The atmosphere (thick layer that keeps the surface warm and protects it from small-to-medium sized meteorites) acts as a greenhouse and traps some energy that would not be radiated to space (Wikipedia 2008a). The result of this greenhouse effect is a warm Earth, which is habitable and conducive to support different life forms (Philander 2000). The main human influence on global climate is emissions of the key greenhouse gases (GHG) - carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFC) and nitrous oxide (N_2O) (DEAT 2004).

Increase of these GHG in the atmosphere is a result of human activities such human activities includes, burning of fossil fuels, farming and clearing land for industrial development. Concentrations of CO_2 has risen from about 270 parts per million (ppm) to 370 ppm, concentration of CH_4 have also risen due to cattle production, cultivation of rice fields and release from landfills and most of the N_2O emissions are a result of industrial processes and automobile emissions (AG:DCC, IPCC 2001b). When ecosystems are altered and vegetation is either burned or removed, the carbon stored in them is released to the atmosphere as CO_2. The main reasons for deforestation are agriculture and urban development, and harvesting timber for fuel, construction and paper. Part of the CO_2 emissions to the atmosphere can be attributed to land-use change (IPCC 2001b). The oceans are a major component of a climate system. Oceans absorb much of the sun's radiation thereby acting as carbon sinks and storage for abundant CO_2 gas (Philander 2000). The Oceans cools down the Earth's temperature through mixing and circulating warm and cold waters. Water vapour contributes to the formation of clouds which shade the surface and have a cooling effect (IPCC 2001b).

What are the effects of climate change?
Climate change is a result of increased temperatures, resulting in altered rainfall patterns across the country (IPCC 2001a). These changes threaten water availability, agricultural production, health, and biodiversity. The effects of climate change are being felt in different parts of the world, depending on the rate of changes and the ability to adapt to changes by the ecosystems. In 2001, the IPCC released the report on climate change revealing that in the last 100 years the earth has warmed by 0.74°C. The last 12 years (1995-2006) rank among warmest years since 1850, and by the end of 21st century temperatures could rise by between 1.1 °C and 6.4 °C (IPCC 2001a).

Climate models tend to show that the greatest warming will occur over inland areas, less warming over oceans and coastal zones, and the least warming will occur over the southern Oceans because of its large capacity to transport surface heat into deeper waters. Changes in the oceans have important implications for South Africa. In the recent past, variation in ocean currents has caused major changes in several fish resources, both as a source of food and biodiversity (Braasch 2008). Changes in temperatures will also lead to more frequent extreme climatic events. It is anticipated that the number of hot days will increase with fewer colder and frosty days. In addition, intense summer heat could result in more violent storms and tropical cyclones as the oceans warm and more energy is stored in our warming atmosphere. This could cause greater flooding, mud/land slides and damage to buildings, roads and bridges.

It is currently estimated that 10% increase in rainfall coupled with an increase in CO_2 would lead to a 10-20% increase in wheat and maize production, while a 10% decrease in rainfall would be approximately balanced by the rising CO_2 content of the atmosphere. Slightly warmer temperatures may lead to a small reduction in wheat yields, but would have little effect on maize. These predictions are not very certain (Turpie et al. 2002) but give an indication of what might lie ahead. Higher CO_2 concentration will lead to less protein in the grass, which will reduce any benefit resulting from increased plant growth. An increase in rainfall or a reduction in plant water use (due to a higher atmospheric concentration of CO_2) could ease the problem slightly (Braasch 2008).

Ecosystems throughout the world are already experiencing high pressures from human activities making them vulnerable and less capable of adapting to ongoing changes. These conditions reduce biodiversity and influence ecosystem functioning. Climate change affect human health, safety and living standards by causing increasing environmental health hazards and reducing natural resources (WHO 2003, Braasch 2008). A small increase in temperature would allow, for instance, malaria to spread into areas which are currently malaria-free, and would increase its severity in areas where it already occurs and could lead to increased drug resistance illness (Lindsay and Martens 1998, Turpie et al. 2002, WHO 2003).

Plants, in particular, have trouble keeping up with rapid climate change. Small, isolated populations could go extinct as a result. South Africa has about 10% of all the plant species in the world, of which about half occur nowhere else on Earth. Warming and a change in the seasonal rainfall within the Cape floral kingdom, is a cause for concern to conservationists (Midgley et al. 2001). Climate change might significantly impact the distribution and species composition in different of habitats in different ways (Midgley et al. 2001, Berry et al. 2002, Pompe et al. 2008), and could possibly drive many species to extinction (Thomas et al. 2004).

Temperature effects, rainfall and soil properties are important factors determining the distribution of plants, determinants of the tree-grass ratio, bush encroachment and vegetation boundaries. Climate change prediction models show the possibility of an increase in aridity in the western regions of South Africa, particularly the Northern Cape (SoER 2004). This aridity may result in changes in vegetation and crop production, amongst other things (Leuci and Ramsay 1999) and the weather conditions being more extreme, with cold and frost and extreme heat in summer (Burger 2002).

Plant diversity is concentrated in several unique native environments known as biodiversity hotspots. These areas are unusually rich in species but are highly threatened by human activities. Hotspots boost a large number of rare, endemic and protected species. The Cape Floral Kingdom (fynbos) has 7,300 plant species of which 68 % are endemic to that area and occur nowhere else in the world (Gibbs 1987). The Succulent Karoo biome contains over 6,000 species of which 2,500 are endemic (Cowling et al. 1998). The plants in Fynbos and Succulent Karoo live on the edge of survival, completely dependent on low but fairly reliable winter rainfall. If the climate of this region becomes any drier, the effects on the entire biome will be devastating. These two floral biodiversity hot spots occur in winter rainfall regions and would be threatened by a shift in rainfall seasonality (Midgley et al. 2001).

A study conducted by South African National Biodiversity Institute (SANBI) strongly suggests that the range of the *Aloe dichotoma* (Quiver tree) has begun to respond to climate-induced stress. Observations from over 50 sites in the trees range noted two trends. Firstly, where populations were found on slopes, mortality was much higher at lower elevations than at higher ones (at higher altitude it is cooler). Secondly, there were higher mortality rates in the north of the tree's range (towards the equator), than those found in the south towards the tropics suggesting that cooler climate were more efficient for the species survival. This strongly suggests that a combination of water and heat stress is the cause of mortality in declining Quiver tree populations (Midgley et al. 2005, Foden et al. 2007)

Rutherford et al. (1999a, b) and Midgley et al. (2001) reported that climate change has been suspected of affecting the biota of conserved nature areas in different and significant ways. Midgley and Thuiller (2007) and Foden et al. (2007) explored why Namaqualand plant diversity might be particularly vulnerable to anthropogenic climate changes despite presumed species resilience. Using simple modelling approaches, their results show strong reduction in spatial extent of bio climates typical of Namaqualand within the next five decades and that both generalist species with large geographic ranges and narrow-range endemics may be susceptible to climate change induced loss of potential range.

Scientists have shown that increased CO_2 levels will increase and improve plant growth (Eamus and Palmer 2007). Tews & Jeltsch (2004) concluded that possible increase in precipitation will strongly facilitate shrub encroachment threatening savanna rangeland conditions and regional biodiversity and that shifts in precipitation patterns will potentially have severe consequences for woody plant population dynamics. Climate change is expected to promote woody plant establishment accelerating bush encroachment, suppressing the grass layer dominance.

Conclusion

The timing and extent of global climate change are uncertain, and as a result our actions need to be pragmatic. Plans to conserve South Africa's rich plant biodiversity must take account of future climate change scenarios. More ecosystems are becoming vulnerable due to their narrow distribution. Eventually many plant species may be lost and this may alter the ecosystem structure, functioning and distribution. Regional and national actions need to be taken to conserve and preserve our plants.

Climate change is a threat to plants distribution and natural habitats due to extreme weather conditions and anthropogenic disturbances. Plants have adapted to these changes for many decades, however it is not predictable if plants will adapt to this rapid changes that has been recorded in the last 100 years. Failure to adapt and shift distribution might lead to extinction from its natural habitats.

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Eco-hydrological changes following grassland degradation in a semi-arid climate

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Introduction

A new discipline called eco-hydrology has received increasing interest by ecologists over the last few years. Eco-hydrology may be defined as "the science that seeks to explain the hydrologic mechanisms that underlie ecological patterns and processes" (Snyman 2005). Although some efforts have been made to evaluate the eco-hydrological implications of arid and semi-arid grassland degradation, many authors argued that we are far from a complete understanding of the issue. For sound grassland management it is essential to develop a better understanding of patterns of plant growth, production (above- and belowground) and how they relate to the driving influences of water and ecosystem degradation (Swemmer et al. 2007).

Aboveground observations of plants are often used to make inferences about mechanisms that influence interactions among plants within communities and between seasons. However, ecological interactions in arid ecosystems, such as competition and other factors that control plant distributions, primarily occur belowground (Busso and Bolletta 2007). Thus, extrapolating from aboveground observations to belowground functions can be misleading especially with grassland degradation. This study aimed at quantifying the effects of grassland degradation over an 8-year period (2000/01 to 2007/08 growing seasons) on different plant (above- and belowground) characteristics in a semi-arid climate.

Material and methods

The research was conducted in a semi-arid summer rainfall (annual average 530 mm) region of South Africa (28°50' S, 26°15' E, altitude 1 350 m). The study area is situated in the moist, cool Highveld grassland. Soils are dominant fine, sandy loams. Grasslands in three condition classes (good, moderate and poor) was studied (Snyman 2005). The three sites chosen reflect distinct species composition and basal cover arising from different grazing histories in this grassland type. Each experimental unit was 2 m x 15 m, with three replications per composition state (condition class).

The aboveground phytomass production for each grassland condition class were collected every second month at the end of October (spring), December (summer), February (summer) and April (autumn) over the 2000/01 to 2007/08 growing seasons. Aboveground production was obtained by defoliating grasses to a height of 30 mm (the effective stubble height) in eight (0.25 m^{-2}) quadrates randomly placed in each plot. Root mass was estimated to a depth of 1 200 mm from a sample of 10 soil cores systematically distributed throughout each plot. Soil cores were collected with an auger (70 mm diameter) at the same time as aboveground samples were taken every second month. Most roots were extracted via successive washings of soil cores through a 2 mm mesh sieve. The remainder of the soil was spread in a shallow tray and fine roots were collected by flotation. The outflow from the tray passed through a 0.5 mm-mesh sieve.

Soil-water content was measured every 15 days (Snyman 2005). Detailed methods, as well as the calculation of above- and belowground rates of production and water-use efficiency are given in Snyman (2005). Water-use efficiency (WUE) is defined as the quantity of above- and belowground phytomass produced per unit of water evapotranspired. It was attempted to emphasize root growth increase in mass over a specific period rather than the accumulation of existing root mass over a season. Evapotranspiration was determined by quantifying the soil-water balance equation (Snyman 2005). Data were analyzed using a repeated-measure ANOVA. The Number Cruncher Statistical System (2000) software package (Hintze 1997) was used for all statistical analysis.

Results and conclusions

Peak aboveground phytomass at the end of each growing season was on average 1 466, 1 233 and 654 kg ha^{-1} for grasslands in good, moderate and poor conditions, respectively. The growing seasonal (October to March) average root mass to a depth of 900 mm was 3 433, 2 343 and 1 220 kg ha^{-1}, respectively, for grassland in good, moderate and poor condition. Water-use efficiency over 2 months periods expressed as either the total phytomass or aboveground phytomass only, is presented in Figure 1. Grassland degradation significantly (P<0.01) lowered water-use efficiency over all months. The mean WUE (root production included) were 4.75, 3.23 and 2.11 kg ha^{-1} mm^{-1} for grasslands in good, moderate and poor conditions, respectively.

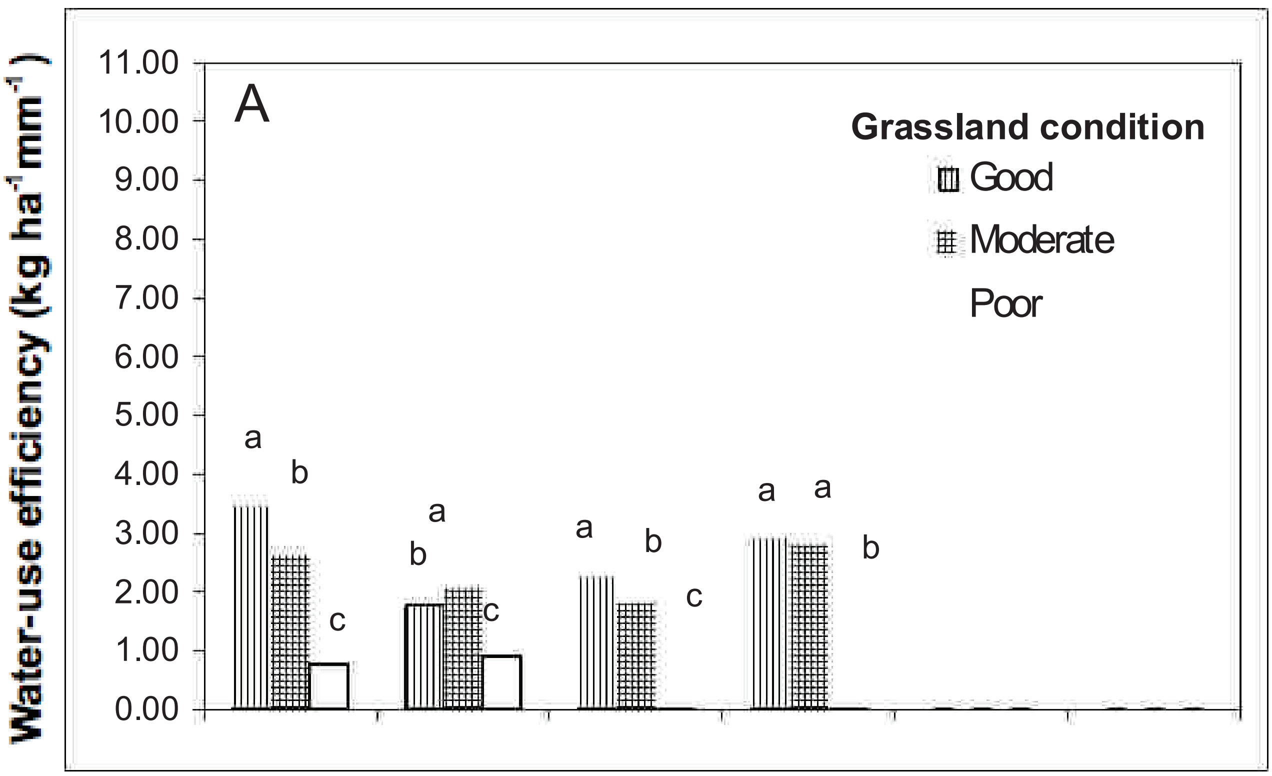
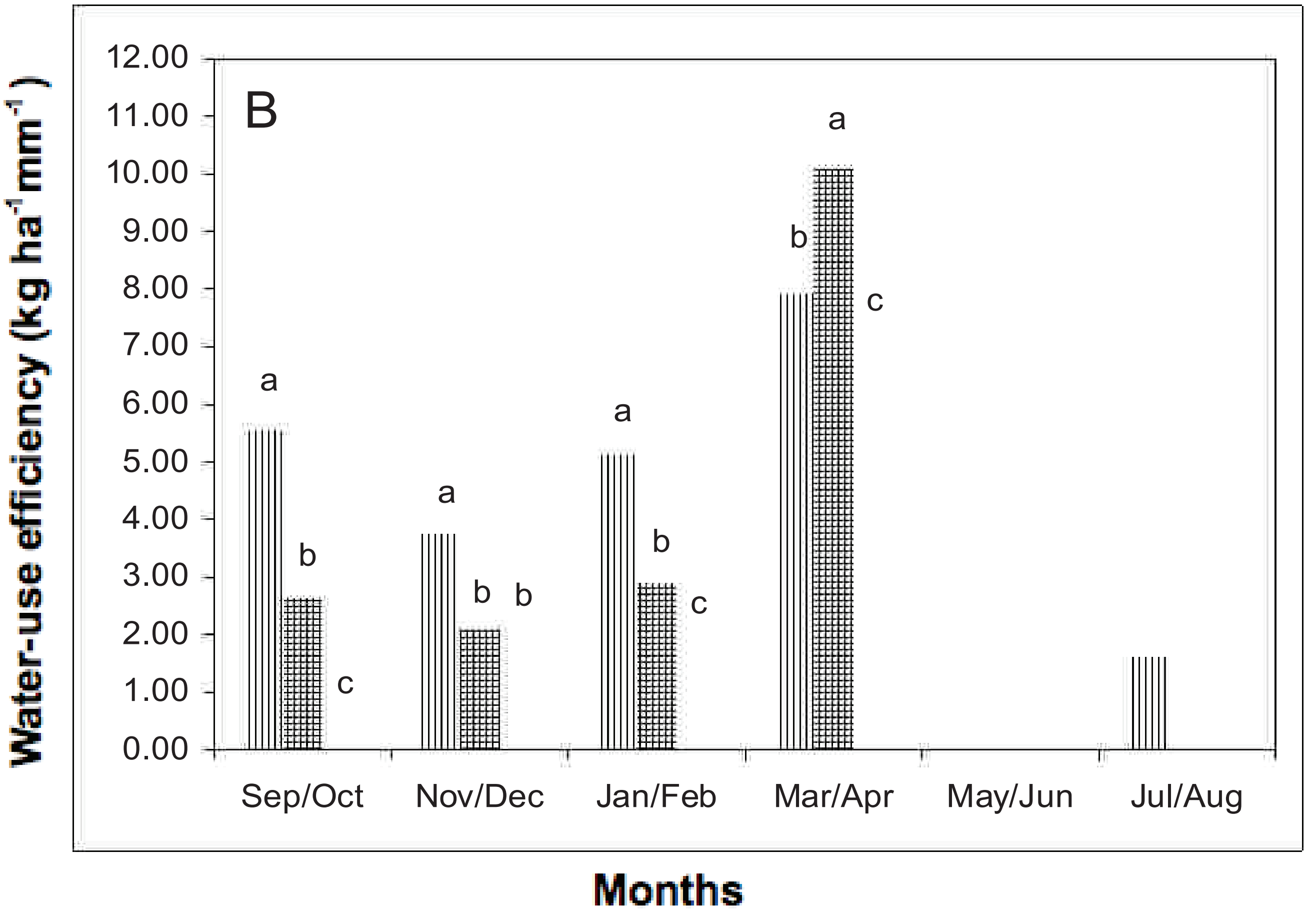


Figure 1. Mean (±SE) water-use efficiency (kg ha^{-1} mm^{-1}) (A = expressed in terms of only aboveground phytomass and B = expressed in terms of both aboveground phytomass plus root production increase over a 2-month period) for the different grassland conditions, averaged over 8-seasons (2000/01 to 2007/08). Means within a month with different superscripts differ significantly (P<0.01).



These WUE observations are among the few also including root production in its calculation. In the past, researchers only included aboveground production of grassland in estimating the water-use efficiency and therefore this study is unique with regards to roots produced for a certain quantity of water-use, also considered in WUE estimations. As the absence of knowledge limits our ability to prevent degradation and develop restoration strategies, this study identified the pursuit of eco-hydrological feedbacks in grassland degradation processes as one of the emerging issues of grassland ecohydrology.

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The conservation status of temperate grasslands in southern Africa

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Introduction

The Grassland Biome (25° S - 33° S; 24° E - 31° E) of southern Africa (here defined in the narrowest sense as South Africa, Lesotho and Swaziland) covers an area of c. 360,589 km2, straddling the high central plateau of South Africa (‘highveld’), the mountainous areas of Lesotho, and the high-lying ground of the eastern seaboard (uplands or sub-escarpment of KwaZulu-Natal, Eastern Cape, and Mpumalanga). The Grassland Biome (Figure 1), one of nine biomes in southern Africa, accounts for c. 28% of the terrestrial surface area of southern Africa, and is therefore the second largest biome after the Savanna Biome (Mucina and Rutherford 2006). Topographically, the landscape of the Grassland Biome ranges from flat or undulating with hills and valleys, to rugged mountain escarpment. Elevation ranges from 300 m to 3482 m a.s.l. (Thabana Ntlenyana - the highest mountain in southern Africa). Winters are generally cold and dry, with frequent frosts and snow falls in the higher reaches. Rainfall varies spatially from 400 mm to 2,500 mm per annum, corresponding to the MAR in other parts of the world where similar vegetation is found (O’Connor and Bredenkamp 1997). Rainfall is strongly seasonal (summer) and the growing season lasts approximately half the year (Mucina and Rutherford 2006). The development of the Grassland Biome is thought to be linked to global cooling during the late tertiary, accompanied by continental uplift that began in the Early Miocene and culminated in significant uplift of up to 900 m in some parts of the subcontinent during the Pliocene. This uplift moved a core area of the subcontinent into a cool, high-altitude climate, more suitable for grasslands than savannas. Uplift towards the west was less pronounced, resulting in the sloping east-west gradient. The effect of this gradient, enhanced by the east-west moisture gradient across the subcontinent, is believed to have determined the limits of grassland on our subcontinent (Mucina and Rutherford 2006).

The Grassland Biome is represented by four bioregions (Drakensberg Grassland; Sub-escarpment Grassland; Dry Highveld Grassland; Mesic Highveld Grassland; Figure 2) and 72 vegetation types (units), the latter defined by Mucina and Rutherford (2006) according to similar vegetation structure, macro-climate (mainly the amount of summer rainfall, minimum winter temperatures and frost), and a similar disturbance regime (frequent fire and grazing). The Grassland Biome accounts for three centres of plant endemism (Drakensberg Alpine Centre; Wolkberg Centre; Midlands Putative Centre) whilst a further three centres of plant endemism are shared with the Savanna Biome (Barberton, Sekhukhune and Soutpansberg Centres; Mucina and Rutherford 2006). The Grassland Biome also accounts for three World Heritage Sites (uKhahlamba Drakensberg; Cradle of Humankind and Vredefort Dome).

The latest delineation of the Grassland Biome (Mucina and Rutherford 2006) resulted in the recognition of a new biome on the eastern seaboard, namely the Indian Ocean Coastal Belt Biome, which now includes the humid sub-tropical grasslands and the edaphic grasslands of Maputland and Pondland previously housed in the former Grassland Biome (see Rutherford and Westfall 1986, Low and Rebelo 1996). Furthermore, the Ngongoni grasslands are now part of the Savanna Biome, the thinking being that a subtropical vegetation type is best contained within a subtropical biome. The result therefore is that the grasslands of the currently defined Grassland Biome are all strictly temperate; the Grassland Biome and the temperate grasslands of southern Africa are synonymous and may therefore be referred to interchangeably.

The temperate grasslands of southern Africa are structurally fairly conservative and uniform (O'Connor and Bredenkamp 1997); they comprise single-layered herbaceous communities of tufted graminoids (predominantly perennial grasses of the Family Poaceae), as well as a forb component of mostly long-lived perennials that re-appear on an annual basis from significant below-ground biomass (corms, rhizomes, tubers or bulbs) until the end of their life-span but are heavily reliant on the production and establishment of viable seed for recruitment. Biomass is mostly attributed to the grass component (Family Poaceae), whilst species richness is attributed mostly to the forb component. Woody plants are rare (usually low to medium-sized shrubs) or absent (O'Connor and Bredenkamp 1997), and are confined to specific habitats serving as fire refugia (rocky hilltops, drainage lines etc.). Grassy or Afromontane 'fynbos' (heathland-like vegetation) occurs at the higher elevations and in higher rainfall areas, often on steep, highly leached slopes protected from fire (Mucina and Rutherford 2006). C_4 grasses dominate most of the Biome, except at the higher elevations of the Drakensberg Alpine Centre (i.e. the Maloti-Drakensberg Mtns), where C3 grasses predominate (Low and Rebelo 1996). Canopy cover of the grasslands is moisture-dependent and decreases with low MAR. Cover is also influenced by intensity and type of grazing, as well as by fire (seasonality, intensity) and by minimum temperature (implications for frosts). The temperate grasslands of southern Africa are subdivided into moist (dependent on fire for maintaining structure) and dry types (not dependent on fire for maintaining structure) (Mucina and Rutherford 2006).

The aim of this study was to assess the conservation status of temperate grasslands in southern Africa, discuss possible reasons for the poor level of protection and high degree of transformation, and mention the major current interventions aimed at improving levels of protection.

Methods

The conservation assessment of temperate grasslands in southern Africa was based on a GIS-analysis using ArcView GIS 3.2. Areas were calculated using data in the WGS84 datum Lo29 projection. Levels of transformation were based on the National Land Cover (NLC) 2000 coverage (satellite imagery). The transformed areas do not necessarily lie exclusively outside of protected areas (PAs). Protection levels were derived from the formal PA system (i.e. all legislated, formal state and statutory PAs), according to the National Environmental Management: Protected Areas Act 57 of 2003.

Results

A meager 2.04% of the region's temperate grasslands are conserved within PAs (Table 1). This level of protection is less than half of the global total (estimated between c. 4.6% and 5.5%) for the World Temperate Grassland Biome (see Chape et al. 2003, Peart 2008). This also falls short of the IUCN target of 10% formal protection by 2014, and at a local (national) scale, far short of the 12% target (or an additional ± 42,500 km^2) by 2028 set as part of South Africa's National Protected Area Expansion Strategy (NPAES) (SANBI and DEAT 2008). The poor levels of protection often mean that temperate grasslands account for most of the high priority biodiversity areas for PA expansion, which in KwaZulu-Natal is estimated to be c. 46% (Carbutt and Escott 2010). An assessment of conservation priorities in the Grassland Biome identified some 36.7% of the biome being important for biodiversity conservation (Reyers et al. 2005). Some 33% of southern Africa's temperate grasslands are already irreversibly transformed (Table 1).

All broad temperate grassland units (bioregions) are below target, although the Drakensberg Grassland Bioregion is the most protected (Table 2) principally as a result of the Maloti Drakensberg Transfrontier Conservation Area (comprising the uKhahlamba Drakensberg Park World Heritage Site in South Africa and Sehlabathebe National Park in Lesotho). Priority should be given to the sub-escarpment grasslands, listed in the NPAES as being the only bioregion of the Grassland Biome requiring 'critically urgent' attention (SANBI and DEAT 2008), followed by the Dry- and Mesic Highveld Grassland Bioregions (requiring

Table 1. The conservation status of temperate grasslands in southern Africa.

Broad Vegetation Unit (~ Bioregion)	Total Area km²	Area in Pas km²	Protected (%)	Transformed km²	Transformed (%)
Drakensberg Grassland	42,177	2,477.48	5.87	8,222	22.30
Dry Highveld Grassland	117,753	1,785.57	1.52	32,717	31.51
Mesic Highveld Grassland	125,044	1,996.70	1.60	51,689	42.91
Sub-escarpment Grassland	75,615	1,080.19	1.43	27,547	39.60
Summation for Grassland Biome	**360,589**	**7,339.94**	**2.04**	**120,175**	**33.33**

'very urgent' attention). Ironically, the bioregions with the most PAs (e.g. Mesic Highveld Grasslands; Sub-escarpment Grasslands) conserve some of the smallest areas per bioregion, highlighting the futility of small reserves in fulfilling PA targets (although are often essential in fulfilling biodiversity targets).

The low level of protection (c. 2%) is also slightly overestimated due to the prevalence of forest patches within these grassland areas, reducing the overall area for grassland conservation. Furthermore, some 70% of the minor vegetation types within the bioregions have no or very little (< 2 %) legal protection! As a result, the biome is one of the most threatened in southern Africa, because out of the 72 constituent vegetation types, one is listed as critically endangered, 14 are endangered and 24 are classed as vulnerable (see Reyers et al. 2005). The c. 2% formal protection is also an overestimate or best case scenario given that a further ten years of transformation has taken place since 2000 (the date of the last national land cover exercise).

Discussion

Transformation

The Grassland Biome supports the greatest human population densities and the highest levels of agricultural utilization on the subcontinent, thereby placing it under severe threat and pressure (Meter et al. 2002, O'Connor and Kuyler 2005, Kirkman 2006). The result is that the Grassland Biome is highly transformed (c. 33%; Table 1) and fragmented, with much of its high priority biodiversity located within production ('working') landscapes. This is a worldwide trend because grasslands are highly amenable for settlement and use, having provided for man's needs for centuries. As a result, temperate grasslands are now considered the most altered terrestrial biome on the planet (Henwood 2006).

The primary drivers of transformation by agriculture in the Grassland Biome include the dairy, wool, beef, maize, sorghum, wheat, and to a lesser extent, sunflower industries. A further 65% of the Grassland Biome is grazed for livestock and game (Grasslands Programme, undated). Large stretches of grassland have also been flooded for the construction of large dams, as southern Africa is generally a water scarce country with a MAR around 350 mm. In terms of mining, South Africa is one of the world's top coal producing countries; an extensive coal belt is located within the Grassland Biome. Exacerbating the problem is that large coal-fired power stations (occupying a large footprint) are located in close proximity to the coal-producing areas, in order to minimize transport costs. Gold mining is a further transformer of temperate grasslands.

Major biodiversity conservation initiatives

The conservation of temperate grasslands is being tackled at a number of levels and scales. At a global level, the Temperate Grasslands Conservation Initiative (TGCI) was birthed in 2006 under the Grasslands Protected Area Task Force of the IUCN World Com-

Table 2. Land-use types responsible for the most transformation in the Grassland Biome (adapted from Reyers et al. 2005). The slight disparity between total transformation values in Tables 1 and 2 is attributed to the inclusion of additional land-uses/habitats within grassland habitat such as water bodies, barren rock and forests, for the calculations in Table 1.

Land-use type	**Transformation Km²**	**Transformation (%)**
Cultivation	75,833	21.00
Cultivation	22,041	6.10
Forestry plantations	9,932	2.80
Urban and industrial areas	5,843	1.62
Mines and quarries	933	0.26
Total	**114,582**	**31.78**

mission on Protected Areas (WCPA) to enhance international communication and cooperation for the protection and conservation of the world's temperate grasslands (Peart 2008, Henwood 2010). At a national level, the NPAES (2008 to 2012) has identified the Grassland Biome as the biome requiring the largest addition of land to reach its conservation target. However, given the difference between the PA expansion target and the biodiversity target, it is apparent that formal protection alone, nor agencies working in isolation, will succeed in conserving the biodiversity of the Grassland Biome. Conservation strategies need to incorporate a variety of approaches to biodiversity management, including biodiversity stewardship and biodiversity mainstreaming. Furthermore, given the high turnover of biodiversity across the biome, these initiatives need to be implemented across the full extent of the biome.

The National Grasslands Biodiversity Programme (NGBP), otherwise known as the Grasslands Programme, is a 20-year programme which aims to "secure the biodiversity and associated ecosystem services of the Grassland Biome for the benefit of current and future generations". Hosted by the South African National Biodiversity Institute (SANBI), the programme is a strategic partnership between three spheres of government, the private sector, civil society and the academic sector. In its first five years, the Programme is focusing on a strategy to mainstream conservation objectives into major production sectors operating in the biome (through the Grassland Partner's Forum). This strategy includes interventions to integrate biodiversity-compatible land uses into agriculture; to ensure a direct contribution by the forestry sector to biodiversity conservation; to mainstream biodiversity into Gauteng's economy and to secure biodiversity management in the coal mining sector. The Grasslands Programme recognizes that promoting off-reserve conservation on privately or communally owned land has to form a major component of a grasslands conservation strategy.

Another major intervention that can be employed in the conservation of temperate grasslands is the expansion of existing grassland PAs and the proclamation of newly acquired PAs, including Transfrontier Parks. The Maloti Drakensberg Transfrontier Programme (MDTP) aims (in part) to conserve temperate grasslands and associated biodiversity in the Maloti Drakensberg Region. The Maloti Mtns of Lesotho in particular are poorly protected, as this region is characterized by communal land tenure. Studies have shown that species richness in such communally grazed areas is significantly lower when compared to conservation areas nearby (Everson and Morris 2006). Currently, only 0.21% of Lesotho's total area of c. 30,355 km2 is under formal protection, comprising Sehlabathebe National Park (64.75 km^2) and Masitise Nature Reserve (0.2 km^2) (Letšela et al. 2003, Everson and Morris 2006). The further proclamation of Tsehlanyane National Park (53.33 km^2) and Bokong Nature Reserve (19.72 km^2) will double the area in Lesotho under protection, and linking the two areas through a biosphere reserve as proposed by the Lesotho Highlands Development Authority (LHDA) will extend the area under conservation even further (Letšela et al. 2003). This initiative provides an opportunity to use Community Conservation Areas (CCAs) which recognizes the opportunity to use the potential compatibility of communal resource use and management conservation. A further initiative being driven by SANParks is the establishment of a new grassland PA in the Barkly East-Rhodes district of the Eastern Cape.

Biodiversity Stewardship is another essential weapon in the arsenal because the PA network in southern Africa, whilst fairly extensive (at least outside of the Grassland Biome), is insufficient to safeguard our critically important grassland biodiversity. It is recognized that in order to effectively conserve South Africa's biodiversity, conservation efforts must focus outside of formally protected reserves, considering that some of the country's most scarce and threatened habitats are privately owned. To this end, the National Stewardship Programme (Biodiversity Stewardship South Africa), also being rolled out in our provinces, is underway to secure (amongst other ecosystems), conservation-worthy grasslands (including temperate grasslands) on privately owned land. The aim is to get local landowners with viable tracts of conservation-worthy land to proclaim such areas as Nature Reserves (or according to less formal measures such as Protected Environments or Biodiversity Agreements), depending on the landowner(s). A large biodiversity stewardship-based project that is proving highly effective is the Enkangala Grassland Project, which aims to conserve 1.6 million hectares of moist, high-altitude (temperate) grassland spanning three provinces in South Africa using multiple NGO-based partners such as the Nedbank Green Trust and WWF-SA in collaboration with private land owners. It is a coordinated approach to sustainably utilizing these large, contiguous, relatively pristine grasslands through compatible land-uses (e.g. conservancies, stewardship, land acquisition, biosphere reserves, water catchment protection), by making use of a long-term conservation management strategy.

Conclusion

The constraints against improving the level of protection and conservation in the Grassland Biome relate largely to burgeoning population levels and high utilization by the agricultural (both for cropping and as commercial rangelands), mining, and forestry sectors. Furthermore, PAs within the Grassland Biome are relatively few, generally small and highly fragmented (with the exception of the UDP WHS). Opportunities for expansion into biologically meaningful, contiguous, mega-reserves (to sustain landscape-scale ecological processes) appear few, particularly given the impact of the transformers mentioned above. High gamma-diversity across our grasslands means that PAs also need to be located across the full extent of the biome, and not clustered into certain areas, to ensure that PAs are representative of all grassland biodiversity. A further constraint is that detailed information relating to informal conservation areas is lacking. No national registry or spatial database exists of these areas. These areas may be contributing meaningfully toward conservation goals and targets, but to what extent is currently unknown. No national standard for the certification and management of these areas has been set, so one can't assume that all are well managed and therefore adequately safeguarding biodiversity.

Strategies to meet the conservation targets of the Grassland Biome need to recognize the complexities of implementing conservation actions across this landscape. The biome covers a vast area which straddles national boundaries, as well as several provincial and numerous local government boundaries. Much of the important biodiversity of the biome is on land that is privately or communally owned or under production. Transfrontier Conservation initiatives are hindered by politics and lack of funding. Meeting the biodiversity targets for the Grassland Biome requires a concerted conservation strategy that balances conservation and development agendas.

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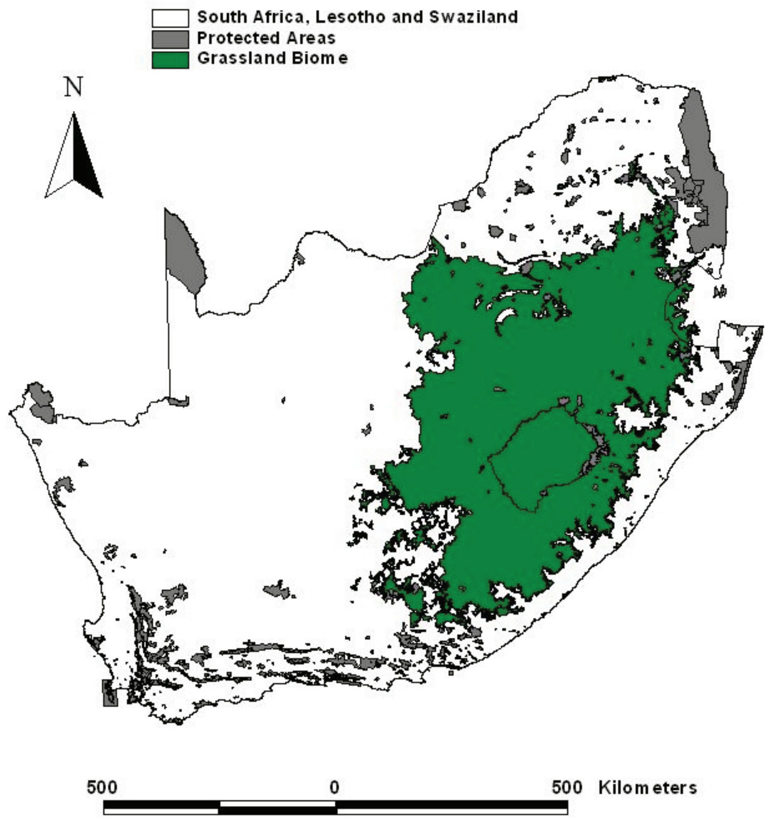

Figure 1. The extent of the Grassland Biome (as defined by Mucina and Rutherford 2006) relative to the formal PA estate of southern Africa.

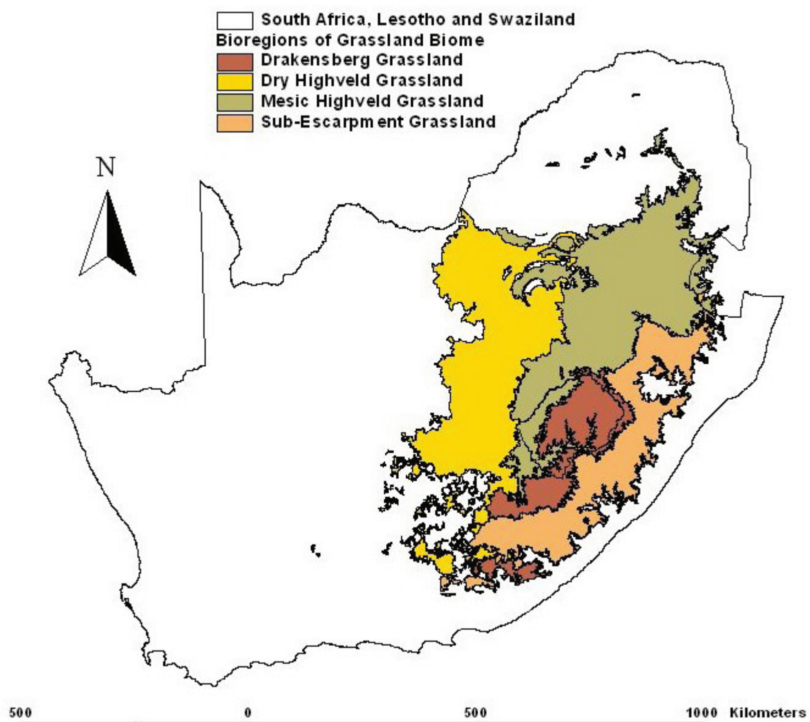

Figure 2. The four bioregions of the Grassland Biome in southern Africa (based on Mucina and Rutherford 2006).

Root studies in a semi-arid climate

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Introduction

In the past, plant ecological studies have largely concentrated on aboveground parts of the grassland ecosystem (Swemmer et al. 2007). However, belowground information is essential for predicting grassland responses to seasonal patterns of rainfall (O'Connor 2008), especially on those with grassland degradation (Snyman 1998). It is therefore essential to develop a better understanding of seasonal patterns of root growth, their production, and how roots relate to driving influences of water.

The South African grasslands used for animal production and forestry utilize approximately 62% of the total annual rainfall (Snyman 1998). In these arid and semi-arid grassland areas, rainfall is one of the single most limiting environmental factors influencing plant production. This emphasizes the importance of a well-established and distributed root system to ensure sustainable plant production in these drier areas. Unfortunately these ecological sensitive arid and semi-arid areas are increasingly subjected to severe grazing pressure causing their rapid degradation. The seasonal trend in root distribution with depth and root/shoot ratios along a degradation gradient were quantified over an 8-year period (2000/01 to 2007/08 growing seasons) for a semi-arid grassland.

Material and methods

The research was conducted in a semi-arid summer rainfall (annual average 530 mm) region of South Africa (28°50' S, 26°15' E, altitude 1 350 m). The study area is situated in the moist, cool Highveld grassland. Soils are mostly fine, sandy loams. Grasslands in three condition classes (good, moderate and poor) (Snyman 1998) was studied. The three sites chosen reflect distinct species composition and basal cover arising from different grazing histories in this grassland type. Each experimental unit was 2 m x 15 m, with three replications per composition state (condition class).

Aboveground phytomass production for each grassland condition class were collected every second month at the end of October (spring), December (summer), February (summer) and April (autumn) over the 2000/01 to 2007/08 growing seasons. This was obtained by defoliating grasses to a height of 30 mm (the effective stubble height) in eight (0.25 m^{-2}) quadrates randomly placed in each plot. Root mass was estimated to a depth of 1 200 mm from a sample of 10 soil cores systematically distributed throughout each plot. Soil cores were collected with an auger (70 mm diameter) at the same time as aboveground samples were taken every second month. Most roots were extracted via successive washings of soil cores through a 2 mm mesh sieve. The remainder of the soil was spread in a shallow tray and fine roots were collected by flotation. The outflow from the tray passed through a 0.5 mm-mesh sieve. Root/shoot ratios were calculated using the above- and belowground growth obtained over a specific period, regardless of existing accumulated root mass over a season. Data were analyzed using a repeated-measure ANOVA. The Number Cruncher Statistical System (2000) software package (Hintze 1997) was used for all statistical analysis.

Results and conclusions

The belowground phytomass production fluctuated considerably over the season during the study period (Fig. 1). In all grassland conditions, root growth took place the most actively during the months of March and May. Peak autumn values were approximately 122, 111 and 53% higher for grassland in good, moderate and poor conditions, respectively, than the lowest values for the mid-winter.

Most of the grass roots were found in the first 150 mm soil layer, but root distribution tended to be more superficial with grassland degradation (Fig. 1). For example, for grassland in poor condition as much as 37% of the total root mass was found within the first 50 mm. As much as 87, 88 and 96% of the roots for grassland in good, moderate and poor conditions, respectively, occurred at a depth of less than 300 mm.

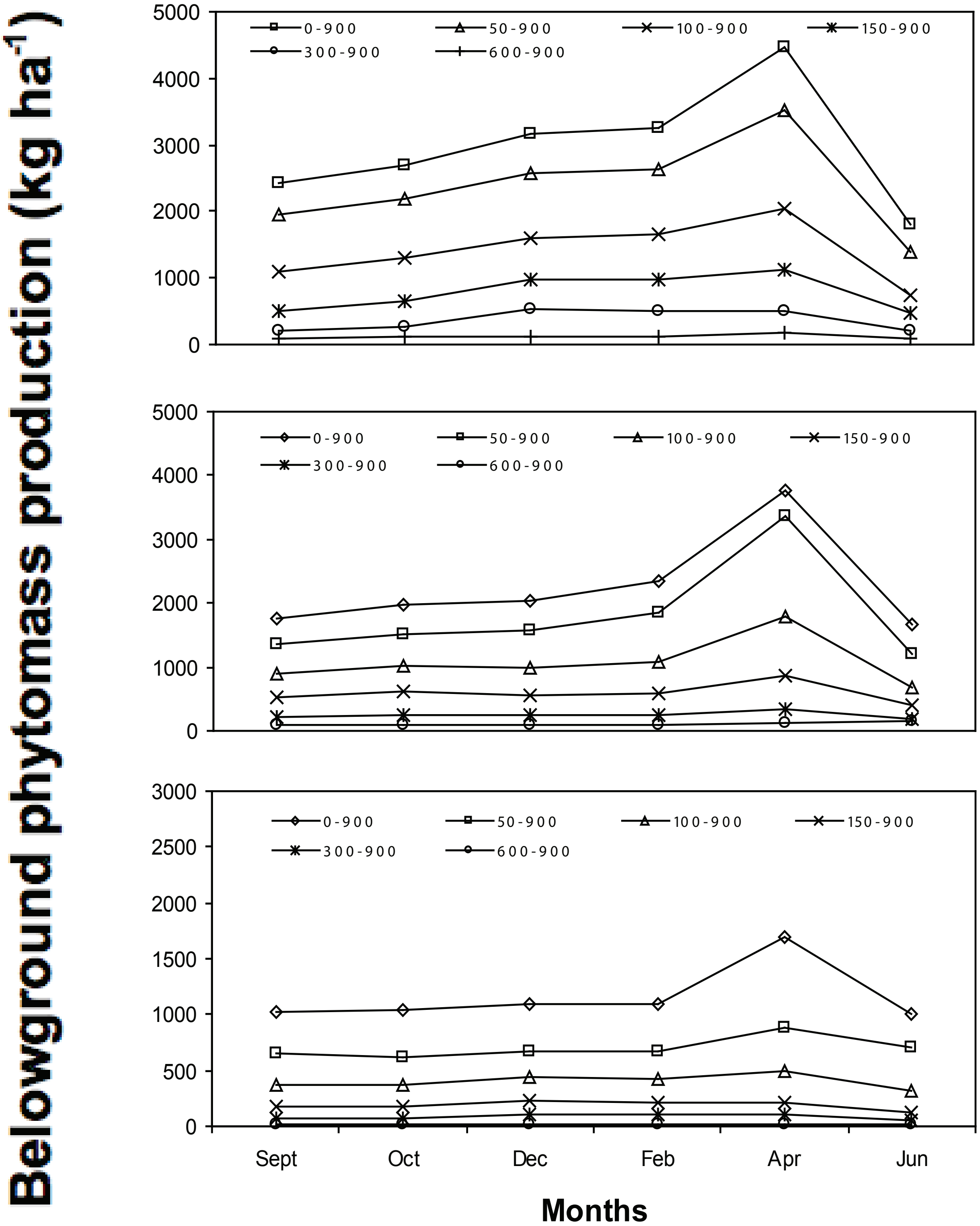


Figure 1. Mean monthly root mass (kg ha^{-1}) for good (A), moderate (B) and poor (C) grassland conditions, over the 2000/01 to 2007/08 growing seasons. Horizons (mm): A = 0-300, B1 = 300- 600 and B2 =600-900.

Total root mass appears to be greater than aboveground phytomass (Fig.2). Both below- and aboveground phytomass production was decreased by grassland degradation ($P<0.01$) in all months. The average decrease in aboveground phytomass due to grassland degradation was 722 kg ha^{-1} compared to the 1 714 kg ha^{-1} decrease in peak root mass. Therefore, root production appears to be more sensitive to grassland degradation than aboveground production. Peak aboveground phytomass at the end of each growing season was 1 466, 1 023 and 654 kg ha^{-1} for grassland in good, moderate and poor conditions, respectively. Grassland in poor condition maintained a consistently low amount of aboveground phytomass, throughout the year. On the other hand, peak average root mass to a depth of 1 200 mm for grassland in good, moderate and poor conditions, were 3 433, 2 343 and 1 220 kg ha^{-1}. The mean monthly root/shoot ratios for grasslands in good, moderate and poor conditions were 1.16, 1.11 and 1.37, respectively.

The importance of a well-established root system for sustainable production in the semi-arid grasslands cannot be overemphasized. This study is one of the few where different grassland conditions were evaluated and can serve as guidelines for sustainable utilization of the grassland ecosystem in a semi-arid climate.

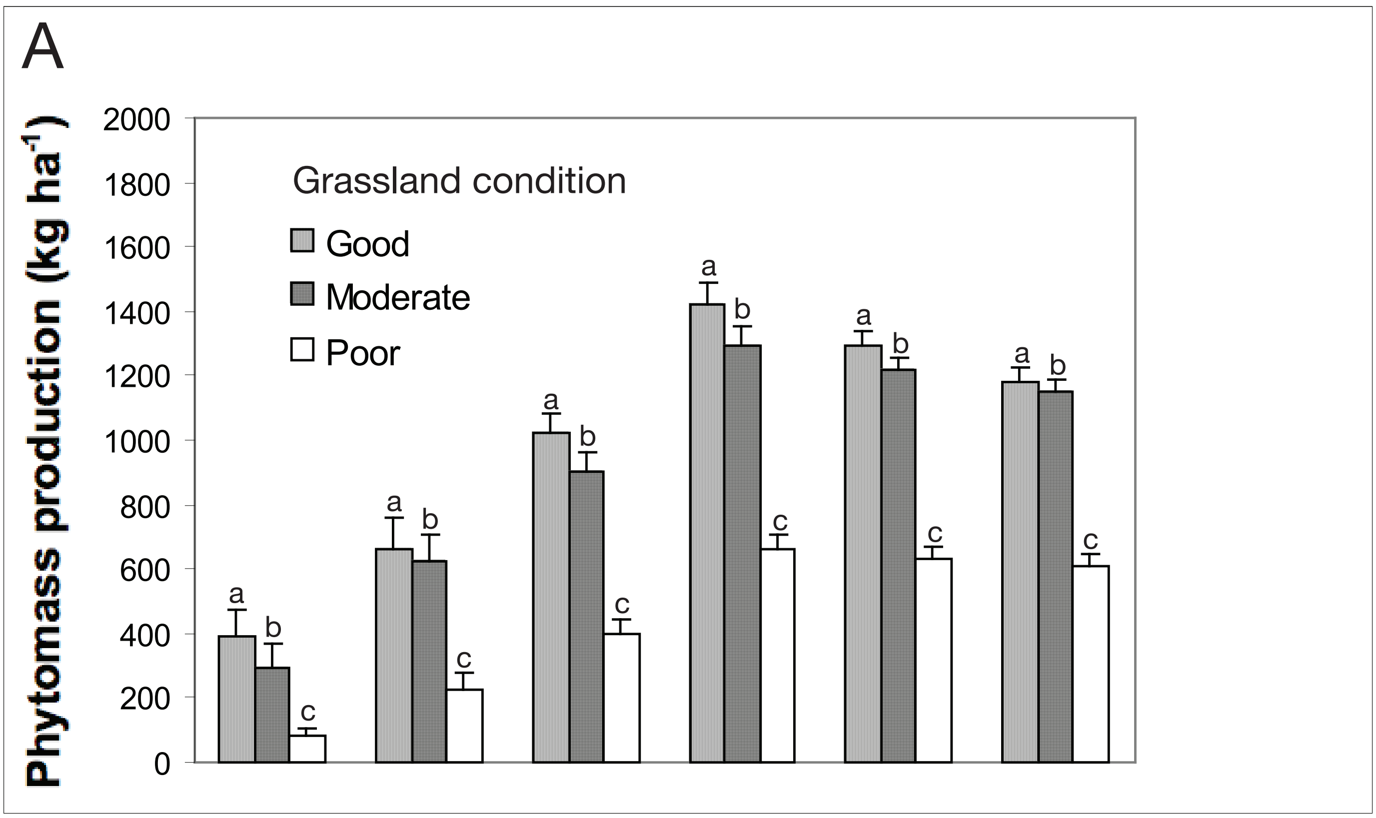
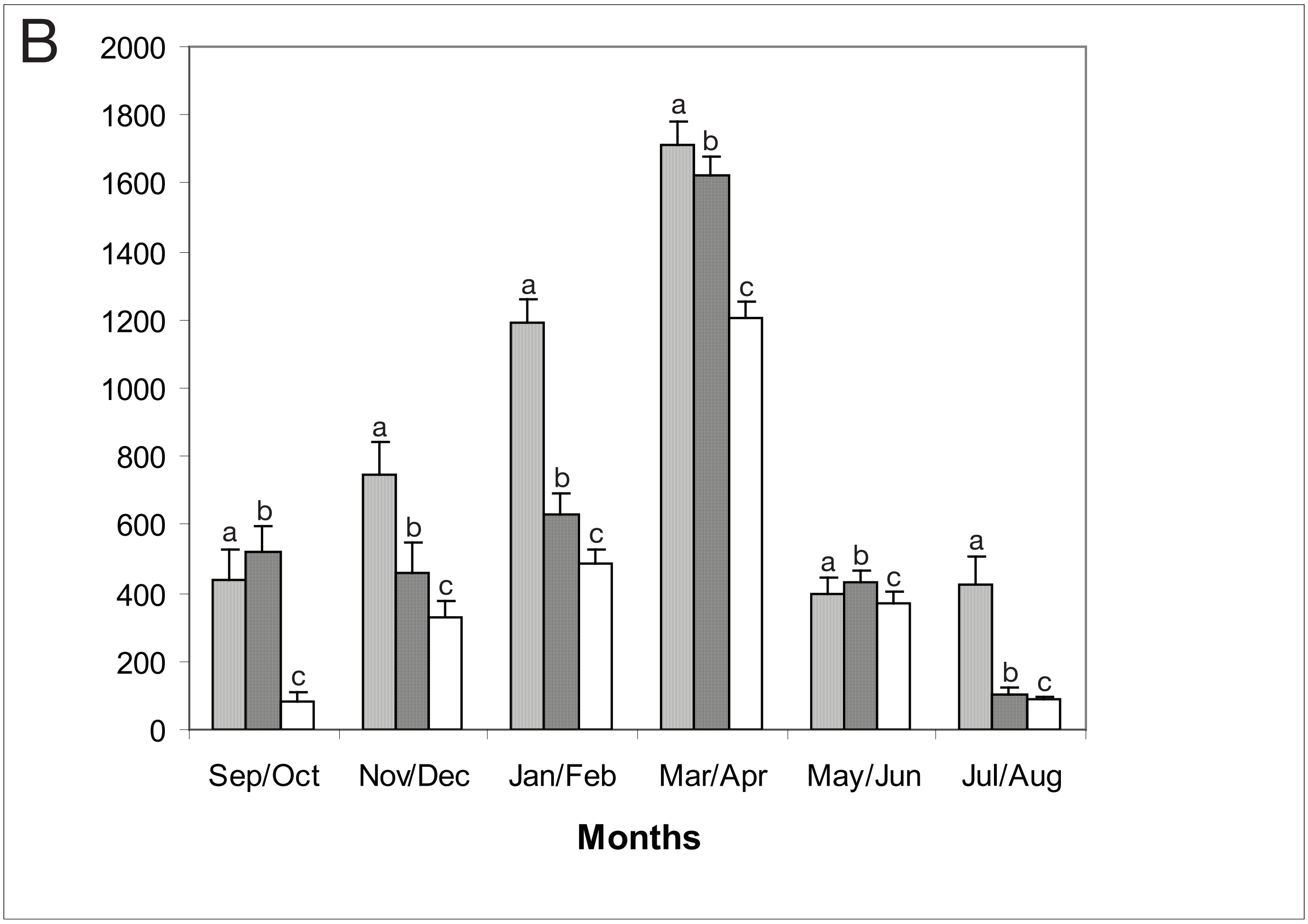


Figure 2. Mean (±SE) above-(A) and belowground (B) (first 1 200 mm depth) phytomass production (kg ha^{-1}) (new growth) for the different grassland conditions, measured every second month, averaged over 8- seasons (2000/01 to 2007/08). Means within a month with different superscripts differ significantly ($P<0.05$)



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46th Annual GSSA Congress

Advancing Rangeland Ecology and Pasture Management in Africa - 10 to 15 July 2011

Grootfontein Agricultural Development Institute, Middelburg, Eastern Cape, South Africa

Preliminary Announcement
Deadline for Title submission: 31 March 2011
Deadline for Abstract submission: 29 April 2011
Deadline for Early Bird payments: 31 March 2011

The Annual Congress will be hosted by the Eastern Cape Province at the Grootfontein Agricultural Development Institute in Middelburg. Situated in the foothills of the Renosterberg and surrounded by the characteristic bossies and koppies of the Karoo, Middelburg and Grootfontein have a long history in the field of agriculture. The Agricultural College was established in 1911 and so is celebrating its centenary during 2011. The Grassland Society is honoured to be included in the calendar of events of this special year!

Organisers of special sessions, symposia, workshops, etc. are encouraged to publish contributions in a special issue of the African Journal of Range and Forage Science. Remember that page charges for all papers published in 2011 by members of the Grassland Society of Southern Africa will be ZERO!!

Several special sessions, symposia and workshops are being organised in addition to the standard sessions. Further details will become available over the coming weeks BUT if you would like to submit an idea, please do so as soon as possible.

Further details of the Congress including tours, registration procedures, preliminary programme and planned symposia will follow shortly. with the First Announcement. Please diarise the dates and include in your annual budget!! Estimated registration is R3000 per delegate excluding accommodation but including 2012 membership. Early bird rates will be included with the First Announcement.

New Research initiative to improve food security

Major international research initiative launched to improve food security for developing countries

In a unique and important move to harness science to improve food security for millions of people in the developing world, research funders from the UK and USA and government departments in the UK and India announced a new £20M/$32M joint research initiative.

The new initiative will fund teams from the UK, India and developing countries to work on research projects to improve the sustainability of vital food crops. The research will particularly investigate ways to improve the disease-resistance and stress-tolerance of staple crops in sub-Saharan Africa and South Asia.

Funding will be awarded to teams that can show that their research can improve food security and increase sustainable crop yields within the next 5-10 years.

Over one billion people globally are already undernourished and food security is a major issue with the world's population forecast to reach nine billion by 2050. Environmental change, new trading patterns and urbanisation are all expected to increase pressures on food security in coming years.

The new initiative is being managed by the UK Biotechnology and Biological Sciences Research Council (BBSRC). The £20M fund is made up of contributions from BBSRC, the Bill & Melinda Gates Foundation (through a grant to BBSRC), the UK Department for International Development and the Indian Department of Biotechnology.

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Research Fellowship

The purpose of the continence research fellowship is to support increased dissemination of continence research knowledge by offering an opportunity and funding to visit, observe and train with a renowned continence research team.

Special requirements:
The trainee must propose a fellowship that encompasses state-of-the-art research not available in his or her institution or country.

Length of fellowship:
From two weeks to three months
Amount:
Travel and living expenses would be funded:
Travelling expenses: up to £1800
Accommodation: up to £400 per week (up to £4800 maximum)
Per diem: up to £50 s / day (£4200 maximum)

The applicant will be responsible for all healthcare costs and/or any other costs other than those stated in the application. The applicant is responsible for obtaining travel documents, visas, and any other relevant documentation required for his or her entry and stay in the host country.

Application Procedure:
Obtain application from: www.icsoffice.org/Awards-fellowship, please send to awards@icsoffice.org
CV
Rationale for support form
Confirmation of status letter
Completed host institution form (if applicable)
Special requirements (if applicable, see fellowship details)

MSc bursary

MSc bursary available worth R45000.00 for 2011 at the North-West University Potchefstroom Campus, Department of Botany.

Title: Genetic biodiversity of the pan tropical grass vetiver (Vetiveria zizanioides (L.) Nash)

Study leaders Dr Sandra Barnard and Prof Johnnie van den Berg.

Interested persons with a molecular biology background please contact Dr Sandra Barnard at:
sandra.barnard@nwu.ac.za
Cell: 0824301772

Upcoming events

South African Association for Laboratory Animal Science Congress 2011
Date: 09 -11 March 2011
Venue: Muldersdrift, Gauteng
Contact: Sonja du Plessis
Email: Sonja@londocor.co.za

International Rangelands Congress 2011
Date: 02 - 08 April 2011
Venue: Rosario, Argentina
Email: secretariatAOC@rangelandcongress.com

South African National Seed Organisation Congress 2011
Date: 04 – 05 May 2011
Venue: Western Cape Hotel and Spa
Contact: Manon van Lent
Email: manon.vanlent@wur.nl

5th International Wildland Fire Conference – South Africa
Date: 09-13 May 2011
Venue: Sun City, South Africa
Tel: +2721 797 5787
E mail: info@wildfire2011.org

8th European Federation for Information Technology in Agriculture, Food and the Environment Conference
Date: 11-14 July 2011
Venue: Czech University of Life Sciences Prague
Contact: Eva Cervenkova
E mail: conference2011@czu.cz

10th African Crop Science Society Conference
Date: 10-13 October 2011
Venue: Maputo, Mozambique
Contact: Luisa Santos
Tel: (258) 2149 2177
E mail: acss2011@uem.mz

10th African Crop Science Society Conference
Date: 10 – 13 October 2011
Venue: Maputo, Mozambique
Email: acss2011@uem.mz
Tel: (258) 2149 2176

7th International Wildlife Ranching Symposium
Date: 10 – 14 October 2011
Venue: Kimberly
Contact: Glaudin Kruger
Email: kruger@kruger-associates.com

VELD MANAGEMENT

AFRICA LAND-USE TRAINING is presenting a 2-day course on grass identification and veld management. The two days can also be attended separately . . .

DETAILS

Venue: Pretoria Botanical Garden **Date:** 10 – 11 March 2011

Cost: Day 1 - R 650.00 / person
Day 2 - R 500.00 / person } Whole course – R 1 000.00 / person

GRASSROOTS

Newsletter of the GRASSLAND SOCIETY of SOUTHERN AFRICA

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