grass roots

Newsletter of the Grassland Society of Southern Africa

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GSSA Council 2005/06

EDITORIAL

Dear members,

The 2005 congress has come and gone, and by all accounts it was one of the most successful congresses we've had in years. Well done to all those involved in the organising of the congress, and especially to all the participants who presented posters and papers, as well as the audience members who kept the presenters on their toes by asking probing questions.

Leslie Brown, our new Professional Affairs Committee (PAC) chairman, has been closely involved with the discussions around the Natural Scientific Professions Act of 2003, which is currently being implemented. This act is likely to affect nearly every member of this Society, especially those who give advice to managers, or even just lecture to students. You can read more about the South African Council of Natural Scientific Professions (SACNASP) in Leslie's Report in this issue. Since this act affects a great many other professional societies, it is likely that the GSSA is going to have to team up with other like-minded bodies to ensure that our voices are heard on SACNASP.

It's encouraging to see members of the GSSA are involved in organising events in several regions in coming weeks. Axel Rothauge writes about the upcoming Namibian Rangeland Forum Meeting, Herbert Prins *et al* tell us about a programme called TEMBO, and Nicky Findlay, our PRO, is assisting with the organising of a dairy farmers' symposium together with the Milk Producer's Organisation in KZN.

A programme rather close to my heart is the South African Environmental Observation Network (SAEON). This is a programme to coordinate data collection and archiving of long-term ecological trials across the sub-continent. As we all know, there are a plethora of long-term experiments and monitoring programmes scattered across the region. Although most of these have yielded a great deal of valuable data, there are often hypotheses that can be tested on the trials that the original designers didn't dream of. The most obvious examples of the types of new questions that can be asked of these trials and their data are on climate change and biodiversity, both of which are relatively recent topics of interest, as well as meta-analysis of several trials to yield more insights into ecological systems. Silvia Mecenero tells more about the SAEON programme and how we can get involved.

Alan

News from Council

Sigrun Ammann

The full GSSA Council met on 18 July 2005 before the start of Congress 40 at Kapenta Bay in Port Shepstone. The venue for the congress was excellent and certainly met with approval. It was also very pleasing to see the large number of delegates that attended the congress this year compared to previous years.

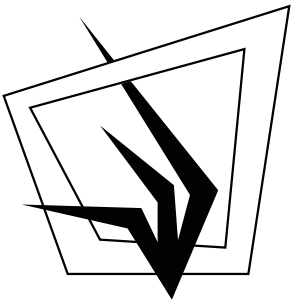
The major points of discussion were again the journal and the financial situation of the GSSA. The concern regarding the journal revolves mainly around the publishing and printing costs. The dilemma is that the journal is published and printed very professionally but it is becoming increasingly more expensive and putting the society under financial strain. Council has and is continuing to seek solutions that are sustainable financially while maintaining the quality of our journal. The financial situation could also be improved if more of the membership fees were to come in more timeously.

The strategic objectives were reviewed shortly as these are considered an integral part of the dynamic functioning of the GSSA and have to do with many of the activities performed by council members.

A detailed report about SACNASP (the South African Council of Natural Scientific Professions) and the possible implications for our profession was also discussed (see Leslie Brown's article on the subject in this issue of *Grassroots*). Members will be kept informed through the PAC about any new developments.

It is pleasing to see that the GSSA website is receiving an increased number of hits. It means that the website has to remain current in order to keep this trend going. It will also be beneficial to get Grassroots to be available on the website. This has been the idea for a number of years and it is not due to a lack of trying. Hopefully this will soon be a reality. An appeal goes out to all GSSA members to submit articles to Grassroots.

The council said goodbye to two members namely Annelie de Beer, the Immediate Past President and to Dawood Hattas, the website coordinator. Both made major contributions to the running of the GSSA. Three new members now join the council, the new Vice President Mark Hardy and as additional members Rina Grant and Luthando Dziba.



GSSA Congress 40

Alan Short

This year's congress was one of the best-attended and, by all accounts, one of the most successful congresses we've had in years. It was also the first congress in four years solely arranged by the GSSA.

About 60 platform presentations were given, with another 30-odd posters. An interesting feature of this congress, and one that might prove to be a useful model for future congresses, was the five mini-symposia that were arranged, not by the congress organisers, but by the presenters themselves. Two of these symposia were half-day workshops, while the other three were two-hour sessions consisting of several coordinated papers around a common theme, with a short discussion at the end.

Susi Vetter and her colleagues from the Eastern Cape arranged a mini-workshop on communal rangelands (read a more detailed account of the workshop in this issue). The second workshop was arranged by Christo Fabricius and co-workers, and was on complex adaptive systems management. Both events were well-attended and generated a lot of discussion.

Sigrun Ammann and Dave Goodenough pulled together a variety of experts in the pasture industry to discuss endophytes in pastures. If you don't know what an endophyte is, don't worry, you're in good company. Endophytes are organisms that can infect grasses, with potentially both negative and positive consequences for farmers, depending on the type of endophyte and the infection level. The workshop was intended to be a farmer's day, but very few farmers arrived, most complaining that Port Shepstone was too far. However, the interest in the topic was demonstrated by the fact that several farmers asked for the show to be taken on the road.

Mark Hardy and colleagues arranged a session on integrated land-use planning, using the heavily transformed and poorly conserved Renosterveld as a case study. Unfortunately, their session ended up in the graveyard shift of the congress, and was therefore poorly attended, which didn't do justice to the quality of the papers and ideas discussed.

The fifth mini-symposium was a report-back on the multi-disciplinary Brotherton trial resurvey (reported on in the June 2004 issue of *Grassroots*), which generated some interesting results and useful discussion on fire, biodiversity and carbon sequestration, among other things.

The other sessions were arranged by the congress organisers in the traditional way, and there was a great variety of topics covered, from giraffe browsing to milk production from pastures. The Best Presentation and Best Poster judging was ably coordinated by Winstone Trollope and Mark Hardy, who seconded volunteers for each session to judge the speakers, based on criteria such as scientific credibility and clarity of presentation. In the end, Richard Fynn's talk, together with his co-authors Craig Morris and Kevin Kirkman, on plant strategies and species composition, was voted the Best Presentation. The Best Presentation by a Young Scientist was won by Luthando Dziba, who was not very far behind Richard in the overall points table, on how plant secondary compounds influence feeding behaviour of herbivores, which in turn influences species diversity of rangelands. The Best Poster was judged to be Gideon van Rensburg and Hennie Snyman's paper “Soil degradation impact on seedbank sustainability”. Read the abstracts for the papers in this issue.

Grassland summit

The most important single event at the congress was the Grassland Summit, arranged by Richard Hurt in collaboration with the National Grasslands Biodiversity Programme (NGBP), and facilitated by Pete Zacharias. This programme is an initiative of the South African National Biodiversity Institute (SANBI), with funding from the World Bank's Global Environmental Facility (GEF). The members of the GSSA have the expertise and the knowledge to contribute meaningfully to the NGBP, and the purpose of the summit was to explore, practically, how we could do that. A set of resolutions from the summit were adopted at the GSSA AGM that evening. They were:

1. The GSSA recognizes the value of the National Grassland Biodiversity Programme (NGBP), and wishes to identify with it.
2. The GSSA mandates council to investigate and pursue appropriate mechanisms for formalizing the relationship between the NGBP and the GSSA.
3. Council will report via Grassroots and the AGM on the progress emerging from this relationship.

Beach parties and disco nights

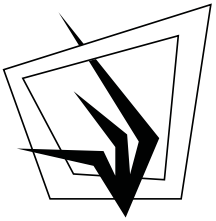
The hotel laid on great entertainment. Ironically, the beach party was held next to the swimming pool, 50 yards from the beach, but nobody was worried about minor details like that. The one-man band had everyone dancing, until the neighbours complained, with a mixture of jazz, blues, kwaito and rock that kept the dance floor packed. The first night was a late one, but it didn't stop there. There were red eyes and grumpy “good mornings” all week. No doubt delegates stayed up late to talk business and drink tea.

On the last day of the Congress, the sad news arrived that Denis Barnes, one of the founding members of the Society and a highly respected grassland scientist, had passed away. At the dinner that evening, his old friend Norman Rethman gave a moving and eloquent tribute to his former colleague.

In the great tradition of congress, the contest for the coveted *faux pas* award was a close one. But, in the end, the judges' decision was unanimous. As the MC, Kevin Kirkman, explained, in the old days there were overhead projectors. A speaker could highlight a point by either placing his pen on the surface of the projector, thus projecting the pen's shadow onto the screen behind him; or he could point with a long stick directly at the screen. Of course, nowadays we have laptops, PowerPoint and laser pointers, and our pointing options are more limited. Rob Scott-Shaw seemed to have forgotten that, as for several minutes he stood in front of his peers happily highlighting interesting features of an aerial photograph by pointing his laser at the screen of the laptop, until his befuddled audience realised what was happening and gently corrected him.

The bottom line

Financially, the congress was successful, and the Council can once again breathe a sigh of relief that this will not be the year that the Society folds. On a more serious note, the congress opened up some exciting possibilities for further activities that the GSSA and its members can get involved in, particularly the interest in endophytes from the top dairy farmers, and the GSSA's involvement with the National Grasslands Biodiversity Programme.



Congress 40 - Peter Edwards Award

by John Clayton

The Peter Edwards Trophy is awarded at the annual GSSA Congress in recognition of outstanding contribution towards conservation farming in the province where the Congress is held. The recipients this year were Karel and Rika Landman who own and, together with their management team, run the Pongola Game Reserve on the northern section of the Pongolapoort Dam.

Their land use gradually changed from a beef enterprise in 1980, when they ran up to 2000 head of cattle on some 7150 ha, until 1992 when the last cattle were removed to concentrate on game. They run six camps - two catered lodges, four self catering camps (two of which are hunting camps), with a total capacity of 110 beds. The business has over 80 full time employees, 31 of whom are in managerial positions, with 58% of the management staff being black.

Approximately half of the 68 000 kg carcass weight removed annually is processed through their handling facilities to products required by their hunting clients. The enterprise brings in a gross of approximately R950/ha, which is well above the average return for beef ranching in the area.

Karel's commitment to the game industry in KZN was recognised by the Natal Game Ranchers Association when he became Honorary Life Member in 2000. The training facility which was established on the ranch in 2004 has to date enabled 89 students to complete a 14 day hunting guide course, as well as other courses that are run at this facility from time to time.

The Peter Edwards Award has found a very deserving home for the next 12 months.

Endophyte in Pastures Symposium

Held at GSSA Congress 40: Endophytes, Insects and Pastures

by
Sigrun B. Ammann & Dave Goodenough
August 2005
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Reasons for a symposium discussing endophytes in pastures

It is of utmost importance that the discussion and research on endophytes in pastures is given some attention in South Africa. This has long been part of the New Zealand and to some extent the Australian perennial ryegrass pasture scene. Some of this information is now spilling over to South Africa, especially the possible advantages of having such a fungal organism present in the pasture. However, there is very little information about the behaviour of endophytes, the real benefits under South African conditions and the possible disadvantages of endophytes for the South African pasture/dairy industry.

The purpose of the symposium was to start the discussion process and assess what knowledge base we have to date and what the critical research questions are. It is important that we understand the organism and its functioning under our climatic conditions before it becomes widespread throughout the industry. Perennial ryegrass seed with endophyte is already on sale in South Africa, although the extent is not known at present.

Various guest speakers were invited to give presentations at the symposium, which ended with a facilitated discussion. Professors Wijnand Swart and Schalk Louw from the University of the Free State, Andrew Beckerling of Profert, Jan Coetzer of Agricol

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and Dave Goodenough of the ARC Livestock Business Division (Range and Forage) presented papers on specific aspects of this complex three-way interaction between the ryegrass plant, the endophytic fungi and the insects feeding on ryegrass and tall fescue. Problems related to animal disorders in endophyte-infected tall fescue and perennial ryegrass pastures were also highlighted.

What are endophytes?

By definition endophytes are fungi that live internally in plants without the plant showing any symptoms. They are found in all plants and are abundant and very diverse. Endophytes in grass plants infect the above ground plant parts. They are mainly transmitted via hyphae in the grass seed. These fungi produce alkaloid poisons or mycotoxins. These are of benefit to the host plant by giving it a defense mechanism against both vertebrate and invertebrate herbivores i.e. against grazing animals and insects. Some examples of these mycotoxins are peramine, lolitrem B and ergovaline. Other reported benefits to the host plant can be disease resistance, decreased nematode predation, and increased plant vigour. Thus the competitive abilities of the host plant in stress conditions could be enhanced e.g. heat and drought stress.

The advantages to the fungus in this mutualistic relationship are a stable environment free from competing microorganisms, nutrients being provided by the grass plant and dissemination via the grass seeds. These fungi grow between the plant cells and do not cause any defense responses by the host plant.

There is however some evidence that the relationship between the endophyte and the grass also has costs to the host and is dependent on the plant environment and the genotype. The fungus could act as a nutrient sink. There are case studies that show plants without endophyte to produce better than plants with endophyte. For example, stressed perennial ryegrass plants (low nutrient levels, drought or low light intensity) without endophyte, performed better than plants with endophyte.

Endophytes in agronomic grasses

The endophytes found in grasses are of the genus *Neotyphodium*. The endophyte associated with perennial ryegrass is *N. lolii*, and in tall fescue *N. coenophialum.* For both these species there are the so-called wild/standard strains and the safe/novel strains. The wild/standard strains produce a host of mycotoxins, some of which result in animal health problems such as heat stress and blood circulation disturbances. The safe/novel strains have been selected specifically for producing only some of the mycotoxins which deter the invertebrates but have little or no effect on the grazing animal.

The mycotoxin ergovaline seems to be one of the main culprits in causing animal disorders. Cattle ingesting these toxins can have increased body temperature and hooves and tails falling off due to blood circulation problems. These symptoms result in lower feed intake, lower weight gains and lower milk production. It may also happen that these symptoms are sub-clinical while still resulting in loss of animal production. The alkaloid peramine is mainly responsible for deterring insects and thus present in the novel endophytes. Other alkaloids produced by the fungus are loline, a natural insecticide also present in novel endophytes, and lolitrem B, an insect toxin and thought to be responsible for ryegrass staggers. Novel endophyte strains for both perennial ryegrass and tall fescue have recently been identified and developed for commercial use.

Grass endophytes (*Neotyphodium*) reproduce mainly asexually through transmission via the grass seed but a sexual life cycle could possibly also exist. In the sexual life cycle spores are produced on the

surface of the plant and allowed to disperse. More clarity is required on the conditions which could lead to the sexual life cycle.

Insects in pastures in South Africa

In South Africa there is no information available about insects feeding on pasture in terms of quantifying the damage they do. Likewise there is no data available on the resistance to insect damage by endophytes under South African conditions. At best information can be roughly extrapolated from Australia and New Zealand.

The following insects are found in pastures in Australian and New Zealand and some endophyte-induced insect resistance exists: (Table1)

The pests identified so far in pastures in the Tsitsikamma by dairy advisors and farmers have been categorised into two groups, namely "outbreaks" that occur under certain climatic conditions and "resident pests" that are more permanently part of the pasture management system in the region. Spittle bugs (*Locris arithmetica*), black maize beetle (*Heteronychus arator*) and armyworm have been identified as "outbreaks". Fleas, aphids, other sucking insects, caterpillars, grasshoppers, slugs and snails are the "resident pests".

Pasture farmers in the Tsitsikamma have had problems with poor ryegrass seedling survival, which they have termed "Round-up Syndrome" believing that the herbicide had

Table 1: Insect pests in pastures in the Tsitsikamma

Common name	Scientific name	South African equivalent	Damage agent / symptom
Argentine stem weevil	*Listronotus bonariensis*	All species of Naupactini	Adults and larvae
Black maize beetle	*Heteronychus arator*	*H. arator* occurs	Adults & larvae (root-feeding grubs)
Black field cricket	*Teleogryllus commodus*	*Gryllus bimaculatus*	Nymphs and adults
Bluegrass billbug	*Sphenophorus parvulus*	Numerous species of Rhynchophorinae	Adults and especially larvae (stem-borers andectophages)
Common armyworm	*Mythimna convecta*	*Spodoptera expemta* (armyworm) & *S. exigua* (lesser armyworm)	Larvae
Common cutworm	*Agrotis efusa*	*A. segetum* & *A. ipsilon*	Larvae cut young plants near ground level
Bluegrass sod webworm	*Parapediasia teterella*	*Culladia inconspicuella* & *Oligochroa terrella*	Larvae clip grass blades close to surface
Pasture mealy bug	*Balanococcus poae*	Not evident, but probably any of the *Pseudococcus* species	All life stages - cause "browning-off" of pastures
Oat aphid	*Rhopalosiphum padi*	*R. padi* is a universal pasture pest	Leaves roll up and spiral; are vectors of viral diseases
Russian wheat aphid	*Diuraphis noxia*	*D. noxia* occurs	All life stages - streaking and purpling of affected leaves

something to do with it. However, the actual cause is possibly pests above and below ground. These problems need urgent attention. Dairy production in the Tsitsikamma region is from 60 000 cows worth R450 million annual turnover in milk sales. The most limiting factor to dairy production in the area is the quality of the pasture and to improve this it is vital to have successful establishment of ryegrass through oversowing.

Some of the critical questions in relation to endophytes in pastures and their potential role in controlling insect pests are whether there is a possibility of insect resistance to endophytes, how the varying concentrations of endophyte in different plant parts affect their protective role (endophyte concentrations are higher in stems than in leaves), how much energy does the host plant actually infest in the storage of alkaloids and is this a reliable process throughout the existence of the plant?

It is critical that more knowledge is acquired about insects in pastures in South Africa, on their feeding behaviour, on how much damage they cause and what functional groups are involved. It may be useful to look at a more integrated health management strategy, which includes biological control agents such as predators, parasitoids and Bt (*Bacillus thuringiensis*) and not only to rely on endophytes.

Endophytes (*Neotyphodium*) in stored seeds

Endophytes survive in the stored seeds only under very specific conditions. The relative humidity must not exceed 50%, the seed moisture content must be less than 11% and the air temperature must be below 10ºC. This has relevance and implications on two fronts. Firstly it could mean that the perennial ryegrass and tall fescue seed imported to South Africa, which may have been infected with the standard endophtyte, may no longer have been infected by the time it was shipped to South Africa. On the other hand, if seed is inoculated with the novel endophyte and farmers are paying a premium price for the seed, it could mean that the endophyte has died by the time the seed reaches South Africa, or died whilst in storage in the seed company warehouses, resulting in no benefit to the farmer.

The effect of transport and storage conditions on the survival of endophyte in the grass seed requires urgent attention if there is to be importation of grass seeds with novel endophytes and especially if such products are sold at a premium price.

Outcomes of the symposium

- The pasture-endophyte-insect relationship is a complex system.
- Research into insect pests and their effect on pasture production in South Africa is required.
- Will the novel endophytes control the insect pests found in South African pastures?
- Research into the current presence of endophytes in South African pastures, including indigenous endophytes and their possible effects on animal health is needed.
- Research into novel endophytes under South African conditions and their effect on pasture production and animal production is required.
- The survival of endophytes in seed during transport and storage requires investigation.
- Could endophytes change the amount and composition of mycotoxins produced under variable agroecological and climatic conditions?
- Is there a possibility of sexual reproduction i.e. horizontal transmission via spores of endophytes such as *Neotyphodium*?
- A multidisciplinary approach to the pasture-insect-endophyte system is required.
- The present state of knowledge of

endophytes in South African pastures and their future success is very limited.

It was decided to establish a so-called Endophyte in Pastures Forum with a steering committee under the chair of Bryan Mappledoram of the ARC Livestock Business Division (Range and Forage Unit) to look at research priorities and to get as many role players as possible involved. Presently there are already farmers in South Africa who are sowing perennial ryegrass seed with endophytes. Questions such as whether they are the novel or standard strains, whether they are actually still present in the seed after transport from Australiasia, whether they will ultimately control the insect pests in South African pastures and improve pasture production and whether they could result in reduced animal production compared to a no-endophyte pasture, need to be addressed urgently for the sake of the pasture dairy industry in South Africa.

Invited speakers at the Symposium:

Prof WJ Swart, Centre for Plant Health Management, Department of Plant Sciences: Plant Pathology, University of the Free State.
A Mycological and Ecological Perspective of Endophytic fungi in Agronomic Grasses.

Prof SvdM Louw, Centre for Plant Health Management and Department of Zoology and Entomology, University of the Free State.
The Pasture Endophyte Herbivore System: role of insects in a complex multifaceted interaction.

Mr J Coetzer, Agricol Seed (Pty) Ltd.
Ryegrass Endophyte The Past, the Present and the Possible Future in South Africa.

Mr A Beckerling, Profert Eastern Cape.
Pests in the Tsitsikamma

Mr DCW Goodenough & BD Mappledoram, ARC Livestock Business Division, Cedara Centre, Range and Forage Unit.
Endophytes in tall fescue: a review.

Livestock development in communal rangelands: What can be done to improve the success of interventions?

By
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Synthesis of a session held at the 40th GSSA Congress, Port Shepstone, July 2005.

Over the last decade or so, there has been increasing focus among researchers, extension services, NGOs and government departments on livestock development and resource management in communal rangelands of South Africa. At the same time, a considerable amount of research in a variety of disciplines has been done in South African communal rangelands since the early 1990s. Studies in South African communal rangelands (e.g. Bembridge 1984, Mokgope 2000, Ainslie 2002 (ed.) and studies therein and Vetter 2003 in the Eastern Cape; Tapson 1990 and Letty *et al* 2002 in KwaZulu-Natal, Debeaudoin 2001, Hendricks 2004 and Hendricks *et al* 2005 in Namaqualand)have found a number of common features which, in the case of the studies by Mokgope (2000) and Letty *et al.* (2002), includes land reform projects. There is also a growing body of experience in development projects of various kinds, which has been less well documented.

Despite this gradual accumulation of data and a growing understanding of the ecological, economic and social aspects of communal rangelands, most development and resource management interventions are still based on commercial models of improving veld condition and animal productivity. The lack of success of many of these interventions and the low rate of adoption of new technologies and management practices by the communities suggests that there is a need to review our

endophytes in South African pastures and their future success is very limited.

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Synthesis of a session held at the 40th GSSA Congress, Port Shepstone, July 2005.

Over the last decade or so, there has been increasing focus among researchers, extension services, NGOs and government departments on livestock development and resource management in communal rangelands of South Africa. At the same time, a considerable amount of research in a variety of disciplines has been done in South African communal rangelands since the early 1990s. Studies in South African communal rangelands (e.g. Bembridge 1984, Mokgope 2000, Ainslie 2002 (ed.) and studies therein and Vetter 2003 in the Eastern Cape; Tapson 1990 and Letty *et al* 2002 in KwaZulu-Natal, Debeaudoin 2001, Hendricks 2004 and Hendricks *et al* 2005 in Namaqualand)have found a number of common features which, in the case of the studies by Mokgope (2000) and Letty *et al.* (2002), includes land reform projects. There is also a growing body of experience in development projects of various kinds, which has been less well documented.

Despite this gradual accumulation of data and a growing understanding of the ecological, economic and social aspects of communal rangelands, most development and resource management interventions are still based on commercial models of improving veld condition and animal productivity. The lack of success of many of these interventions and the low rate of adoption of new technologies and management practices by the communities suggests that there is a need to review our

understanding of the way communal rangelands work and to think more carefully about the reasons why current interventions very often fail.

At the GSSA Congress, we grappled with these issues around interventions in communal rangelands during a paper session with six presentations followed by a two-hour workshop. Here I summarise some of the issues raised and the debates around these. Hopefully this will stimulate further engagement by members of the Grassland Society with policy and interventions concerning communal areas.

What is the aim of interventions, and what would a successful intervention achieve?

It is a commonly held perception that livestock in communal areas make an insignificant contribution to both rural livelihoods and the national economy. This has led some people to argue that interventions aimed at livestock in communal areas are misguided and even a waste of resources. Why bother? It is true that livestock are seldom a major source of income of a household but they are nevertheless a key element in rural livelihoods and their role is likely to increase as unemployment rates rise. Livestock perform an essential "safety net" function in rural areas, which keeps many people from becoming destitute. Benefits from livestock are shared by people who own no livestock, e.g. in the form of meals and employment. The sum total of benefits derived from livestock in communal areas is substantial, but this is usually underestimated as these benefits are divided by a huge number of people. Shackleton *et al* (2001) present figures on the contributions of livestock, cropping and natural resource harvesting in South African communal areas, and their data highlight the considerable contribution these activities make to rural livelihoods. There is also a considerable amount of unacknowledged and unrecorded commercial activity, particularly sales of livestock, within the communal areas.

There are different motivations for interventions. Historically, many interventions have been driven by the perceived need for better resource stewardship and protection of natural resources from irreversible degradation. In recent years, many people have questioned the assumption that communal livestock farming necessarily leads to abuse of the resource. The evidence suggests that many areas (such as the coastal grasslands) are fairly resilient to heavy continuous grazing, while others (such as the higher altitude grasslands) have suffered substantial transformation, and it is thus important to determine whether improved resource management is a priority in an area. In many cases degradation has not been simply the result of communal grazing *per se*, but of a combination of high human densities and their various impacts, heavy stocking rates being maintained through additional feed or purchases of livestock, and ploughing of marginal land which leads to spectacular soil erosion which is often wrongly attributed to overgrazing. In such cases, simply reducing grazing pressure is unlikely to reverse the problem and more innovative and holistic solutions have to be found. A local understanding of the varied historical and spatial impacts of these different drivers is important, as well as the ecological variables such as soil, vegetation, rainfall and water availability. Institutional arrangements and economic conditions that influence resource use and management also vary considerably between areas.

Apart from improving resource management, another aim of interventions is to increase the contribution that livestock make to rural livelihoods within the communal system. The approach most commonly taken is to improve herd productivity for offtake, but there is now ample evidence that this is not an objective of the majority of livestock owners and that the contribution of livestock to rural livelihoods

cannot simply be measured and improved by focusing on offtake and sales. Instead, livestock development should take into account the objectives, practices and constraints of livestock owners. Because livestock contribute only a fraction of household income, livestock development needs to be part of an integrated development agenda to improve sustainable livelihoods from land-based activities. A fact that is often overlooked when designing rural development around livestock is that over half the households in many areas own no livestock at al lA typical figure that emerged from studies in KZN and the Eastern Cape is that only about 40% of households own livestock. Among those people who have livestock, ownership is highly skewed, with a few people owning large herds or flocks and the majority owning very low numbers.

What have we learned about communal rangelands, and what do we still need to know to improve the success of interventions?

It is now well known that people in rural areas keep livestock for multiple objectives including milk, manure, ploughing, ceremonial slaughter, slaughter for meat, lobola, sale when money is required, and as a form of savings and security. The relative importance (perceived and actual) of these benefits differs between areas and livestock species. Most research focus in the Eastern Cape and KwaZulu-Natal has been on cattle, and the current and potential contribution of small stock to rural livelihoods is less well understood.

There still seems to be a common perception that people in communal areas keep large numbers of livestock for "cultural reasons" and that they try to keep as many livestock as possible as a measure of wealth and status. Livestock do fulfil important spiritual and social functions and there is no denying that having large herds does confer social status. Interviews in the Eastern Cape and KwaZulu-Natal have, however, revealed that keeping lots of cattle as a sign of status is not an important reason for keeping livestock.

Many livestock farmers are trying to increase the size of their herds. The most commonly cited reason is that their present herd size is too small to permit regular selling or slaughtering of cattle. The small average herd size of cattle owners (the majority of people in many studies have less than 10 head) is an important factor which leads to low overall herd productivity: 1) because people are reluctant to sell or slaughter from small herds, and 2) because of the male-biased herd composition that results when a farmers has a small herd and needs a bull or some oxen for ploughing. Having larger herds or flocks also buffers against drought risk, and this comes out particularly strongly in studies from Namaqualand. It is commonly argued that people in communal areas keep too many livestock; while it is true that the animal densities are very high, the average person has too few livestock to meet their needs, or no livestock at all. This explains why every study conducted in communal areas has found people to be strongly opposed to destocking.

Livestock development which focuses on maximizing sales, low stocking rates and high-performance breeds has not worked on any significant scale in communal areas. This is not to say, however, that people are unwilling to use their livestock to make an income, as the success of some wool marketing schemes has shown. Cattle sales have met with far more mixed success, partly because people prefer to keep their cattle, and partly because of a distrust of the marketing system and low prices. Livestock owners appear to be more prepared to sell and slaughter small stock than cattle, because of the greater live value of cattle. Insufficient or unfavourable marketing opportunities are leading to lower sales of livestock and wool than farmers would be prepared to make. Insufficient grazing, livestock diseases, drought and stock theft are also major constraints on livestock production.

Why have so few interventions had lasting success?

Two fundamentally different reasons may explain the lack of success of interventions in communal rangelands. The first is that the interventions are appropriate and desired by at least part of the rural population but that they fail due to various constraints that make their implementation difficult. Some widely cited reasons for low success rates are the high population density in rural areas, the lack of co-ordination and co-operation among livestock owners, weak institutional capacity, crime and a lack of interest in improved resource management among livestock owners and institutions. These are real and deep-rooted problems in most rural areas and cannot simply be wished away. It is important to understand and acknowledge the historical and political factors that have led to this state of affairs: skewed access to land, forced removals, generalised rural impoverishment and the effects of apartheid-era 'show-case' agricultural development schemes in the so-called "independent homelands".

Ainslie (1999) discusses some of these factors and how they affect people's attitudes towards, and a capacity for, managing natural resources. He stresses the need to identify, strengthen and work with legitimate local institutions when trying to improve livestock productivity and resource management. As rangeland ecologists and agricultural scientists we are poorly equipped to deal with many of the underlying problems that hamper development. It is thus crucial that we recognize these limitations and integrate our efforts with those of others tackling broader development issues.

Some of the papers presented at the Congress illustrated the amount of time and effort required to build trust around development interventions, and how important genuine participation is in achieving some success. Although an increased emphasis has been placed on participatory methods in recent years, the development and research agenda is still largely driven by traditional agricultural approaches and political agendas. "Participation"is in most cases used as an information-gathering exercise, and rural people are usually little more than passive recipients of development schemes. Participation seldom extends as far as allowing people to have a say in the types of interventions that take place.

Another reason for the failure of development interventions may be that the interventions themselves are inappropriate and undesirable to all or the majority of people. Most interventions have been based on the premise that commercialisation is the solution to low productivity and poor resource management in communal areas. The solutions offered involve reducing stocking rates, selling more animals, improving breeds and the implementation of grazing systems such as rotational resting based on fenced grazing camps to improve veld condition. In practice, people resist destocking because they need their livestock and most have fewer than they need. Grazing systems are expensive to implement and often do not yield tangible benefits in the short to medium term. Fencing in many areas causes or exacerbates conflicts over particular areas, and when fences cut people and livestock off from important resources they are very likely to be removed. It is important to critically examine the motivation for the choices of interventions, and who actually benefits from schemes such as fencing and the introduction of improved breeding stock.

Contrary to the image some people hold of contented rural dwellers peacefully making a living from the land, the former bantustan communal areas are best characterised by poverty, economic marginalisation, social exclusion, HIV/AIDS devastation, inferior infrastructure (schools, clinics, roads, water and electricity provision) and extreme dependence on government social welfare. This places limits on rural people's ability to

and interest in taking economic risks such as commercial production. Development needs to build on what rural people are already trying to do and provide options that reduce risk rather than increase it through greater livelihood specialisation.

A one-size-fits-all approach should not be allowed to persist for another decade. We need to differentiate between blocks of communal land along a number of criteria (agro-ecological, social, politico-institutional and economic) and come up with credible ways of improving livelihoods that are applicable to those more homogeneous blocks. In order to improve the effectiveness of interventions, it is essential that planners and extension staff have a realistic grasp of the objectives and constraints of communal livestock farmers in particular areas and stop basing their interventions on the ecological and economic assumptions and ideals of the commercial farming model.

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PAC REPORT 2004/2005

By
Leslie Brown
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South African Council For Natural Scientific Professions (SACNASP)

The Natural Scientific Professions Act of 2003 is in the process of being implemented and the current Council has entered into consultation with the various "learned societies" such as the GSSA to discuss issues related to these different organisations and how it will affect the members of such organisations. The following is a summary of the information that was disseminated at a meeting held between the SACNASP Council and the "learned societies" on 1 July 2005 in Pretoria.

Natural Scientific Professions Act Of 2003

The new Act of 2003 brought a number of changes to the previous Act of 1993. Several of these have a direct effect on the different professional/learned societies such as the GSSA. These societies are now described as "voluntary associations" and do not have direct council representation anymore. It is seen as being a more inclusive approach. According to the new Act the minister of Science and Technology (currently Minister Mosibudi Mangena) is responsible for the nominations and placements of advertisements for council members of SACNASP. A panel will then be appointed by the minister to make recommendations on appointments. The minister will have to inform "voluntary organisations" to nominate persons as members of council. The invitation to nominate members will be done by notice in the Government Gazette.

Powers of the council

Council will have to make recommendations

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with regard to the minimum qualifications/requirements for registration and the period of validity of such a registration. This was necessitated by the removal of the previous category for "Technologists" and replacing it with a new category for "Certified Scientists".

The Council will also establish structures to become involved with the education and training of natural scientists and will perform functions within the South African Qualifications Authority Act (1995) and Higher Education Act (1997).

Categories of registration
There are three categories namely 1) professional natural scientist, 2) candidate natural scientist, and 3) certified natural scientist. These new categories will need new requirements and abbreviations also.

Qualification and experience requirements
Professional Natural Scientist (Pr.Sci.Nat.)
A 4-year B.Sc., B.Sc. (Honours) or B.Tech. degree, or a 4-year N.H. Dip., ***plus*** three years appropriate experience in a natural scientific profession;
OR
A M.Sc. or M.Tech., ***plus*** two years experience in a natural scientific profession;
OR
A D.Sc., Ph.D. or D.Tech., ***plus*** one year experience in a natural scientific profession.

Certificated Natural Scientist (Cert.Sci.Nat.)
Any person who holds an appropriate THREE-year degree/diploma (or equivalent qualification) from a South African university, university of technology or a technikon (or a similar institution), which is accredited by the Higher Education Quality Committee (HEQC) of the Council for Higher Education (CHE) and by the Education Committee of the Council, and who, for **at least one year**, has performed work of an appropriate nature, shall be eligible for registration.

Candidate Natural Scientist (Cand.Sci.Nat.)
Any person who holds an appropriate FOUR-year degree/diploma ((or equivalent qualification) from a South African university, university of technology or a technikon (or a similar institution), which is accredited by the Higher Education Quality Committee (HEQC) of the Council for Higher Education (CHE) and by the Education Committee of the Council, shall be eligible for registration. (No work experience required).

A candidate Natural Scientist is a person who intends to register as a Professional Natural Scientist (Pr.Sci.Nat.) after completion of the appropriate three years vocational experience as may be required.

Registration
One of the more contentious issues of the new act is the wording of regulation 20(1) of the act stipulating that "**Only a registered person may practise in a consulting capacity**". It was first thought that it is referring to person doing consultancy work, but Council understands it as anyone who advises another in this field. Thus it was explained it would include lecturers at tertiary institutions, persons within government organisations such as the ARC, private consultants etc. This will have the implication that all persons in these different sectors must register with SACNASP in a field of practice.

Fields of practise in natural scientific professions
Council feels that the current list is outdated and have asked the Registration Committee of SACNASP to revise the current list. The list is included for GSSA members to peruse and send through any comments to Leslie Brown (lrbrown@unisa.ac.za) before the end of August.

Fields of Practise
Agricultural Science
Animal Science
Biological Science
Botanical Science
Chemical Science
Earth Science
Ecological Science
Environmental Science

Food Science
Forensic Science
Forestry Science
Geographical Science
Geological Science
Hydrological Science
Industrial Science
Marine Science
Materials Science
Mathematical Science
Mathematics Education Science
Metallurgical Science
Microbiological Science
Natural Science Education Science
Physical Science
Radiation Science
Water Care Science
Zoological Science

Recognition of voluntary organisations
The SACNASP Council has in terms the Act prescribed the requirements with which a voluntary association for the Natural Sciences will have to comply with to be recognised. The following is the most important information regarding the requirements:

An association shall in terms of its constitution, further the interest of at least one discipline belonging to the following groups of related sciences (Earth Sciences; Chemical Sciences; Physical Sciences; Mathematical Sciences; Biological Sciences; and Agricultural Sciences)

An association shall have at least 50 corporate members (member of an association who have voting rights in such an association).

At **least two-thirds** of the corporate members of an association shall be **registered with SACNASP** as natural scientists.

Identification of work
SACNASP Council has informed all members present at the meeting that they intend to consult with the various voluntary associations on various aspects especially the identification of the type of natural scientific work that may be performed by registered persons.

Code of conduct
A new code of conduct will have to be developed. The proposed one is available from Leslie Brown upon request since it is too long to include.

General comments
From the above and the meeting it is clear that many aspects still need to be discussed and concluded before final implementation of the Act. There are many aspects still unclear that need attention. Various members of the GSSA have raised concerns about the need to be registered, the different fields of practise as well as the qualification requirements to be registered. The regulation that least two thirds of the GSSA's members have to be registered to be recognised as a voluntary organisation also has implications for the society's continued existence and will need to be debated. Various other issues such as "why become a member of a voluntary association and not just register with SACNASP?" will also be put in the spotlight. I am of the opinion that it would require a collective effort between the different voluntary organisations, which fulfil an important role in the furthering of their respective fields of expertise, and the SACNASP Council to arrive at a workable and acceptable relationship.

SACNASP Council has requested that the different voluntary associations provide them with comments on all the different issues especially the "fields of practice", "type of natural scientific work that may be performed by registered persons" and the "code of conduct". Members of the GSSA are therefore invited to send all their comments or questions directly to Leslie Brown (lrbrown@unisa.ac.za) who will collate all the info into one document to present to SACNASP Council. This would be our "window of opportunity" to give an input as a society and maybe to ensue that the interests of our members are looked after and catered for. As soon as more information becomes available it will be circulated to members.

GSSA Prestige Award for Sue Milton

By: Timm Hoffman and Nicky Allsopp

Prof. Sue Milton has been awarded the Grassland Society of Southern Africa's Prestige award for her outstanding research, teaching and outreach contributions over many years to the field of rangeland science.

This is a fitting award for someone whose research career spans more than 25 years, much of which has been spent in the Karoo. She is best known for her population ecology work in which she has studied the response of plant populations to a variety of impacts including harvesting, grazing, alien invasive plants and natural disturbances. Sue has worked in a variety of ecosystems but particularly in the arid zones of southern Africa.

She currently leads a number of innovative research programmes including several long-term studies on the ecology and restoration of Karoo and Renosterveld vegetation and an analysis of camelthorn woodland dynamics and biodiversity. Prof. Milton has an extensive and well-cited publication record in the peer-reviewed literature and together with her ornithologist husband Dr WRJ Dean, has published two important books on the Karoo.

Prof. Milton has taught at undergraduate and postgraduate levels at several South African universities and technikons over the last 10 years. Her innovative and passionate teaching style has enthused many young ecologists and conservationists. She supervises an impressive number of southern African postgraduate students and has contributed significantly to the field of rangeland science through these activities. Anyone who has been with Sue in the field will appreciate her encyclopaedic knowledge and ability to inspire.

Prof. Milton's outreach activities are varied and extensive. She has served as a member of GSSA council and as Editor of the Society's Journal. She currently serves on a number of Editorial Boards and review committees for national and international organisations. Together with her students,Prof. Milton regularly attends annual conferences of the GSSA as well as several other local (e.g. the Arid Zone Ecology Forum [AZEF]) and international meetings. She has played an important role at recent International Rangelands Conferences, organising workshops and theme sessions, presenting papers and delivering one of three final synthesis papers at the VIIth IRC conference in Durban in 2003.

Sue Milton finds time to lead an exciting field work course for children at the school in her home village, Prince Albert. She is well known to farmers in the Karoo and devotes considerable time to translating the outcomes of scientific research into easily understood, practical management options. Those who've heard her talk at conferences will agree that she has a rare talent for turning complex concepts into easily understood ideas without oversimplifying or losing scientific rigour.

Prof. Milton has made a substantial impact on the discipline of rangeland science and the GSSA is proud to be associated with the recognition of her achievements.

Above: *Sue Milton at the office*

An inventory of long-term environmental datasets in South Africa

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The South African Environmental Observation Network (SAEON) has been implemented to establish long-term monitoring of environmental indices, understand ecosystem function, monitor environmental and land use changes, and determine the impact of these changes on the human society of South Africa. SAEON is a National Research Foundation (NRF) initiative and is funded by the Department of Science and Technology (DST). SAEON has international links with similar projects, namely the Long Term Ecological Research sites (LTER) and the Environmental Long-Term Observatories of Southern Africa (ELTOSA).

Field centres or nodes, established across the range of habitat types or biomes in South Africa, will be responsible for monitoring these changes. Each node will act as a central facility within a multi-tiered network of environmental monitoring sites, to collect, store and assess data, provide scientific coordination, act as a logistical and administrative platform, contribute towards education and outreach, and deliver information products. SAEON has already launched the Ndlovu (Lowveld savannah) and Fynbos nodes. Marine and coastal nodes are in the process of being implemented. In the next couple of years, nodes for the arid lands, grasslands and forests will be planned.

SAEON invites individuals or institutions carrying out long-term environmental research to consider joining the network. This will facilitate the coordination, administration, sharing and use of long-term datasets on a national scale, and help secure the datasets for posterity. To find out more about SAEON, go to their website (http://www.saeon.ac.za/).

While a number of new environmental monitoring projects are to be instigated, there are many existing studies, while some relevant projects are lying dormant. In order to determine which environmental datasets already exist, their status and their value in terms of SAEON's objectives, information regarding them is needed. Therefore, one of the aims of my SAEON-supported post-doctoral fellowship is to create an inventory of long-term environmental datasets (active as well as dormant) existing in South Africa. Datasets of relevance include comprehensive baseline studies covering any aspect of the environment, such as flora and fauna, climate, geology, water, soil, oceanography, land-use, socio-economics, etc. The inventory will be in the form of metadata.

What is metadata? The metadata of a dataset is not the data itself, it merely describes the data within. As a simple analogy, the information on a tinned food label represents the metadata of the product (e.g. manufacturer, mass, ingredients). The kind of metadata that I am collating includes the following:

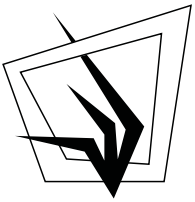
- Contact(s) for the dataset (e.g. name of the organization and contact details of the person in charge of the dataset)
- Dataset information (e.g. title, brief description, purpose, keywords, key publications, temporal and spatial coverage, whether the dataset is dormant or active, digital or non-digital)
- Data quality (e.g. a description of how accurate are the data, what gaps exist)
- Access and use of the dataset (e.g. access/use constraints and conditions, how to get a copy of the dataset, how to

cite the dataset)

- Metadata author details (contact details for the person who produced the metadata)

To assist you in providing me with metadata for your long-term datasets, I have created a user-friendly 'metadata form' for you to complete. I am currently updating this form after receiving feedback from initial recipients. Once it has been updated (before the end of August) you can obtain a copy directly from me (smecener@adu.uct.ac.za) or you can download it from the metadata project website (http://web.uct.ac.za/depts/stats/adu/saeon.htm).
The metadatabase will be made available on the SAEON website as a search interface, thereby assisting researchers (local and international)in locating datasets of interest and establishing contact with the owners/managers of the data. Potentially, collaborative studies can be formed in this way.

The datasets identified for the inventory shall be assessed for their national importance, from the perspective of their usefulness to a broad spectrum of potential long-term environmental researchers. Comprehensive baseline studies will be selected and evaluated with regards to their usefulness to SAEON, and specifically regarding their relevance to the nodes. Important criteria include the usefulness of datasets for understanding ecosystem function, monitoring environmental change, and determining impacts of climate or land use changes on the environment and on society.



SOIL DEGRADATION IMPACT ON SEEDBANK SUSTAINABILITY

By
G.J. van Rensburg & H.A. Snyman

Seedbank evaluation is important in understanding plant community development and successional patterns which can be used in identifying factors regulating population dynamics. Seedbank composition along a degradation gradient was evaluated on an Arcadia soil type at Soetdoring Nature Reserve, 42 km north-west of Bloemfontein, in a semi-arid climate with an average annual rainfall of 550 mm. Twenty soil samples were collected up to a depth of 50 mm in late June 2000. The treatments included bare soil, veld in good, moderate and poor condition, which represented a degradation gradient. Seed germination trials were conducted in the greenhouse to determine germinability and botanical composition of the seedbank. Four grass species were identified in the seedbank (*Aristida congesta, Chloris virgata, Themeda triandra* and *Tragus racemosus*). *Aristida congesta* occurred in all treatments except veld in a good condition and was the only species that germinated on the bare soil. *Tragus racemosus* occurred in both the poor and moderate veld, while *Chloris virgata* occurred only in moderate veld. *Themeda triandra* occurred in both the moderate and good veld condition, but was the only species in the good veld. The decline of seedbank germinability along a degradation gradient can be attributed to the reduction of seed production, increase in soil surface temperature, increased soil erosion, decrease in soil water content and changes in the soil characteristics and climate. Therefore, further research is necessary in solving some of these plant-soil interactions.

Short-term influence of fire in a semi-arid grassland on (2): root distribution, seasonal root production and root/shoot ratio

By
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Introduction

Little work has been carried out to investigate the seasonal patterns of root growth and turnover (O'Connor and Bredenkamp 1997) because past plant-ecological studies mainly concentrated on the aboveground parts of the grassland ecosystem. This is especially true in the fragile ecosystems of semi-arid climates where small changes may have long-lasting consequences (Wiegand *et al*. 2004). The fact that roots have no direct economic importance to grazing management systems, the difficulty in sampling because of the inability to distinguish live roots from dead and the high variability of the resultant data, are of the most important reasons for the above problem. This lack further intensifies into the complete lack of data also on the impact of fire on both of the above- (Everson 1999; Snyman 2003, 2004a) and belowground fractions (Trollope 1999; Tainton 1999) in specifically arid and semi-arid grasslands.

Large parts of the semi-arid grasslands of southern Africa are characterised by large-scale accidental, runaway fires driven by August winds. Either lightning or man caused these unplanned events, they not only have a short-term influence on productivity of the grassland ecosystem, but may also have a major residual effect on the next growing season, depending on successive climatic conditions and post-fire management (Snyman 2003, 2004b). This information can serve as guideline in claims arising from unforeseen fires, in which thousands of Rand can be involved and often being based on unscientific evidence. My objective was therefore to quantify short-term (two years) influence of a one-year grassland burning trial, which is a normal event in the semi-arid areas, on above- and belowground productivity for a semi-arid grassland.

Procedure

The research was conducted in Bloemfontein (28°50'S; 26°15'E, altitude 1350m), which is situated in the semi-arid (summer annual average 560mm) region of South Africa. The study area is situated in the Dry Sandy Highveld Grassland. At the start of this study the veld was in good condition (veld condition score was 92% of that of the benchmark site) and dominated by the climax species *Themeda triandra* with *Eragrostis chloromelas* and *Elionurus muticus* also occurring relatively abundantly. Soils in my study area are mostly fine sandy loams of the Bloemdal Form (Roodepoort family 3200). Clay content increases with soil depth from 10% in the A-horizon (0 to 300mm) to 24% in the B1-horizon (300 to 600mm) and 42% in the B2-horizon (600 to 1200mm).

The research was conducted on 18 plots of 10 x 10m each, with an edge effect of 5m around every plot. The three treatments included fire burning against the wind (back fire), with the wind (head fire), and a control with no burning taking place. The experimental layout was a fully randomised design with

three replications for each treatment. Half of the burn plots were burnt on 30 August 2000 and the other half on 23 August 2001. Therefore every plot was burnt only once during the trial period. The control was harvested at the same time as the burning treatments to a height of 30mm. The head and back fire treatments were applied on the same day to ensure that the two types of fires were comparable over a similar range of environmental variables. The fire treatments were applied during the time when the soil and grass fuel were initially very dry and then spring rainfall thoroughly wetted the soil causing the grass sward to become relatively green. Burning took place in the morning with a light wind blowing. To limit the fire to every burnt plot, the plants surrounding each plot were cut short and soaked before burning. The plots were excluded from any grazing over the two year trial period. At the end of each growing season, every treatment was defoliated to a height of 30mm. The detail on fire behaviour was discussed in the previous volume of grass roots.

At the end of every season, as well as two months after burning, plant density was determined by counting all plants within eight quadrats of 0.5 x 0.5m each per plot. The aboveground and belowground phytomass productions for all treatments were determined every second month at the end of October, December, February and April of the 2001/02 growing season. The August 2000 burn treatments were therefore defoliated (30mm height) and root mass determined the first time in 2001, after resting for a full growing season. As the burn treatments of the two separate years were defoliated the first time and root mass determined the same year, variation of climate on phytomass productions was largely excluded. The root mass was also determined during the end of the months of March and June and 15 August (when grass started sprouting) to more clearly identify the possible peak periods of development. Just before the burning (end August) root mass was also determined in the burnt plots.

Root mass was estimated at 50mm intervals to a depth of 900mm together with the aboveground production estimated from a sample of 10 soil cores systematically distributed over each plot. The soil cores were collected with an auger (70mm diameter) during the abovementioned months. Sieving was through two sieves, a 2mm mesh followed by a 0.5mm mesh. After most of the roots had been extracted via successive washings of the core through the 2mm mesh, the remainder of the soil was spread in a shallow tray and water was run continuously through to separate the fine roots by flotation. The outflow from the tray passed through the 0.5mm mesh sieve. No attempt was made to distinguish between live and dead roots. Harvested materials were oven-dried at 90°C for 72 hours before being weighed.

Results and discussion

Plant density

Fire had a drastic influence on the plant density (Table 1). As the plant density did not vary much from season to season for unburnt grassland, only the mean value is given in Table 1. The influence of the back and head fire on plant density did not differ much from each other and is therefore presented as an average in Table 1. It is clear from Table 1 that the densities of *Themeda triandra*, *Cymbopogon plurinodis* and *Elionurus muticus* were influenced most by the fire. The species which only appeared after the fire are *Aristida congesta* and *Tragus koelerioides*. Most species' densities were not influenced by the fire. Various researchers also found a decrease in density on semi-arid grassland due to fire (Everson 1999; West and Yorks 2002), but Tainton and Mentis (1984) could detect no decrease in the higher rainfall areas.

Table 1: *Average plant density (plants/m^2) (± SE) in burnt and unburnt grassland, measured one, four, eight and twenty months after fire*

Species	Unburnt	Burnt			
		Time after burning (months)			
		One	Four	Eight	Twenty
Aristida congesta			1.96± 0.06		
Cymbopogon plurinodis	2.68± 0.21	1.05± 0.09	1.06± 0.08	1.06± 0.09	2.86± 0.28
Digitaria eriantha	5.01± 0.11	4.22± 0.14	5.14± 0.13	4.02± 0.41	4.96± 0.31
Digitaria argyrograpta	1.98± 0.09	1.94± 0.08	1.96± 0.09		
Eragrostis chloromelas	20.31± 4.16	22.14± 3.15	23.01± 0.63	24.06± 0.51	22.21± 0.54
Eragrostis superba	2.65± 0.21	2.96± 0.10	2.97± 0.21	2.92± 0.09	1.86± 0.10
Elionurus muticus	9.21± 0.41	1.82± 0.06	2.86± 0.12	6.12± 0.12	8.14± 0.21
Panicum stapfianum	1.92± 0.09	1.03± 0.02	1.06± 0.09		
Sporobolis fimbriatus	2.86± 0.21	2.94± 0.05	1.96± 0.12	4.41± 0.13	4.10± 0.13
Themeda triandra	24.31± 3.16	14.06± 0.34	15.01± 0.36	19.14± 0.51	19.21± 0.31
Tragus koelerioides		1.96± 0.06	2.03± 0.12		
Triraphus andropogonoides	1.94± 0.09	1.85± 0.06	1.96± 0.11	2.84± 0.09	4.06±0.13
Total	**70.19**	**55.97**	**60.98**	**64.57**	**67.40**

Root distribution with depth

As expected, regardless of the fire treatment, most of the root distribution was concentrated over the top soil layers with a decrease in roots with depth (Table 2). The same root distribution pattern was also noted by various other researchers (Shackleton *et al.* 1988; Moore 1989). Root distribution did not differ much between head and back fires over all depths for both seasons (Table 2). Presumably, in response to increased concentrations of nutrients in the surface layers of the soil, the bulk of root mass for most grass species are located in the top 50 100mm (Table 2). A significant interaction ($P<0.01$) was obtained between root distribution and soil depth deeper than 50mm for both burnt and unburnt grassland. Fire significantly increased root distribution over the first 0 to100mm depth (19%) and decreased it deeper than 100mm (Table 2). The above increase in root distribution due to fire only occurred six months after the fire, while the decrease with depth was already noticeable two months after the fire. A further increase in root distribution by fire occurred during the second season over the 50 to 100 mm layer with the greatest increase the second half of the season. The decrease in root distribution over the top soil layers due to fire can possibly be ascribed to the increase in the concentration of various soil properties.

Table 2: *Percentage root distribution with depth for the unburnt and burnt (head and back fire) grassland*

Depth (mm)	% of total root mass excavated (± SE)				
	Unburnt	First season after burn		Second season after burn	
		Head	Back	Head	Back
0-50	20.68± 1.26	27.83± 1.32	27.28± 2.96	24.25± 1.22	23.85± 0.96
50-100	29.09± 1.33	31.13± 1.22	31.92± 2.41	34.99± 2.22	35.20± 2.12
100-150	22.06± 1.22	16.80± 1.11	17.30± 1.126	18.51± 1.21	17.88± 1.62
150-300	13.07± 1.01	11.76± 0.91	11.43± 0.92	10.08± 0.96	10.37± 0.96
300-600	8.40± 1.00	6.94± 0.86	6.91± 0.86	7.20± 0.99	7.71± 0.92
600-900	6.70± 0.90	5.54± 0.89	5.16± 0.65	4.97± 0.66	4.99± 0.66

Both the burnt and unburnt grassland show a strong concentration of roots in the top 150 mm soil layer where the averages for roots occurring, for the unburnt grassland and one year after the fire for the head and back fires, were 71.83%, 75.76% and 76.50% respectively (Table 2). Typically, more than 85% of roots in unburnt grasses are to be found in the top 300mm of soil (Tainton 1981; Moore 1989; Snyman 1998). There is evidence, however that the deeply penetrating roots are considerably more efficient per unit weight of root than are the surface roots, so the value of these roots

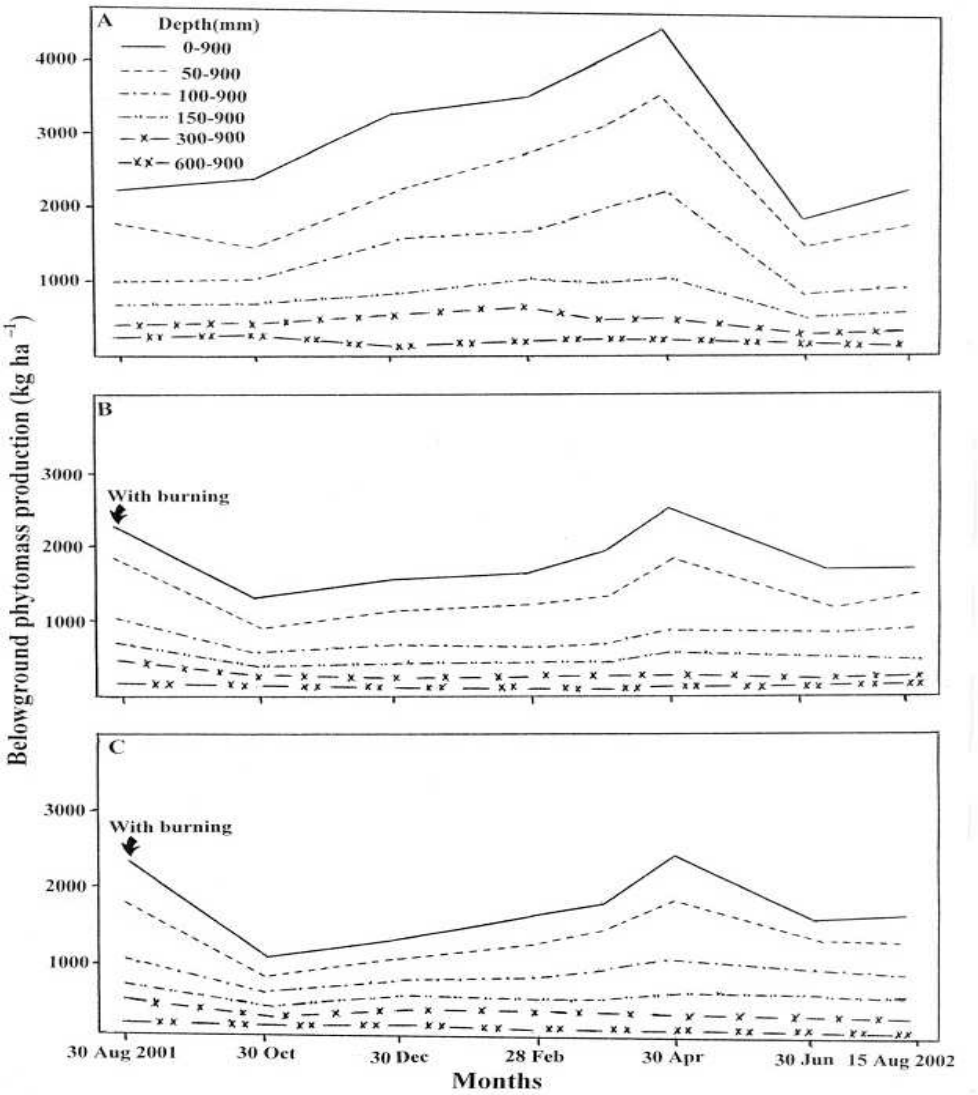

Figure 1:
Monthly root mass (kg/ha) for the unburnt (A) and burnt (B = Head fire and C = back fire) grassland over the first growing season after burning. Horizons (mm): A (0-300), B_1 (300-600) and B_2 (600-900). LSD (0.01) for 0-900 mm depth = 396.

should not be under-estimated (Wolfson and Tainton 1999). In arid and semi-arid environments, many grasses do not have a deep enough root system to access ground-water and are reliant on surface water after rainfall events (Drew 1979), leading to a short growing season which can further be hindered by fire (Table 2).

Two years after the fire the difference in root distribution between burnt and unburnt grassland is still significant with the roots in the burnt part still better distributed over the top 100mm (Table 2).Though no root cores were drawn deeper than 900mm, it should not have made a big difference to total root mass, as most of the roots occur above that.

Belowground phytomass production and seasonal trends

Over the first year following the fire, root mass was lowered ($P \leq 0.01$) by fire (Figure 1). The second season after the fire, the root mass of the burnt parts did not differ much from that of unburnt grassland over almost all depths (Figure 2). Though the back fire had a greater decrease ($P<0.05$) in root mass than the head fire over the first season after the fire, the difference grew smaller as the second season progressed, following the fire.

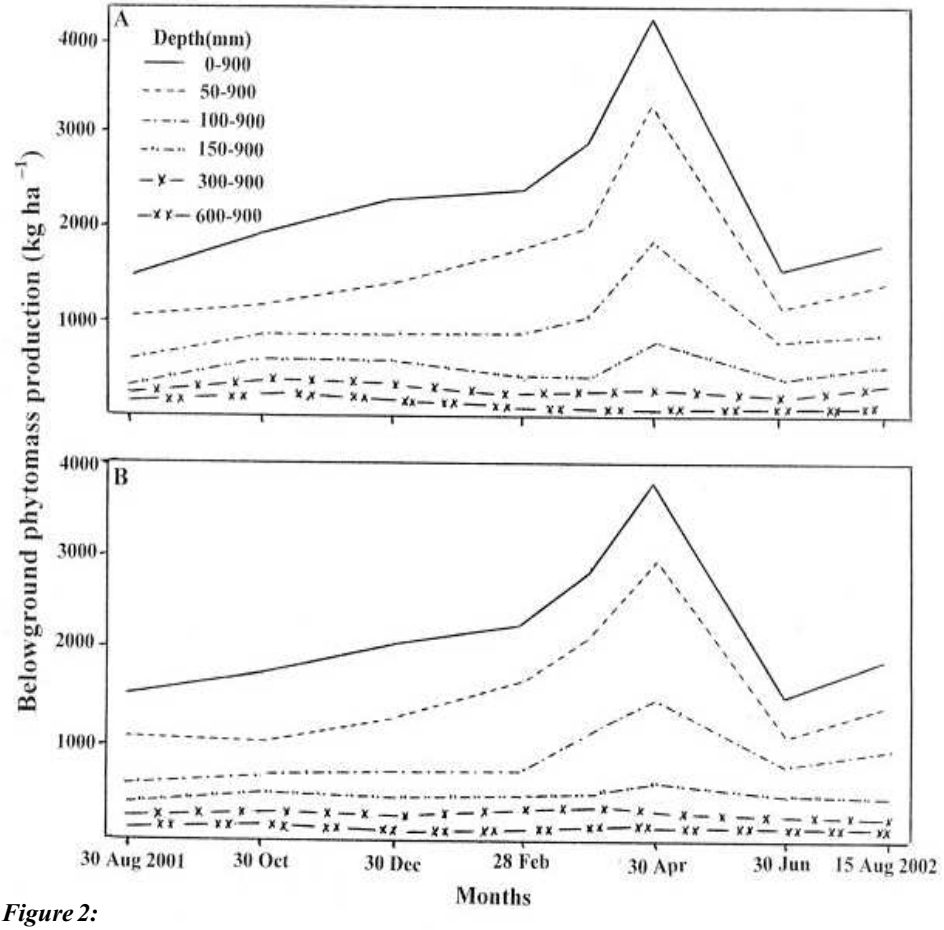

Figure 2:
Monthly root mass (kg/ha) for the burnt (head fire = A and back fire = B) grassland over the second season after burning. Horizon (mm): A (0-300), B_1 (300-600) and B_2 (600-900). LSD (0.01) for 0-900 mm depth = 376.

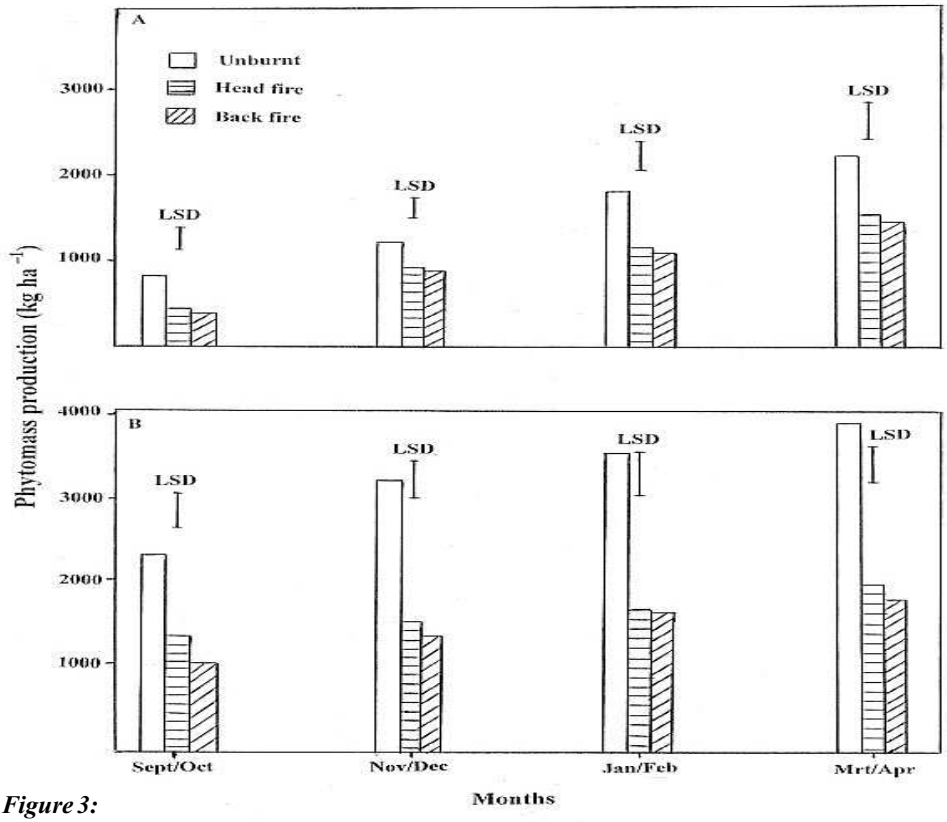

Figure 3:
Cumulative above- (A) and belowground (first 900 mm depth B) phytomass production (kg/ha) for the unburnt and burnt (first season after burning) grassland, measured every second month. Least significance (LSD) is calculated at the 1% level.

The peak root mass (up to 900 mm depth) of the unburnt grassland was 80% and only 11% higher than that of the burnt grassland, one season and two seasons respectively, after the fire (on average for the head and back fires). The peak root mass of 4549 kg/ha for unburnt grassland compared well with other peak values for South African semi-arid grassland of 3100 kg/ha (Weinmann 1943) 2260 kg/ha (Huntley 1977), 4630 kg/ha (Kelly and Walker 1974) and 2327 kg/ha in the Rift Valley province of Kenya (Ekaya *et al.* 2001). Although according to Wolfson and Tainton (1999) and Ingram (2003) root biomasses in semi-arid grasslands are strongly seasonal, the general trend was very similar over the two seasons with this study.

The belowground phytomass production fluctuated considerably over the study period (Figure 1), which is a common problem with root studies (Shackleton *et al.* 1988). Regardless of burn treatment, the grasses grew most active during the months of March to April. Peak autumn values for unburnt grassland were approximately 77% and 84% higher for respectively the head and back fires, one season after burning and 4% and 19% respectively for the second season after burning.

Notable of the considerable decrease in root mass occurring mid-winter, is that root mass was most influenced especially in the top soil layers (0 to 100mm) and also showed the most marked increase in autumn (Figure 1). Also significant in Figures 1 & 2 is that the root mass in unburnt grassland, one and two

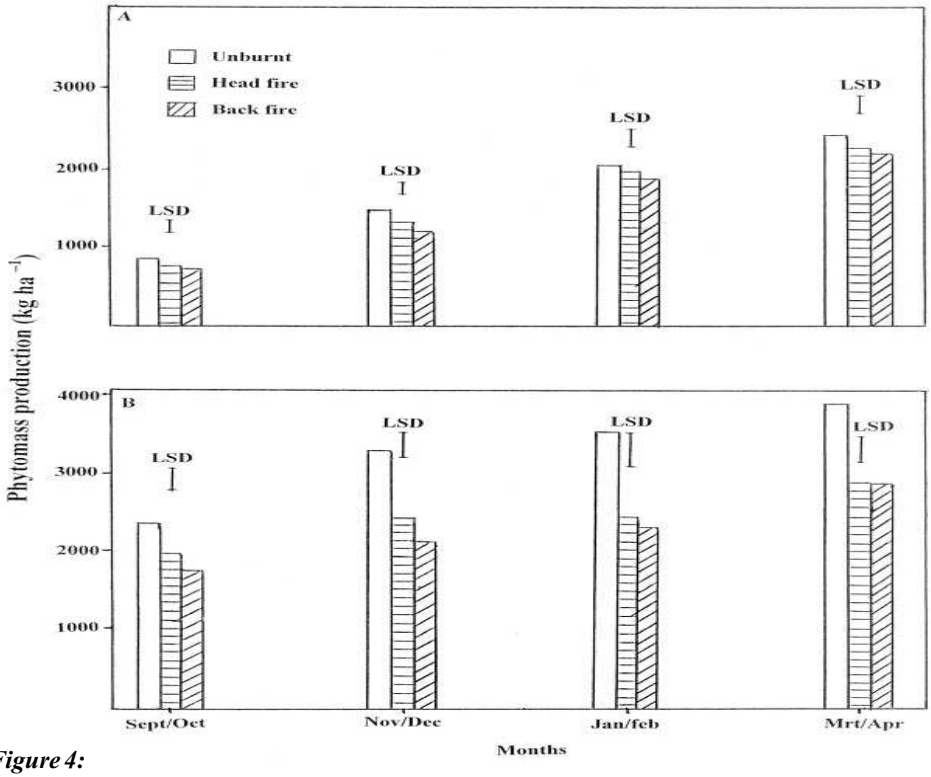

Figure 4:
Cumulative above (A) and belowground (first 900 mm depth B) phytomass production (kg/ha) for the unburnt and burnt (second season after burning) grassland, measured every second month. Least significance (LSD) is calculated at the 1% level.

years after the burning treatments, all declined to almost the same mass during mid-winter over most depths. The increase in root mass occurring with the onset of the growing season, can largely be linked to the increase in tuft sizes (litter production) as the season progresses (Snyman 1998).

Aboveground phytomass production

Fire decreased ($P<0.01$) aboveground phytomass production or regrowth of the burnt grassland over the first season after the fire (Figure 3). For the second season following the fire, the production was still lower than that of unburnt grassland, but statistically significant ($P<0.01$) only at the onset of the season (Figure 4). The production in case of the head and back fires was not significantly ($P<0.05$) different for any month, though the back fire had the lowest production throughout. This lower production could possibly be ascribed to the higher intensity of the back fire, which caused the lower plant density. Over the first season following the fire, the average production for head and back fires was 35% lower than that of unburnt grassland.

Root/shoot ratio

The root/shoot ratios for both one season and two seasons following the fire, as well as for unburnt grassland are presented in Table 3. With the exception of October, the ratios of unburnt grassland were higher ($P<0.01$) than that of the burnt grassland. This phenomenon is valid for both one and two seasons following the fire (Table 3). For almost all months, the head fire had a slightly ($P<0.05$) higher ratio than the back fire. This can possibly be due to the higher intensity of the

back fire, which was more detrimental towards the root mass than aboveground production. As the first frost already occurred in the beginning of April in both growing seasons and the plants already then became dormant, the March root masses are used in Table 3 to calculate the root/shoot ratio for April.

For most months, the ratio within a burn treatment following a fire is higher during the first year than in the successive year (Table 3). The reason for this being that the aboveground production was influenced less than the roots by the fire over the first year following the fire. The root masses (over the first 900mm depth), responsible for the aboveground phytomass production for the different months for a growing season following the fire and two seasons thereafter, are graphically presented in Figures 3 and 4 respectively. From Figures 3 and 4 it is clear that in semi-arid areas it seems that root mass is generally greater than aboveground biomass (Shackleton *et al.* 1988). The decrease in aboveground phytomass due to burning for the first (2000/01) and second (2001/02) growing seasons after burning, were respectively 806 and 175 kg/ha compared to the 2002 and 1027 kg/ha decrease of root mass. The conclusion can therefore be made that belowground growth is more sensitive to burning than that of aboveground. The latter is one of the reasons for the decrease in root/shoot ratio with burning.

Table 3: *Average root/shoot ratios for the burnt (first (A) and second (B) seasons after burning) and unburnt grassland, measured every second month. Least significant differences (LSD) are calculated at the 1% level.*

Month	**Unburnt**		**Head fire**		**Back fire**	
	A	B	A	B	A	B
October	2.80	2.79	3.12	2.60	2.96	2.50
LSD: A = 0.42						
B = 0.46						
December	2.60	2.24	1.70	1.83	1.59	1.80
LSD: A = 0.86						
B = 0.88						
February	1.83	1.72	1.42	1.27	1.49	1.24
LSD: A = 0.36						
B = 0.38						
April	1.66	1.62	1.25	1.25	1.20	1.22
LSD: A = 0.22						
B = 0.31						

Conclusions

The time for recovery of belowground systems will not only depend on the burning intensity and its effects on key ecosystems processes and components, but also on the previous land-use practices. Therefore, the impacts of fire on belowground systems can be highly variable and may not be predictable. However from results obtained in this study, it was clear that poor root development accompanying fire, will over the short-term decrease the plant's susceptibility to drought and will reduce its capacity to extract mineral nutrients from the soil. This effect has been strongly implicated in the increasing frequency of man-made drought in the arid and semi-arid regions in southern Africa, in particular. The fact that underground production is more sensitive to fire than the aboveground, further emphasises the importance of a well-distributed root system for sustainable utilisation of the grassland ecosystem in arid areas. As the largest percentage of roots is limited to the top soil layer and responsible for production, the importance of deeper roots contributing towards survival of the plant during water stress, must not be underestimated. Peak root mass is attained during the dormant months when active

growth has ceased, with the storage of photosynthate to promote rapid regrowth at the onset of the growing season.

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Plant strategies and determinants of community composition in South African mesic grasslands

By
R.W.S. Fynn, C.D. Morris & K.P. Kirkman

Habitat fertility and disturbance have been recognised as the major determinants of plant community organisation. However, there is much debate over the strategies of plants on fertility and disturbance gradients. The importance of competition and tolerance on these gradients is not yet clearly understood. We used pot and plot competition experiments and long-term field experiments to examine plant traits and strategies on soil depth, fertility, burning and mowing gradients in the Pietermaritzburg region. Plant height and leaf width appear to be the major trait axes along which plants are differentiated along fertility and soil depth gradients, with leaf width and height increasing with increasing soil depth and fertility. Height also appears to be an important trait differentiating species on disturbance gradients. Short and medium height species generally dominate regularly burnt or mown areas. Competition experiments revealed that dominance at different points on fertility and disturbance gradients is generally related to tradeoffs in competitive ability that species make, with some being good competitors in infertile or disturbed habitats at the expense of an ability to compete in fertile or infrequently disturbed habitats and *vice versa*. *Eragrostis curvula* and *Panicum maximum* were extremely competitive in high fertility treatments and appear to dominate on deep bottomland sites, fertilised sites or infrequently burnt sites because of an increase in soil fertility in these sites. Broad-leaved species such as *P. maximum* and *Sorghum bicolor*, however, are unable to compete with narrow-leaved species such as *E. curvula* when phosphorus is limiting. *Themeda triandra* was extremely competitive under regular cutting and appears to dominate regularly burnt or mown sites because of its strong competitive ability under some form of regular defoliation and tissue loss. However, tolerance also appears to be an important strategy employed by some species on soil depth and disturbance gradients. A tiny narrow-leaved species, *Sporobolus stapfianus*, did not appear to be competitive under any conditions but probably dominates extremely shallow soils through its ability to tolerate extreme moisture stress. *Tristachya leucothrix*, *Cymbopogon validus* and *Aristida junciformis* were also not competitive under any conditions but appear to be able to dominate infrequently burnt grassland through their ability to tolerate shading and litter accumulation.

Kinetics of plant secondary compounds: influences on feeding behaviour of herbivores and diversity of rangelands

By
L.E. Dziba

Diverse rangelands provide habitat and forage resources for a wide variety of wild and domestic animals. Yet, biodiversity of the sagebrush steppe has declined as sagebrush density increased to the exclusion of grasses and forbs. Biodiversity can be enhanced if sheep can consume substantial amounts of sagebrush to influence vegetation dynamics and allow recruitment of grasses and forbs. However, the ability of sheep to consume large amounts of sagebrush is limited by monoterpenes and other plant secondary compounds. Intake of sagebrush may be improved through better understanding of the physiological effects of

monoterpenes on herbivores. Lambs were dosed intravenously and into the rumen with three sagebrush monoterpenes - camphor, 1,8-cineole, and p-cymene. Feeding behaviour of controls and dosed lambs was monitored over 1 hour. Plasma samples were collected and analysed by gas chromatography with a flame-ionisation-detector to determine terpene concentrations over 7 hours and 8 hours for rumen and intravenous dosing, respectively. Kinetic analyses were performed to determine how concentrations and rates of elimination influenced feeding behaviour of lambs. During intravenous infusions, dosed lambs stopped feeding at 21 minutes compared to 1 hour that control lambs spent feeding ($P < 0.05$). There was no apparent adaptation to terpenes during the intravenous studies, as lambs did not change the time they spent feeding during repeated dosing trials for each lamb. During the rumen dosing experiments dosed lambs fed for only 33 minutes compared to 1 hour for control lambs ($P < 0.05$). All three monoterpenes were rapidly eliminated in both studies. There was a marked decline in maximum plasma terpene concentrations after lambs had been on a terpene-containing diet for more than three weeks. This suggests rumen microbial adaptation since no induction of elimination pathways was observed during the intravenous trials. Primary clinical effects induced by the monoterpenes were similar for all three compounds. Plasma concentrations and elimination rates of sagebrush monoterpenes influence how much sagebrush animals can consume. Strategic supplementation has been effective as a means to improve consumption of sagebrush and improve use of domestic herbivores such as sheep and goats as tools for enhancing and maintaining biodiversity of rangelands. The studies reported here have implications for managing rangelands that are dominated by undesirable, toxin-containing plants. Increasing consumption of such undesirable plants depends on understanding their toxic effects, elimination rates, and ability to manipulate their negative physiologic effects.

KwaZulu-Natal Biodiversity Programme: A programme of the Endangered Wildlife Trust

By
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Introduction

The province of KwaZulu-Natal is one of South Africa's most diverse in terms of its biodiversity components, with many species (from invertebrates to large mammals), communities and ecosystems of great value to the country. Yet, the conservation status of many of these systems is extremely poor, with few threatened species being adequately conserved in the current system of protected areas, and many habitat or ecosystem types currently being heavily transformed through agricultural developments. As a result of the immense value of the province's biodiversity to the country as a whole, and its extremely threatened status, a clear need exists to focus conservation activities in the most efficient manner for the benefit of all communities.

The formal conservation authorities in the KwaZulu-Natal province are unfortunately not able to allocate sufficient resources to conserving biodiversity in the province, with the result that many, if not most, of the important and threatened species and ecosystems now occur on privately-owned or communal land. In addition to this, a large proportion of the conservation work is currently being carried out by the conservation NGO sector in an attempt to fill this “conservation gap”.

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The formal conservation authorities in the KwaZulu-Natal province are unfortunately not able to allocate sufficient resources to conserving biodiversity in the province, with the result that many, if not most, of the important and threatened species and ecosystems now occur on privately-owned or communal land. In addition to this, a large proportion of the conservation work is currently being carried out by the conservation NGO sector in an attempt to fill this “conservation gap”.

Current state of biodiversity in KwaZulu-Natal

During 2001 Ezemvelo KwaZulu-Natal Wildlife conducted a Strategic Environmental Assessment (SEA) to determine the current status of biodiversity conservation in the province. The following is a summary of the findings of the SEA:

- 35 landscape types (30%) have been transformed by more than 40% (the theoretical threshold beyond which ecological processes are significantly disrupted);
- Wetland habitats in the 500 to 1200 m elevation range were under-protected and therefore require conservation focus;
- Two of the province's 16 grassland types are considered endemic ('Ngongoni veld or Natal mistbelt and Natal sour sandveld) and both are under-protected (only 0.3% and 0.4% in formally protected areas respectively);
- Nine of the province's 16 grassland types have been transformed by more than 40%,
- The 2 inland forest types (montane and mistbelt) are the most poorly represented in protected areas in the province;
- Seven (30%) of the 23 plant communities in KwaZulu-Natal are endemic, all being very under-protected (<10%), with most having less than 3% of their area under protection;
- Midlands mistbelt vegetation type is the most highly transformed by development of any type;
- Of the 85 threatened plant species analysed, 45% are not found in any protected area. The area with the highest concentration of threatened plant species is the midlands and southern KZN;
- Only 3 of the 29 threatened bird species are adequately protected in the province. 19 of the 29 most threatened bird species show a clear preference for grassland and wetland habitats;
- Protected areas in the province only contain viable populations of 2 of the 10 endemic reptile species; and
- Of the 4 endemic amphibian species, 2 are not found in any formally protected area, while 3 species are distributed primarily in the midlands and Drakensberg foothills.

In summary, biodiversity in KwaZulu-Natal province is grossly under-protected, with the conservation status of most threatened or endemic species being poor. It appears that the current system of protected areas in the province is totally inadequate in protecting this province's biodiversity.

In addition, the current conservation situation in KwaZulu-Natal is characterised by many different conservation NGO groups working predominantly in isolation, and there is therefore the dire need for a more focused and coordinated approach to the work that these groups are undertaking in partnership with Ezemvelo KZN Wildlife. The KZN Biodiversity Programme aims to coordinate and improve the focus of various activities that will make the most significant contribution to the conservation of the province's biodiversity.

Combined efforts

Due to the current realities of limited funding and human resources, this can only be achieved by developing a well-coordinated approach, where funding and resources are shared in order to achieve the over-riding conservation goals. The focus will continue to include highly threatened, charismatic species such as the wattled crane, blue swallow, cape parrot and oribi, although management activities directed at these species will address the requirements of, and threats facing broader habitats and ecosystems, providing ecologically-based conservation strategies.

With the current rate of land transformation

and species loss in the province, a broader ecological approach is urgently required. Coordinated management of the current activities of a host of different Endangered Wildlife Trust Working Groups and other NGO projects, in continual liaison with Ezemvelo KZN Wildlife will ensure the long-term conservation of our natural heritage within the province. The successful development of the KZN Biodiversity Programme will therefore result in improved allocation and sharing of resources between projects, increased focus on critical areas, increased collaboration and coordination between like-minded projects focussing on similar issues and working with similar stakeholder groups, reduced need for administrative backup and core funding for the different groups through a sharing of resources, increased efficacy through specific skill development and reduced multi-tasking, improved data collection, collation and interpretation as well as input into the Ezemvelo KwaZulu-Natal Wildlife C-Plan database, improved public education and communication through a centralised resource centre, coordinated input into land transformation and development applications and an overall more efficient use of resources and capacity for the benefit of conservation and communities throughout the province.

This Endangered Wildlife Trust programme aims to achieve the following:

- Improved conservation of critical biodiversity elements in sensitive areas in KwaZulu-Natal through the overall integration of efforts and activities of all relevant conservation NGOs in the province;
- Engaging private landowners in the process of conservation and land management through improved natural resource management;
- Primary liaison for improved communication between NGOs and provincial and government authorities on issues of conservation relevance;
- Providing incentives for private landowners to conserve biodiversity elements;
- Improved effectiveness and streamlining of the development application procedure;
- Increased effectiveness in carrying out broad-based environmental education and awareness, focusing on the holistic picture of biodiversity conservation;
- A centralised resource centre with information on all relevant projects, issues and NGOs available to members of the public, relevant stakeholders groups and donors, to vastly improve on conservation awareness.

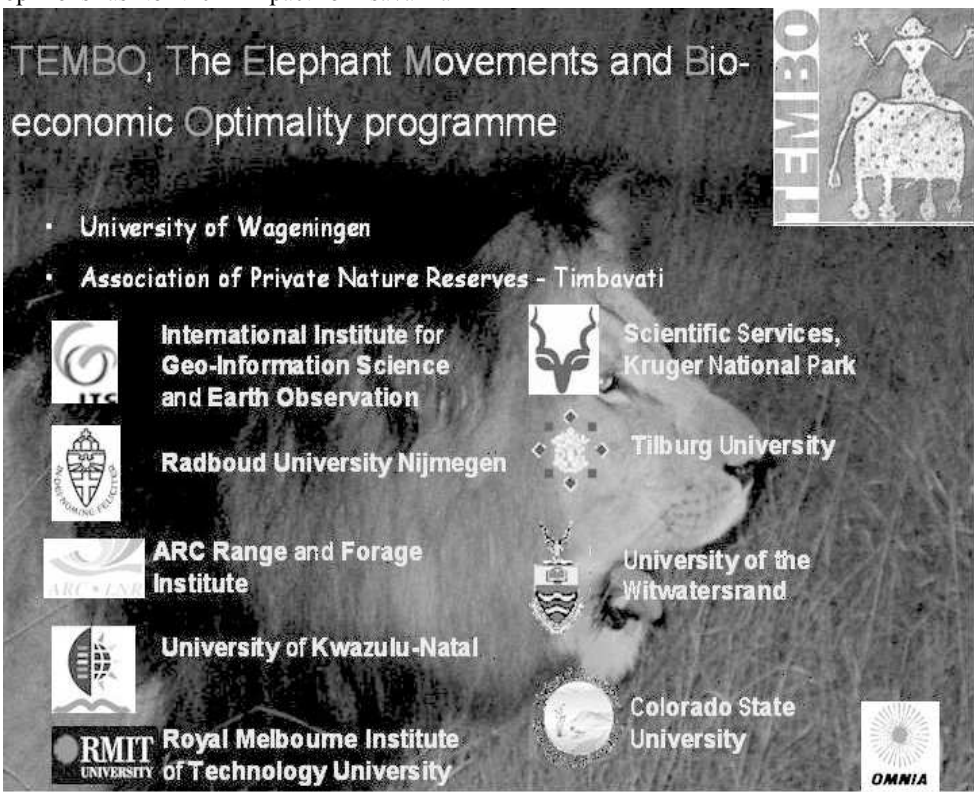
The focus for this KZN Biodiversity Programme is on activities that benefit both the environment as well as the people inhabiting these same areas. We need to acknowledge that the environment, with its functioning ecosystems can supply extremely beneficial services to people, i.e. ecosystems are able to take natural assets such as air, soil and water and produce goods valuable and beneficial to people, including financially. The key to this concept is that humans are inextricably linked not only to ecosystems, but to the protection of these ecosystems, including the individual components on which the ecosystem relies. Humans must therefore not view themselves as outside the realm of these services and simply gain the benefits thereof. People, like farmers, manage the ecosystems and hence play a fundamental role in sustaining and fulfilling human life. In contrast, by our selfish actions, with little concern for the environment, we can also destroy the ability of the environment to supply these beneficial services. By maintaining viable and functioning ecosystems we can look forward to cleaner water supplies, reduced flooding, maintenance of soil fertility, removal of toxic and disease-causing compounds, pollination of our important fruit crops, pest control, the absorption of carbon from the atmosphere, and even cultural and spiritual stimulation through ecotourism. And, most importantly, ecosystems are where our food, fibre, building materials and pharmaceuticals are produced.

TEMBO
The Elephant Movements and Bio-economic Optimality Programme

Herbert Prins, Fred de Boer & Mike Peel

Context

Elephants are one of the main assets of most conservation areas in South Africa, generating income through tourist game viewing, live sales, photo safaris, and hunting expeditions. Elephants are important ecological drivers and there is a diversity of opinions as to their impact on savanna systems. For example does high elephant density trigger a local decrease in biodiversity, through their negative impact on the woody component and concomitant cascading effects OR do elephant promote large herbivore diversity through their modification of the vegetation? The understanding of the role of elephants comprises a huge challenge for the improvement of natural resource management in mixed ownership conservation areas. One would expect that spatially explicit models could help to tune management decisions regarding the necessary actions to be taken in order to optimise income and mitigate negative ecological impacts. However, such models are not available, and this programme aims at filling this important gap.



Scale
The distribution of elephants is mainly governed by three important factors: vegetation biomass, vegetation quality, and water, and by the spatial distribution of these resources. The analysis of the local spatio-temporal elephant dynamics will be accompanied by analyses at varying scales, higher spatial scales, with studies at local levels (10-100 km²) and regional levels (100-10000 km²),such as the use of available aerial survey results for elephant distribution. The impact of elephants on the presence and abundance of other grazer and browser species, through vegetation changes, will also be studied. Predictions of the elephant distribution will be used as input in a financial cost-benefit analysis for the optimisation of management actions. The proposed analysis for the TEMBO project will incorporate the different management objectives, which differ among conservation areas (KNP, communal, and surrounding private and corporate conservation areas). The project is set up in such a way that it accommodates different spatial scales so that the natural dynamics of elephants is captured in the financial analysis for the optimisation of resource management scenarios.

Importance
Understanding the causes and consequences of long-term patterns and dynamics of biodiversity and community structure is needed to help increase our ability to predict responses of communities to natural and anthropogenic change. Elephant spatio-temporal dynamics form a key role in this respect and the programme will be tackled at varying spatial and temporal scales. This understanding is critical for informing management decisions. Furthermore, this knowledge will help elucidate the controversial relationship between biodiversity and the functioning of savanna ecosystems. The programme will be made up of six PhD projects with three projects allocated to South African students and three to students from the Netherlands.

OBITUARY

Dr. E. Mark Hutton

1912 - 2005

Dr Mark Hutton was born in South Australia and graduated B.Agr.Sc. from the University of Adelaide in 1933. He spent the first years of his professional career as Field Officer in the Dept of Agriculture until 1936 and as assistant Plant Breeder at Roseworthy College from then until 1940. During this period he completed his M.Sc. from Adelaide which he obtained in 1941.

He achieved eminence in various fields, first as a member and later as leader of the Genetics section of the CSIRO Division of Plant Industry. In 1952 he transferred to Brisbane where he joined Dr. J Griffiths Davies in building up a research group which was to gain independence as the Division of Tropical Pastures in 1959.

He was asked by Jack Davies to develop research on the improvement, by breeding, of tropical forage plants and he was able to build up a team of six scientists for this work. Recognising the importance of pasture legumes both as feed for animals and as agents for the improvement of soil fertility, he directed the main effort into breeding legumes in the genera *Macroptilium, Leucaena, Desmodium, Centrosema* and *Stylosanthes.* Work was also done on grasses of the genera *Setaria* and *Sorghum.* His research has led to a sound understanding of the genetics of these plants and to the release of several valuable cultivars of which his great personal achievement was the release of Siratro.

In 1969 Mark was appointed as the second Chief of the Division of Tropical Pastures, a position that he filled for eight years. During

this time the Division was faced with a period of consolidation and in 1973 and 1974 the Katherine and Kimberley research stations were added to Mark's responsibility. While they were an invaluable extension to the Division they brought with them the complexities of administering research in remote locations. These pressures led to Mark spending a lot of weekends and evenings at his office and those of us who knew him will know how important he had to consider things to put them before his family. Mark always befriended overseas visitors and visiting scientists and often took them into the family fold. Spending a Christmas with the Huttons was like a meeting of nations.

During all his time as Chief he still maintained a very full and active research programme of his own and after his retirement from the CSIRO he traveled throughout the world taking on research opportunities in South America (with CIAT in Colombia) and Asia. He also continued his work on *Leucaena* and succeeded in overcoming most of the problems associated with this promising tree legume.

Mark's contributions to agriculture have been recognized by a number of appointments and honours. In Queensland he was a member of the Faculty of Agriculture Board of the University of Queensland and an Honorary Research Consultant to its Department of Agriculture. He was President of the State Branch of the Australian Institute of Agricultural Science (AIAS) in 1964. He was also Federal President of the AIAS in 1966 and was made a Fellow of the Institute in 1967. In 1968 he received the Farrer Memorial Medal and in 1970 he was President of the XIth International Grassland Congress.

Professional Societies outside Australia also recognized his contributions to Grassland science by the award of Honorary Fellowships. He was honored in this way by the Japanese Society for Grassland Science in 1974, the Indian Society for Forage Research in 1976 and the Grassland Society of Southern Africa in 1977. Mark and Gwen attended the annual congress of the GSSA, in Windhoek, in 1988.

Mark leaves his wife Gwen, daughters Judith and Faye and son John with their families who have always supported him during his long and fruitful career. Mark was also a close personal friend of two former presidents of the GSSA, Dick Dikinson and Albert Smith who (with his wife Marie) had the opportunity to do research in Mark's team at the CSIRO Division of Tropical Pastures in 1968/69.

Albert Smith and Dick Dickinson

Denis L Barnes

1921 - 2005

Denis Barnes, Honorary member of the GSSA, passed away suddenly on 19th July 2005, aged 83, in Port Elizabeth, while recovering from an operation. He was a founder member and past President of the GSSA, and remained active until his retirement. Denis was born 31st October 1921, in Pietermaritzburg, South Africa, only son of Blanche and William Barnes, and a fourth generation South African. He was educated at Maritzburg College, started a career in trigonometric survey, and served as an engineer in the South African Armed Forces during the 2nd World War. He served in Egypt and Italy, and participated in the Western Desert battle of El Alamein.

After the war, Denis studied for a BSc degree in Soil Conservation at Wits University, a special course for ex-servicemen, given under the leadership of Prof. John Phillips. Then in 1947, along with several other

"donga doctors", as the graduates of this course were known, he emigrated to Southern Rhodesia to work in the Ministry of Agriculture. He started in the Department of Conservation and Extension, and then moved to lecture at the Gwebi Agricultural College, where he initiated some veld grazing experiments and completed a Masters degree by research, through Wits.

In 1954 he started a 26 year career in the Department of Research and Specialist Services, doing range and pasture research. Ten years of this was spent at the Grasslands Research Station near Marondera, on the intensive systems of the Mashonaland plateau. Then he took charge of the Matobo Research Station, where the research was focused on the semi-arid savanna systems of the west and south of Zimbabwe. His last eight years in Zimbabwe were spent at head office where he rose to the position of Chief of Botany and Ecology, heading all range and pasture research activities. During his time in Zimbabwe, he was a keen horseman, owning two horses, and playing polo-crosse.

In 1981, Denis retired and returned to South Africa where he took a job in range and pasture research at Nooitgedacht Research Station in Mpumalanga. Here, he was able to concentrate on research, focusing on highveld grassland and forage systems. He published more than 45 scientific papers, of which close to half were published on work done at Nooitgedacht. He retired finally in 1995, and moved to Port Elizabeth. His last years in the Eastern Cape were definitely happy ones. He was able to indulge in another passion, which was researching family history. He was an active member of the MOTH, as well as the 1820 Settlers association. He also led a socially active life, with relatives and old friends in the Port Elizabeth area.

Kevin Kirkman

NOTICE

MEMBERSHIP FEES INCREASED for 2005/06

After lengthy debate at the 2005 AGM
membership fees were increased to the following:

Category	2005/6 Fee from AGM Decision
Ordinary	**R300**
Associate	**R265**
Professional	**R335**
Family	**R450**
Overseas (South)	**R595**
Overseas (North)	**R975**
Institution	**R780**
Retired	**R78**

Invoices and statements will be posted at the end of October

Invitation to 41st Annual Congress of the Grassland Society of Southern Africa

Range and Forage Science in a Developing Environment

17 - 21 JULY 2006
ATKV Klein Kariba, north of Bella Bella (Warmbaths)

First Announcement and Call for Papers

The 41st Annual Congress of the GSSA will be held at Klein Kariba, an ATKV resort some 10km north of Bella Bella (Warmbaths). The Organising Committee would like to invite all those interested in participating in the Congress to submit the Preliminary Registration form giving titles for papers and posters. The main theme of the Congress is Range and Forage Science in a Developing Environment although a wide range of themes will be covered during the Congress.

Currently, one symposium has been proposed, which will focus on Invasive Plant Management. Both exotic and indigenous invasive species, and their ecology and control will be addressed.

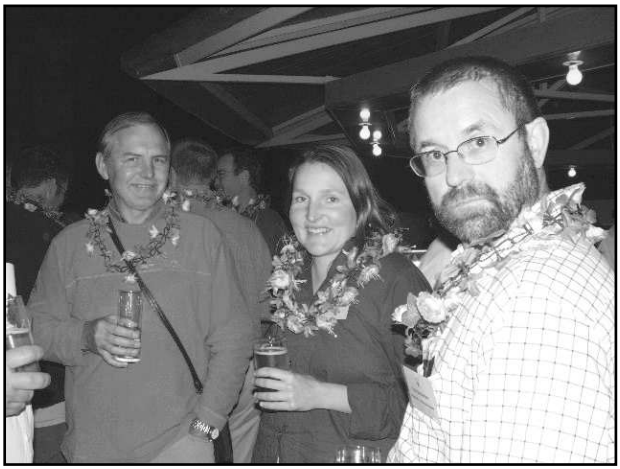
If anyone has other pertinent issues which they would like to address via the medium of symposia, workshops or short courses to be held in conjunction with the Congress, please contact the Organising Committee using the details below.

Chris Dannhauser	Jorrie Jordaan	Freyni du Toit
(015) 268-2784	(014) 736-2251	(033) 390-3113
(082) 873-4736	(082) 829-5449	(083) 256-7202
chrisd@ul.ac.za	jordaanj@agricho.norprov.gov.za	admin@gssa.co.za

PRELIMINARY REGISTRATION

(Fax to +27 (0)33 390-3113 or email to admin@gssa.co.za)

Title:	Initials:		Surname:				
Name for name tag:			Institution:				
Address:							
City:		Postal Code:			Country:		
Tel:		Fax:			Cell:		
E-mail:							
Do you intend presenting:		Platform? (tick)			Poster? (tick)		
Preliminary title:							



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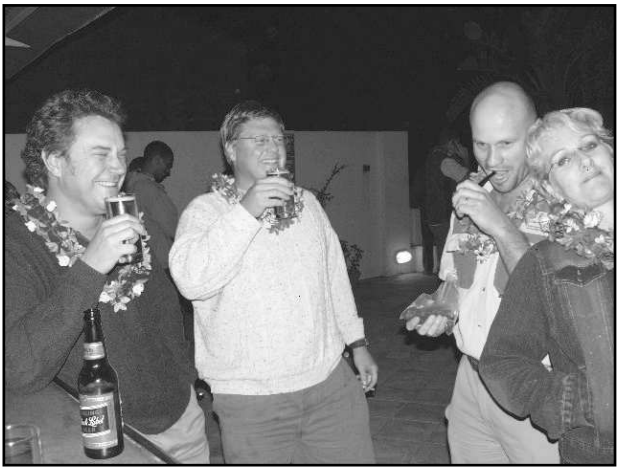
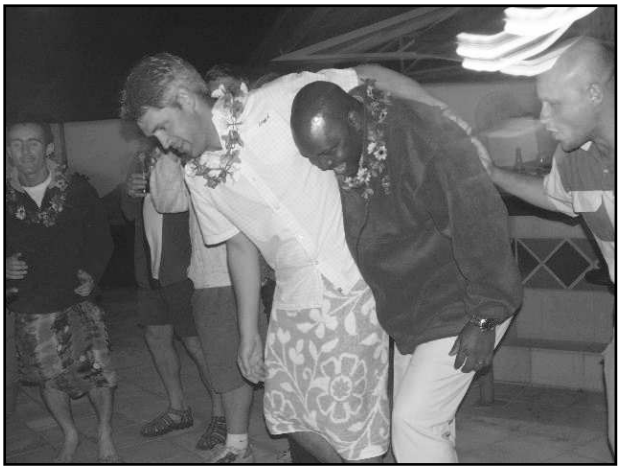
The beach Party:
Grassland Scientists doing what they do best



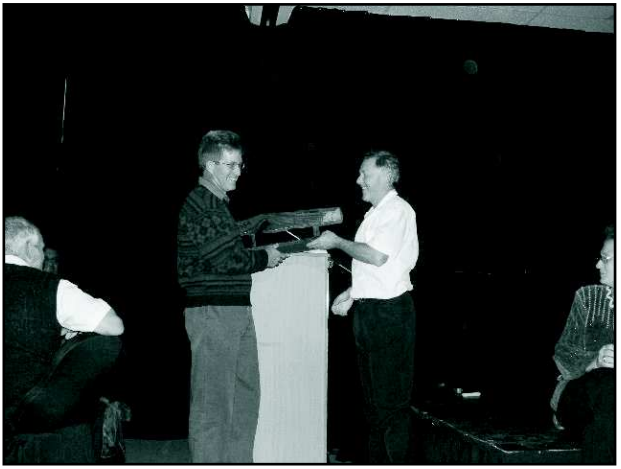


Right:
Even the vegetation knows how to chill on the beach

Left & Above:
Relaxing at the final dinner after a long four days.

Left:
Richard Fynn (centre) receives the award for Best Presentation

Right:
Kevin Kirkman (left) hands the coveted faux pas award to Rob Scott-Shaw



Left:
The hopeful candidates for the faux pas: (from left) Rob, Annelene Swanepoel and Richard Fynn

Photos courtesy Justin du Toit