GRASSROOTS

Guest Editor

A guest editorial from the first editor of the Bulletin of the Grassland Society of Southern Africa, musing about how our newsletter has reflected the changing Society over the past two decades.

The morphing of the "Bulletin" into "Grassroots" is a very good example of the adaptability the leadership, of the Society has shown over the years. On the occasion of the 20th year of regular publication of a 'popular' format we can reflect on how things have changed – or have they?

Certainly the content is quite different as when we started the "Occasional Publications" and the "Bulletin" the intention was really to get "the science into practice" and to record the good ideas emerging from field days and non-congress events (this was sort of a Journal of Good Ideas and Failed Experiments but ISI didn't like the idea so we went it alone!). What we could not anticipate was that the publication, now well established as Grassroots, would provide the forum for the development of a new medium that now characterises the programme at the formal Congresses. This has moved us as a Society and discipline into the era of trans-disciplinary agendas and we have maintained our relevance through this I believe. For those who may not have thought about this buzzword here are my definitions:

Multi-disciplinary – many disciplines working on a project and they do not really need to talk to each other;

Inter-disciplinary – as above, but they have to write a joint report so are forced to talk to each other at the end of the project. Usually these 'studies' come about where one discipline takes on a project, gets into trouble so find some mates from other disciplines to help; and

Trans-disciplinary –here all possible disciplines (especially those very hard ones we call "soft sciences"!) get together and write the project proposal so they are all in it from start to end.

Of course the last of these is where the GSSA has moved itself to in my view. Whether this was done by accident or design I don't know, but this is what has and will keep this Society alive. The GSSA and all its elements have done well to survive the changes in the 'scientific' environment over the last three decades and I have no doubt that the strength-in-adaptability will prevail.

Oh, by the way, I see from Mike Peel's Presidential Address (GSSA Congress 2010) that the planted pastures issue remains. That has not changed in 30 years! Perhaps if the debate was taken into a trans-disciplinary realm, things may look different!

Peter Zacharius (PeteZac) has been a member since 1982 (Processional since 1993), served as Honorary Secretary for more years than he can remember from 1985. He was President in 1993 and has served in every portfolio, except Treasure, available at the time he was on Council structures (1985 to 2005) and attended 21 consecutive congresses. Career decisions have distracted him from the veld since 2006 and after a 30 year association with UKZN he is now Chief Operations Officer for the Safe Blood for Africa Foundation.

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

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

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Features

News

Regulars

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2010 Sustainability Awards and 10th Anniversary of Impumelelo Innovations Award Trust Function at Artscape, Cape Town: May 2010,

N GABRIELS
on behalf of GSSA

I felt really cultured arriving at Artscape on this particular Sunday evening. Light classical music was playing in the reception area and the aroma and aesthetic value of picture food filled the room. There was an air of excitement and expectancy as honorary guests, politicians, prize winners and the rest of the audience filed into the awards venue. The well-known South African comedian, Mark Lottering, was the Master of Ceremonies for the evening. He was very entertaining and managed to make one or two "faux pas" of the evening look as if it was part of the "act". The audience was addressed by Dr Franklin Sonn (Chairperson) and Ms Rhoda Kadalie (Executive Director) of Impumelelo Trust, who stressed the importance and the value of development projects in the townships and rural areas of South Africa. They commended the winners of the 2010 Impumelelo Innovations awards for their hard work, their commitment and their innovations; and the direct impacts of their projects on poor South African communities.

Nine silver, eight gold, four platinum and three social entrepreneur awards were awarded that evening. Winning projects ranged from HIV/AIDS and other health care related projects to literacy, handcraft and music therapy community clinics to greening and recycling projects to mentoring of emerging black farmers. The innovation winners were awarded with certificates and prize money funded by the Ford Foundation, Open Society Foundation of SA, Charles Stewart Mott Foundation and the Konrad Adenauer Foundation.

The projects which were most impressive to me were the Orange Bag Recycling Project from KwaZulu-Natal and the Abalimi: Harvest of Hope - from Seed to Table Project from the Western Cape. The Polokwane Declaration of 2000 prescribed a 50 % reduction in waste to landfill by 2012 and zero waste to landfill by 2022. In order to achieve this, the Cleansing and Solid Waste Unit of the eThekwini Municipality initiated the Orange Bag Recycling Project in August 2007. In partnership with Mondi Paper, the municipality provided orange refuse bags to households in selected areas to be filled only with paper and plastic products. Publicity campaigns were carried out to promote this. Private enterprises collected the bags and took them to Mondi for recycling, thereby reducing the amount of waste taken to landfills. The project was so successful in its pilot stage in the Outer West of Durban, that is has been extended to the Inner West, Durban North and Durban Central. It currently reaches approximately 100 000 homes (60 % of the target). To date, more that 2000 tons of waste has been collected and recycled.

Abalimi Bezekhaya has assisted an estimated 3000 urban poor to "micro-farm" since 1982. In February 2008, Abalimi established Harvest of Hope – from Seed to Table to create a new value chain for farmers from Khayelitsha and Nyanga to sell their produce directly to customers in upper income suburbs through an organic box scheme. This provides a reliable cash income to about 130 farmers. The potential is there for each farmer to earn an estimated R1500 per month, whether realised or not. Abalimi Bezekhaya received an award for his efforts in assisting these small farmers in progressing from survival and subsistence levels of urban farming to a livelihood level where they can earn cash and still produce food for their families.

The audience was rewarded for their patience with classical music and dance performances by the Libertas Choir, Opera singer Musawenkosi Ngqungwana, Hugo Lamprecht Sax quartet, the pianist Eben Wagenstrom and the Jikeleza Feather Dance group.

2010 GSSA Research Skills Workshop

JULIUS TJELELE
Agricultural Research Council, Animal Production Institute

Once again congratulation to the organisers of research skills workshop held in Middelburg, Eastern Cape on the 21 to 22 September 2010. Several speakers discussed fundamental skills required to successfully plan, execute experiments and write scientific papers.

Among other speakers David Ward discussed an interesting talk on "the research question". This is a vital aspect of research, which is often not given the attention it deserves, and many questions are found to be unanswerable or even already answered in other research.

Most young researchers are faced with dilemma of whether to continue with research or move towards management? Luthando Dziba unpacked this issue effectively and hopefully we will now tackle such challenges carefully to avoid frustration.

Delegates at GSSA research skills workshop.

One message that I took home was that "a scientific experiment, no matter how good the results may be, is not complete until the results are published". It is now up to the researchers, especially young researchers to practice all lessons learned from the research skills workshop.

We hopefully now know whether we want to pursue research or move towards management, have the required skills to write proposals, learned how to develop research question, design experiments, collect and effectively managed data and write scientific paper.

More scientific papers, papers, papers……

SA youth warned to protect environment

Pretoria - South Africa, especially the youth, need to take global warming and threats to the environment seriously if the country is to prevent the devastating impacts of climate change. This is according to Deputy Water and Environmental Affairs Minister, Rejoice Mabudafhasi who was speaking at the launch of the Kudu Green School initiative in Pretoria on Wednesday.

"The future of our environment lies in the ability of our youth to understand that the sustainability of our natural environment and ecosystems cannot only be left to existing legislation and policies," the deputy minister said.

The project seeks to rope in school children in Gauteng to be ambassadors in the fight against climate change. Through the initiative, youngsters from selected schools are made aware of the environment and are encouraged to create educational experiences that will change their perspective of climate change. Mabudafhasi said her department, together with other players in the environmental sector, had recently undertaken an initiative to ensure that environmental learning was well articulated and recognised within the newly revised school curriculum.

Several schools on Wednesday were presented with green flags as a symbol of their participation in the fight against climate change.

"An initiative like this one will therefore ensure that learners in urban environments are prepared for future careers in conservation and the natural sciences," Mabudafhasi said.

As hosts of the Congress of Parties on climate change (COP 17) in a year's time, South Africa is under pressure to demonstrate its commitment to reduce carbon emissions, something that can only be achieved through an emigration to cleaner sources of energy.

Mabudafhasi said it was imperative that public awareness on climate related issues be intensified through education and encouraging people to change their attitudes towards the environment.

David Mabunda, Chief Executive Officer at the South African National Parks, said the Kudu Green School initiative was one of the responses to the climate challenge, society was experiencing.

"We are here to commit to sustainability in design and in practice and we want to bring about an increased awareness, appreciation and connection of people to the natural world," he said.

The National Lotteries Board (NLB) has promised to step in and provide funding to various environment-friendly projects across the country.

"If a project has got something to do with protecting the environment, we can provide funding for that," said board chairperson Alfred Nevhuthanda.

The NLB has a distribution of no less than R3 billion in funding to charities and non-profit organisations annually. Trade and Industry Minister Rob Davies has recently instructed the body to spend at least 50 percent of all its discretionary funds on rural organisations whose projects were committed to saving the environment.

BuaNews

SAEON's role in developing the next generation of scientists

R KHASHANE
SAEON Communications Intern

SAEON's education outreach programme had the privilege of hosting its first environmental science education symposium at Silonque Bush Estate in Phalaborwa.

The event attracted environmental education enthusiasts from across the country, comprising of teachers, learners and scientists. Among the guests were Lulekani Education Circuit Manager Tilly Baloyi and the Manager of SAEON's Ndlovu Node, Dr Tony Swemmer.

The symposium created a much needed platform for educators and learners to demonstrate and share their experiences gained as participants in the SAEON education outreach programme. The auditorium was abuzz with excitement as the 55 guests prepared themselves for presentations and discussions. Dr Tony Swemmer opened the proceedings and was followed by SAEON's Education Outreach Coordinator Sibongile Mokoena, who gave an overview of the programme.

"The aim of SAEON's science education is to give teachers and learners curriculum support so that learners are in a position to pursue careers in science," said Mokoena. The SAEON science education outreach programme is creating the next generation of scientist, she added.

The role of the scientist in education

Dr Dave Thompson of the SAEON Ndlovu Node gave a thought-provoking presentation on the role of the scientist in education. He said there is a huge gap between scientists and the curriculum, stressing that the relationship between scientists and the broader community needs to be improved. Thompson noted that most people who are not involved in the sciences receive most of their information from the media and through teaching by non-scientists. "Scientists need to be responsible educators and non-scientists need to be responsible learners," he added.

All in the name of science

DR. T SWEMMER,
SAEON Ndlovu Node
AND M COLGAN,
PhD student, Stanford University, USA

In these times of concern for the environment and efforts to combat global climate change, planting trees is highly regarded. Cutting down trees is not. However, this is exactly what SAEON's Ndlovu Node has been doing for the past three years. All in the name of science, of course.

Trees play a vital role in the regulation of the flow of carbon and water, between ecosystems and the atmosphere. The amount of carbon stored by trees and the rate at which trees grow and absorb more carbon out of the atmosphere is vital information, both for carbon credit projects and for global climate models that inform society of how our climate is changing (and how much more it is likely to change in future).

In order to provide more of the basic data upon which these complex models are built, the SAEON Ndlovu Node has been "harvesting" trees at a mining site. Harvesting involves making detailed measurements of a tree's dimensions before cutting it down and weighing it. By measuring trunk diameter and matching this with the tree's weight, future estimates of carbon stored in living trees are made at other sites where harvesting is not an option (such as inside Kruger National Park). For selected trees, roots are also dug up to be weighed, as nearly 30-50% of a tree's weight (and carbon) is located below ground.

Harvesting a range of tree species, in different types of ecosystems, is needed in order to make reliable estimates of biomass and carbon stocks over large areas.

Upcoming events

Technical Centre for Agricultural and Rural Cooperation (CTA) 2010 Annual Seminar
Date: 22-26 November 2010
Venue: Johannesburg, South Africa
Email: ctaseminar2010@cta.int

37th Annual Conference of the South Africa Association of Botanists (SAAB)
Date: 17-19 January 2011
Venue: University of Rhodes, Department of Botany
Tel: 046 603 8592
Email: saab2011@ru.ac.za

Climate Change Adaptation in Agriculture and Natural Resources Management
Date: 28 February -11 March 2011
Venue: Eastern Africa
Contact: Manon van Lent
Email: manon.vanlent@wur.nl

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

5th International Wildland Fire Conference – South Africa
Date: 09-13 May 2011
Venue: Sun City, South Africa
Tel: +27 21 797 5787
Email: info@wildfire2011.org

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

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

Postgraduate Opportunity

Applications are invited from potential postgraduate students who would like to continue their MSc or PhD in Animal Nutrition or Pasture Science at University of Pretoria in 2011. The topics of research include:

Animal Nutrition
1. Screening of novel plant materials for their inhibitory effect on rumen methanogenesis.
2. In vitro and in vivo screening of commercial fibrloytic enzymes in terms of fibre degradation and reducing methane production.
3. Evaluation of drought tolerant alternative fodder crops leaf meals for milk goat production under small scale farming conditions.

Animal/ Pasture Science
1. Uncertainty assessment of greenhouse gas (GHG) emissions from the livestock sector (i) in terms of carbon sequestration and (ii) in terms of methane emission from ruminants using tropical/sub-tropical forages.
2. Manipulation of rainfall and grazing management with the aim (i) to generate data to gain a better understanding of the role of climate change, and (ii) to predict the effect of climate change on forage quality.
3. Modelling climate change impacts on the productivity of pastures and forage crops.

Requirements:
- Qualifications either BSc (Agric) for MSc degree and MSc (Agric) for PhD degree
- Knowledgeable on Animal Nutrition (Rumen fermentation) for registration in Animal Nutrition
- Knowledgeable on Grassland/ Pasture Science/ Agronomy for registration in Pasture Science

Contact person:
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SANBI'S Grasslands Biodiversity red meat industry initiative (2009-2010)

A PATERSON
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The South African Biodiversity Institution (SANBI) is responsible for managing the Grasslands Programme. This programme involves a strategic approach to developing biodiversity in agriculture, forestry, coal mining and urban areas.

The Red Meat Industry initiative is a major part of the agricultural biodiversity programme. This is because the Grasslands biome covers 29% of South Africa's land surface and this biome is primarily used by livestock farmers utilizing the grass for production. Thus it will be initiatives within the livestock, or red meat sector that will result in achieving the major goal of the Grasslands programme.

This goal has been defined as: "The biodiversity and associated ecosystem services of the grasslands biome are sustained and secured for the benefit of current and future generations".

Investigations into the red meat value chain over the past few years have resulted in the development of an Implementation Plan for achieving this Grasslands goal.

Initially it was felt that a "certified" diversification programme, applied to all sectors of the red meat value chain, could result in a higher price being paid by the consumer for the final product. This increased price being an incentive to primary producers to preserve and develop their grasslands in a sustainable manner. The investigations over the past few years have indicated that only a small percentage of the consumers would be prepared to pay higher prices for these "biodiverse" products and that any increase in value that this would put into the value chain would not filter back to the primary producer.

In the implementation plan it has been made clear that, rather than introducing a certification programme, far better results would be achieved by dealing directly with producers and giving them the direction required to preserve and develop their grasslands. In this process biological production will increase and so will financial returns. In which case, improved profits will be the incentive to continue with and further develop improved veld management techniques. Nevertheless, participants will be acknowledged for their positive participation by way of certification of their operations (rather than certification of their products).

In the implementation strategy three regions have been identified to develop pilot projects. These are:

Harrismith
Farmers belonging to the Eeram Farmers' Association in the Harrismith district of the Free State, who are primarily beef and sheep producers. In addition a target of 30% of the participants will be emerging commercial farmers in the same district. The Blokhuis Feedlot and abattoir (part of the Midland Group) will represent the off-farm value chain components.

Vryheid
Farmers in the Vryheid district of KwaZulu Natal, who are primarily beef and sheep producers supplying Vryheid Meat Masters (who represent the off-farm components of the value chain). In addition a target of 30% of the participants will be emerging commercial farmers in the area.

Colenso
Game farmers in the Ladysmith-Colenso district of KZN. This project will be focused on the existing game production and marketing initiative of Mr.G Horner, but the expansion of the pilot project will assess the feasibility of developing a co-operative game abattoir that will service the slaughter and venison processing requirements of a range of game producers in the grassland areas of KZN and the eastern Free State.

The participants in these pilot projects will be serviced by a private specialist consultant and local extension officers who will combine on-farm visits with study groups. The primary objective will be to assist in developing management plans covering all aspects of the relevant production processes leading to improved veld management, livestock productivity and farm profits.

The SANBI programme covers a period of five years. This first year will result in the initiation of the projects and will involve:

- Discussions with the Department of Agriculture, Extension officers involvement.
- Bringing participants on-board.
- Setting up study groups.
- Veld evaluation on farms.
- Presenting acknowledged standards for each sector of the red meat value chain.
- Establishing present standards in use by producers.
- Developing management plans on farm (20 point Manuals).
- Hold study group meetings.
- Organize farm visits.

COMMENTS
- Participation in the pilot projects by producers is voluntary and a memorandum of agreement will be provided to ensure that participants understand what is involved in the project.

- The successful implementation of the projects must be gauged through an audit programme of acknowledged standards. As there is voluntary participation the audit process must also be of a voluntary nature and ideally conducted by the participants themselves with the assistance of the consultant and extension service.

- A detailed implementation plan has been completed and will be available to participants when confirmed by the Agricultural Coordinator of the Grassland Programme, Mr. Tsumbedzo Madalhothe.

- Dr. Alastair Paterson will be the consultant responsible for the implementation of the project and will be working directly with the Extension service and reporting to Mr. Madalahothe.

Knowledge of seed ecology essential for *Seriphium plumosum* control

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Introduction

Seriphium plumosum, also known as slangbos, bankrupt bush, vaalbos or Khoi kooigoed in the Cape is a serious threat to the sustainable production of grasslands in the Eastern Cape, Free State, Mpumalanga, North-West and Gauteng provinces of South Africa. In the wild there are different forms, varying in colour, for instance the silver-grey form is usually found at higher altitudes and has slightly thicker stems. The name *Seriphium* is derived from seriph, a stroke or line of letters; *plumosum* means feathery (Badenhorst 2009).

Every shrub produces thousands of seeds annually, which can easily be distributed by wind over large distances to encroach areas which were previously free of *S. plumosum* (Snyman 2009a). There is lots of proof that after farmers have eradicated *S. plumosum*; it can reappear after 3 to 5 years. It is unknown whether the veld was contaminated again by seed being blown in and/or due to seed being present in the soil and optimally germinating under favourable climatic conditions. Unfortunately, there is limited information on the actual viability and longevity of the seed and its establishment and germination over both the short- and long-term (Snyman and Le Roux 2009). This aspect was thoroughly investigated as a precaution against further *S. plumosum* encroachment. The effect of different control measures on further seed germination will also be discussed.

Why explosion of *Seriphium plumosum* over past decade or two?

- There is a belief that *S. plumosum* has formed part of the fynbos vegetation component on the high mountains for years, and only later established lower down the mountains, due to the distribution of the light seed by wind (Snyman 2009a). Over the past four decades, its distribution down the slopes and valleys drastically increased. Though the actual reasons for this enormous encroachment explosion of *Seriphium plumosum* in the grassland areas of South Africa, specifically over the last decade or two is in doubt; there are a few reasons on that:

- Marginal soils which were withdrawn from cash crop cultivation in the eighties were the first to be encroached by *S. plumosum* plants. These soils with a low organic matter content, where cultivated pastures were sometimes not immediately established, formed a favourable habitat for *S. plumosum* encroachment (Snyman and le Roux 2009). The resulting areas of dense S. plumosum stands occurring on old fields, contributed to the rapid encroachment presently taking place.

- There is an opinion that sheep utilise the young *S. plumosum* plants, and also its seed tops, which possible control its distribution in the past. Unfortunately, with the conversion of sheep – into cattle farming, due to the predator problem and theft, this trend takes place to a lesser extent which could lead to the rapid encroachment of *S. plumosum.* The general view is that *S. plumosum* is utilised effectively only by Eland. On the other hand, Dorper and Merino sheep farmers believe that their sheep definitely utilise it, especially at young and flowering stages. This allegation of *S. plumosum* utilisation by sheep has not been tested for all breeds and is questioned by some farmers.

- Not the direct climate change on vegetation as such, but the increased atmospheric CO_2 concentration that benefits woody plants (Seydack *et al.* 2002), could also be a factor influencing *S. plumosum's* increase. It is especially over the last two decades that there are marked changes in the different floristic components of savanna ecosystems. Increases in atmospheric CO_2 increased carbon uptake in C_3 plants (Polley *et al.* 1992) and in resent times may have favoured C_3 woody plants at the cost of C_4 grasses.

- Unplanned/runaway veld fires which have increased over the past few years in grasslands, possibly also stimulate seed germination leading to the explosion of *S. plumosum* over the last decade or two. There is enough evidence from farmers of an explosion of *S. plumosum* seedlings after an accidental fire.

- The climatic conditions within a season or in two successive seasons may possibly be significantly favourable for optimal seed germination for an area leading to the *S. plumosum* encroachment explosion.

Likewise, there may be many more reasons for the serious *S. plumosum* problem we are struggling with. To summarise the matter, something drastic must be implemented on a large scale with control measures not only implemented on a few farms. The government has a large financial supporting role in the control of *S. plumosum* before it may be too late and more productive grassland is encroached.

Time of flowering and distribution

The flowerheads of a *S. plumosum* shrub are grouped in small clusters towards the ends of the main shoots, forming a spike-life inflorescence. Pale brown bracts surround the purple disc florets and give the spikes a golden appearance (Badenhorst 2009). Under normal climatic conditions, flowering takes place during March to May and to a lesser extent in September (Snyman 2009b). Ripened seed can cling to the shrubs for as long as 5-6 months, before falling down (Snyman and le Roux 2009). This trend lengthens the distribution period of the seed. Every shrub produces thousands of seed, sometimes forming a yellow carpet under the bushes, awaiting favourable climatic conditions for germination or distribution. Usually a seedling already forms seed in the same year of its germination (Snyman 2009a). In contrast to cash-crop cultivation, the seed production of *S. plumosum* is mostly successful almost every year, strengthening its encroachment in valuable grassland areas. *Seriphium plumosum* is dependent on wind pollination causing the trend of forming dense stands in time, as clearly observed in the veld (van Wyk 2004). There is speculation on whether the common name slangbos is derived from the resemblance of the flower head to a snake rearing its head or from unsuspecting individuals finding a cobra curled up underneath a shrub (Wijnands 1983).

The general occurrence of *S. plumosum* is initially limited to the southern slopes of hills from where it spreads further downwards to the lower-lying areas. It is seldom found in wetter areas (vlei), due to water-logged conditions and high soil fertility (organic matter) reigning there, being an unfavourable habitat for *S. plumosum* (Snyman 2009a). It is noteworthy that *Eragrostis plana* is found mostly in wetter areas, while *S. plumosum* avoids those wet habitats. Fields withdrawn from cash-crop cultivation is also a very favourable habitat for *S. plumosum* encroachment due to the low soil fertility (organic matter) found there (Snyman 2009a). On these marginal soils, S. plumosum-encroachment is also associated with the simultaneous encroachment of *Hyparrhenia hirta.* This grass species became a major encroacher over the previous few years, causing some farmers huge utilisation problems. Unfortunately this problem has not yet resolved. The right management can possibly control the grass by severe grazing and then resting for long periods. In this way the grass growing very tall is shortened such that it is less competitive with other grasses.

Time of seed germination

The seed production of the previous year (March to May), germinates simultaneously with the time of flowering, naturally depending on the reliability of the environmental conditions (especially rainfall). Germination takes place at this time of most reliable rainfall and decrease in temperatures, as the young seedlings are very susceptible to droughts (Snyman 2009c). The cooler times of the year are preferred for

optimal germination. Germination also takes place in the spring, but to a lesser extent, while the chances for survival of the seedling during this time is also slight, due to limited and variable soil moisture conditions (Snyman 2009c). The seedling, with the visual appearance of a small cross, when viewed from above, can die within a few hours if the soil dries out. It can be concluded that millions of seeds do germinate, but only a limited number survive to reach maturity (Snyman 2009d). If *S. plumosum* seeds were not susceptible to unfavourable environmental conditions, the encroachment problem would have been much worse. In the past, it was alleged that a huge explosion of seed germination and seedling establishment took place in the open spaces left by the chopping out of mature plants. Fortunately, this statement is untrue, as *S. plumosum* seed germination is inhibited by direct sunlight and variable ground-water conditions. (Cohen 1935, Lacatsas 1962). Seedlings only establish and survive underneath the leaves of grass tufts and not in open spaces. The allelopathic characteristic of a *S. plumosum* plant is lifted in time with the removal of mature plants which can lead to the germination of seeds and seedlings can develop close to the open space where the mother plant was standing previously, but not in the open space itself (Dakshini *et al.* 1999). The *S. plumosum* seed has a post-ripening period of about a year before optimal germination will take place. The cold winter period is therefore mostly responsible for the lifting of the rest- or post-ripening period (Snyman 2009c).

An average of 34 seedlings m^{-2} were found to emerge between the shrubs in the veld during March/April in a *S. plumosum* stand of 1 420 shrub ha^{-1}, which fortunately not all survived (Snyman 2009c). Underneath the shrubs, no seedlings were found and seed only germinate about 300 mm from the mother plant (Snyman 2008).

S. plumosum seedlings only occur underneath the leaves of grasses, especially those of *Cymbopogon pospischilii* and *Elionurus muticus.* These two unpalatable grass species are poorly utilized by animals over the season and therefore form a favourable habitat protecting the seed from direct sun radiation and variable soil-water conditions. Seedlings are seldom found in the open spaces between grass tufts, again emphasizing that *S. plumosum* encroachment does not necessarily accompany overgrazing where there is a sparse cover (Hattingh 1953, Roux 1969)

Allelopathy and germination

The allelopathic characteristic of the *S. plumosum* plant prevents seed from germinating or seedling development from taking place close to the parent plant (Snyman 2008). This phenomenon is due to toxic substances from the leaves of the shrub and accumulating during the drier winter period to be washed off during the summer rainfall period into the soil. The closest seedlings were found about 300 mm or 460 mm from the stem of the parent plant. This ensures the even distribution of *S. plumosum* plants over the area in time and not only establishing around the mother plants. It also ensures that the limited soil-water available is utilised by the right plant density. This allelopathic characteristic in the soil takes about 12 – 16 weeks to be lifted (Snyman 2008). Both green plants and dead plants have this characteristic, with the latter to a lesser extent (Snyman 2008). Wind-pollinated plants, of which slangbos is a good example, usually have this allelopathic characteristic (van Wyk 2004).

Germination potential

S. plumosum seeds can survive in the soil for a number of years and remain viable. For example, three-year-old seed still has a germination of 65% (Snyman and le Roux 2009). *S. plumosum* infected area always has a seed bank in the soil just waiting for favourable environmental conditions for germination.

In a trial where seeds were gathered underneath the shrubs to determine the germination potential of *S. plumosum*, it was found to have a delayed germination and only germinated 5 to 6 weeks after being watered (Snyman 2009b). One would expect a very fast germination from a seed as small as this one. In reality, the smaller a seed, the less reserves available to enable the seedling to germinate and therefore the seed must germinate rapidly to enable the seedling to survive under variable climatic conditions. Fortunately, the opposite is found in *S. plumosum* which can possible lead to a lower survival of seedlings.

This delayed germination can possibly be ascribed to the allelopathic influence which must first be lifted before optimal germination will take place (Snyman 2008). Seeds collected form the shrubs had a fast germination rate (Snyman 2009b). It must also be considered that the seed has a post-ripening period of about a year for optimal germination (Snyman 2009c). In a germination trial in the greenhouse under controlled conditions, as many as 147 *S. plumosum* seeds shrub^{-1} or 588 *S. plumosum* seeds m^{-2} germinated in the seed bank, after 5 to 6 weeks of being watered (Snyman 2009b).

Interestingly, about 4 months after being watered, seeds from the seedbank germinated. Though this second germination produced less seedlings (100 seedlings shrub^{-1} or 440 seedlings m^{-2}), which further contributes hugely to the encroachment of *S. plumosum* (Snyman 2009b). The reasons for this second wave of seedlings germinating later can be ascribed to the allelopathic potential of *S. plumosum* in the soil which first has to be lifted. The toxic substance released by the plant into the soil, which prevents seed from germinating, is only lifted after 14 to 16 weeks in the soil. It is still unclear whether the lifting of the allelopathic impact on the soil is a result of leaching from the soil or a time factor.

Seeds can cling to the plant for as long as 5 to 6 months after flowering. This characteristic causes the seed to be easily spread by wind over far distances. It also significantly lengthens the period for possible distribution. It is not always realized that areas where no *S. plumosum* was found previously, can easily be infected by this effective distribution adaptation of the bush. The prevention of further *S. plumosum* encroachment therefore requires a team effort, as the problem can snowball if all the neighbours do not cooperate with its control. The seeds can also be easily distributed by animals by clinging to their bodies.

Control measures

In the past a lot has been written and speculated on the control of the mature *S. plumosum* plants (Richter 2002), while less attention was afforded to the soil seed bank. The potential of the contribution of the mass of seed accumulating in the soil and annually supplemented, to the long-term *S. plumosum* problem must not be ignored in the effective control of *S. plumosum.* There are various measures, some more successful than others, to control the large bushes of *S. plumosum* (Richter 2002).

Control measures must already have been applied at the time of flowering of the *S. plumosum* shrubs in March/April, to prevent further seed formation and distribution taking place from the dead shrubs. The influence, whether positive or negative, of the different control measures of *S. plumosum* on seed germination or seedling establishment are as follows:

Mechanical control (chopping)

Regardless of this method being laboured intensive, it indirectly stimulates seed germination by spreading some of the seeds in the process of chopping.. It has been proven that an explosion in seed germination will not necessarily take place in the open spaces left by the chopping process, because of the light-sensitivity of the seed for optimal germination (Snyman and le Roux 2009). The allelopathic characteristic is lifted and seed will germinate some distance from the open space left by the chopped shrub and can even lead to a seedling explosion. It must be considered that the stem of the shrub must be chopped below the soil surface; else it will sprout again (Snyman 2009a).

Fire

As the mature *S. plumosum* shrubs do not burn to death, they usually sprout at a rapid rate and also produce seeds that same year, supplementing the seed source to a huge extent (Snyman 2009d). Fortunately young plants are very susceptible to burning and do not sprout again after a fire. It would be expected that the very hot fire caused by the volatile oils of *S. plumosum,* would destroy all the seed in the soil. Research has shown the opposite and burning actually stimulates seed germination of *S. plumosum.* In a *S. plumosum* stand of 2 500 plants ha^{-1} , 510 seedlings m-2 germinated after an August fire the following season (March/April) versus an adjacent area which did not burn with only 35 seedlings m^{-2}. Unfortunately a possible burning follow-up programme is still only an idea and has not yet withstood the test of time for *S. plumosum* control. Such

a follow-up burning programme may be successful by killing the young seedlings.

Chemical control

Regardless of whether the shrub is green or dead, it possesses an allelopathic characteristic (Snyman 2008). This causes the dead bushes following chemical control, to be beneficial in inhibiting seedling establishment around them. Unfortunately this characteristic is lifted after a period (14 to 16 weeks) and numerous seedlings may then appear. Fortunately many of the chemical agents have a residual effect which will prevent seedling establishment around the shrub for some time (Richter 2002). Due to the longevity of the *S. plumosum* seeds, they may still germinate after a few years when the chemical agent has lost its effectiveness.

Conclusion

Clearly all of the measures discussed above need a follow-up planning; else the *S. plumosum* problem may only intensify. The after-care treatment, therefore, largely applies to the control of seedling establishment. *Seriphium plumosum* has as many names as ways in which it is adapted to encroach in grassland. Not only knowledge is necessary for its control, but also wisdom. "Work is not primarily a thing one does to live, but the thing one lives to do. It is, or should be, the full expression of the worker's faculties, the thing in which he/she finds spiritual, mental and bodily satisfaction, and the medium in which he offers himself to God." Dorothy Savers.

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Can we use the ordered-distance method to estimate basal cover in tufted grasslands?

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Introduction

Basal cover in tufted grasslands is of interest to ecologists as it is often less variable through seasons than aerial cover. Basal cover can influence water runoff and soil loss, and within a vegetation type can provide an index of the productivity of a rangeland.

Many attempts to estimate basal cover have been attempted, including point-quadrat using devices such as a wheel-point, visual estimation, line-intercept and quadrat-based methods. Mentis (1982) condemned the widespread use of basal cover as a parameter estimated in the field, due to the many flaws in the various techniques proposed for its estimation.

Hardy and Tainton (1993) published an empirically-derived equation to estimate basal cover from repeated measurements of the distance from a point to the nearest tuft and the diameter of the tuft, in order to address some of Mentis' concerns. However, like any empirical relationship, their method is limited to a relatively narrow range of environments.

Plotless methods for estimating plant density have existed since the 19th Century (Bonham 1989, Krebs 1999). Plotless methods usually work on some variation of the distance from random points to a plant, or the distance from a randomly-selected plant to a neighbouring plant. The density of individuals is then related to the inverse of the mean distance of repeated measures.

Although they were originally developed for surveying forest communities, some workers have tested plotless techniques in grasslands (Dix 1961, Risser and Zedler 1968), with mixed results. In both the cases referenced, the authors measured the distance from random points to the nearest grass stem, using the point-centred quarter method.

Theoretically, an estimation of tuft density in grasslands, combined with an estimate of basal area of tufts, should give a reasonable estimation of basal cover. In other words, the number of tufts per square metre, multiplied by the mean basal area of tufts, would give the basal area in cm^2 per m^2, or percentage basal cover.

Krebs (1999) and Bonham (1989) covered the theoretical foundation of plotless methods of vegetation sampling and their practical advantages and shortcomings. One major practical advantage of plotless methods of survey is speed. A major shortcoming of many plotless methods is bias – the theoretical foundation of the methods assumes a random or near-random distribution pattern of individual plants, which rarely occurs in nature. In addition, plotless methods are poor at determining species composition of species-rich communities, unless a very large number of points are measured. Only one or two dominant species are likely to provide reliable density data.

In this paper, we attempted to use a plotless method, the ordered-distance method, to determine the basal cover of a tufted grassland. The analysis was based on 15 years of monitoring at Kokstad Research station.

In our case, we defined an individual plant as a grass tuft rather than a stem. This is an important difference between this paper and the work of Dix (1961) and Risser and Zedler (1968).

Methods
Two long-term trials were established at Kokstad research station in 1994 and 1996. Biennial vegetation surveys were conducted on each trial. On each treatment of each trial, 200 points were surveyed using the step-point method, where at each point, the nearest grass plant was identified, and the distance from the point to the edge of the tuft and the diameter of the tuft were measured in centimetres. The minimum value recorded was 1cm. Surveys were conducted by criss-crossing the entire paddock (ranging in size from 0.5ha to 2ha).

Density
The ordered-distance method (Bonham 1989, Krebs 1999) was used to calculate the total density of tufts for each survey. The ordered-distance method assumes that the bias in estimating density decreases by increasing the order of the nearest plant to the point; in other words, by measuring the distance to the second-nearest, third-nearest or fourth-nearest plant rather than the nearest plant. The formula for density is given by

Equation 1

$$D = \frac{an-1}{\pi \sum (d_i^2)}$$

Where
D = Density
a = order of plants measured to each point (ath-nearest plant). In this study, a = 1, as we measured only the nearest plant to each point
n = Number of points measured
π = 3.14159
d_i = distance from each point to the centre of each tuft.

The distance value d_i was calculated by

Equation 2

$$d_i = Dist + r$$

Where
Dist = Distance from the point to the edge of the nearest tuft and
r = radius of the tuft

The variance of this density estimate is given by

Equation 3

$$Variance(D) = \frac{D^2}{an - 2}$$

Since the measurements were in cm, the density of plants per square metre *Dm* was determined by

Equation 4

$$D_m = D \times 10000$$

Basal cover
The basal area of each tuft was calculated assuming a circular tuft shape, by $A = \pi r^2$
where *A* is the area in square centimetres of each tuft.

Percentage basal cover is

Equation 5

$$BC = \overline{A} \times D \times 100$$

Where
BC = Percentage basal cover
$\bar{A}$ = Mean basal area in cm2
D = Density from Equation 1

Species composition
Density of individual species cannot be obtained by using the procedures outlined above, unless at every point every species has been separately identified and measured. Use of the above procedures to determine density and cover of individual species will lead to seriously biased results, as the assumptions of the plotless method will be violated. In order to determine the density of *Themeda triandra,* for example, at every point the nearest (or ath-nearest) *Themeda triandra* plant would have to be recorded. The same would hold for all other species of interest.

The species composition would be determined by the relative abundance of each species. The relative abundance could then be multiplied by the density D_m to give an estimate of the density D_S of species *S*. Likewise, the density D_S could be multiplied by the basal cover to give an estimate of the cover of species S. Note that only the dominant one or two species would give relatively reliable density and cover values.

Results

The range of basal cover estimated by the ordered-distance method was far greater than the range of basal cover of the same treatments estimated by the Hardy and Tainton method (Figure 1). Although the two methods were strongly correlated (not surprisingly, since both techniques relied on the same raw data), the ordered-distance method appeared to greatly overestimate the basal cover relative to the Hardy and Tainton method. Basal cover as estimated by the Hardy and Tainton method ranged from 13% to 21%, while the ordered-distance method estimated basal cover as ranging from 13% to 47% - more than double the maximum value of the Hardy and Tainton method.

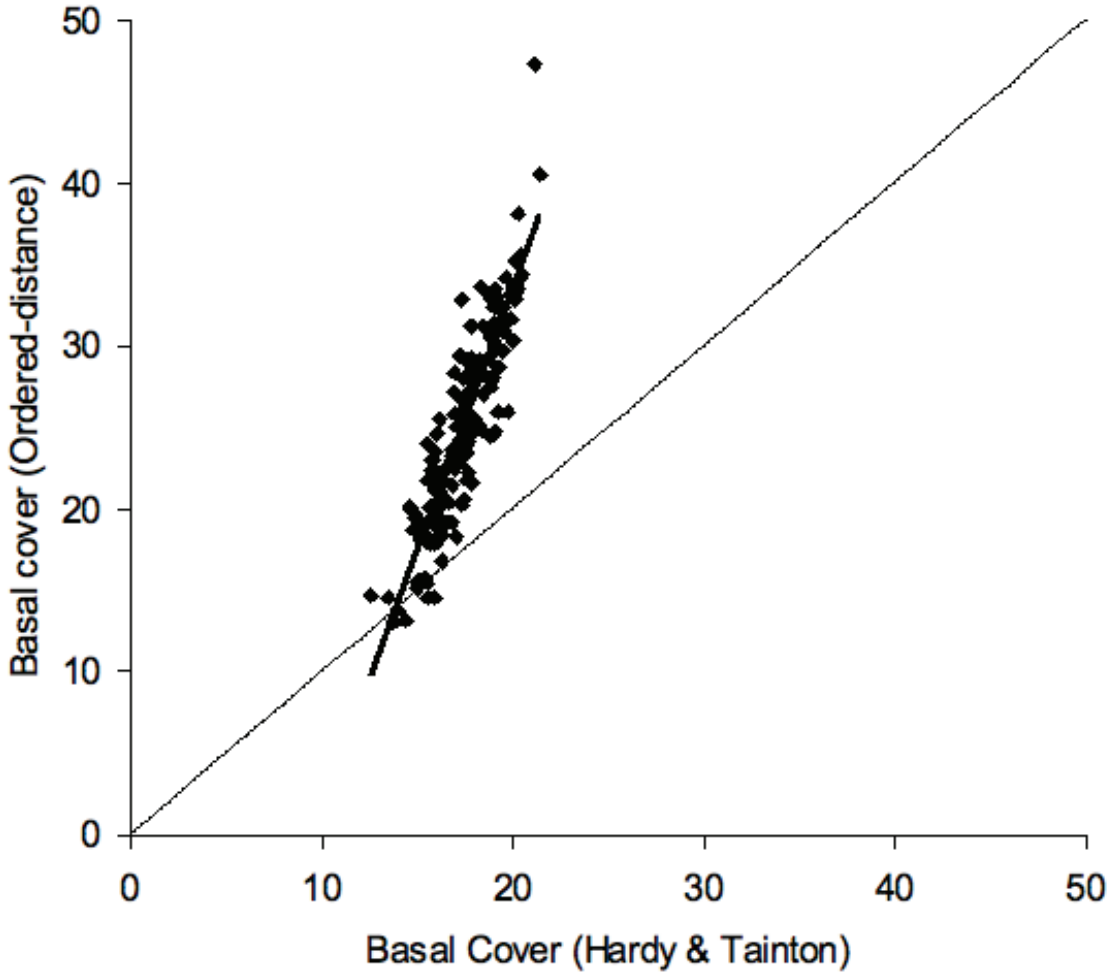

Figure 1: The relationship between basal cover estimated by two methods: Hardy and Tainton (1993) and by a modification of the ordered-distance method. The dashed line shows the slope of a 1:1 relationship between the two techniques. Each point represents one survey conducted on a long-term trial.

Discussion

Plotless methods of measuring plant density are based on geometric relationships between plant spacing and plant density. An estimate of density obtained by measuring from a point to the nearest individual can be improved by measuring to the second- or third nearest individual , but in practice South African rangeland operators have been trained to measure to the nearest individual (Krebs 1999) to a point for decades.

Although a number of historical and current monitoring and evaluation projects have used Trollope's method of including a point-to-tuft distance in a standard step-point survey, these data cannot be used to calculate tuft density and basal cover as described in this paper. Measuring to the edge of the tuft rather than the centre of the tuft appears to seriously bias the density estimates. The point-to-tuft distance cannot give a reliable estimate of tiller density, since tillers are clumped together in tufts. In addition, without a tuft diameter the basal cover cannot be estimated as the basal area of the plants cannot be calculated.

Avoiding bias and recording rarer plants of interest

The densities of relatively rare classes of plants (such as specific forbs) are poorly represented in a plotless survey method. One possible way of overcoming this bias is to divide all plants into several growth forms or classes, and at each point, record an individual of each class. For example, grasses could be divided into small and large tufts (e.g. smaller and larger than 5cm diameter), with additional classes for annuals and forbs, and shrubs. If a particular species or genus is of interest, such as the poisonous *Senecio,* a separate class could be created. The sum of the densities of each class would give the plant density of the site.

Bear in mind that each class requires a separate measurement at each point, so that four classes would quadruple the number of individual measurements required in a survey relative to only one class.

Conclusion

Although strongly correlated with the Hardy and Tainton technique, the ordered-distance method appears to overestimate basal cover. However, the procedure described above requires detailed testing against precise measures of basal cover using a quadrat-based technique in order to determine the bias inherent in the method, and operator effects. The geometric nature of the underlying theory makes the use of the ordered-distance method theoretically more widely applicable than the empirically derived equation of Hardy and Tainton (1993) for estimating basal cover from the same measurements.

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Seed testing - The Chaffy Grasses

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The germination rate is crucial to the success of establishing forage crops. The purpose of seed testing was to minimise the risk of poor seedling emergence by assessing the quality of seed before it is sown. Seed testing requires a high degree of accuracy and reproducibility, and it is important that standardised methods designed to produce the same results universally (within an acceptable range) are applied. In South Africa, seed quality is ensured through routine seed testing conducted at seed testing laboratories registered in terms of the Plant Improvement Act (PIA), Act No. 53 of 1976, in accordance with the rules as specified by the International Seed Testing Association (ISTA).

Certain seed kinds are more difficult to test than others. Some of the tropical and sub-tropical grasses fall within this group. The so called "super chaffy grasses" which include Rhodes Grass *(Chloris gayana Kunth)*, Smuts Finger Grass *(Digitaria eriantha Steud.)* and White Buffalo Grass *(Panicum maximum Jacq.)* have long been problematic with regard to the application of seed testing methods, e.g. the detection of a "seed" *(caryopsis)* in the "flower parts" *(spikelet or floret)* is problematic in the physical purity analysis. Determining the germination capacity is in turn also challenging as empty, sterile, immature and dormant units can be present.

In recent years, ISTA has amended the definition of "pure seed" in order to simplify the seed testing procedure and to achieve more consistent results between different seed analysis laboratories. Seed purity is expressed as a percentage by weight once the composition of the sample is determined. This analysis also identifies the various species of seed and the inert material making up the sample. The purity requirement (the maximum percentage of inert matter any sample may contain) has now been adjusted as "empty units" are no longer regarded as inert matter and included in the pure seed component. The amendment in the purity analysis has also had an effect in the way in which germination capacity is expressed. All units are planted, irrespective of the presence of a "seed". Rhodes grass has been tested in this manner for many years already, so the changes in the purity requirement as well as the germination capacity affect only Smuts Finger Grass and White Buffalo Grass.

The following table draws a comparison between the current, amended requirements outlined in the Plant Improvement Act and the previous standards:

	Maximum content (%)		Minimum % (Germination)	
Grass species	New standard	Previous standard	New standard	Previous standard
Digitaria eriantha	8.0	50	15	40
Panicum maximum	2.5	50	10	20

The minimum quality required before seed may be sold to South African farmers is essentially the same as the new amended standards which are based on seed lots that were tested by both the new as well as the previous methods. Farmers are advised to purchase seed from registered seed companies to ensure that it has been tested by a licensed laboratory.

The Economic viability of finishing Nguni Weaners on Natural Veld and planted pastures

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Introduction

Nguni cattle is an indigenous breed that is adapted to harsh conditions and plays an important role in animal agriculture in developing areas of Southern Africa (Collins-Lusweti 2000, Mapiye *et al.* 2007). The recent recognition of its adaptive traits has led to increased efforts to use Nguni cattle in the commercial sector. Currently one of the biggest constraints in farming with indigenous cattle such as the Nguni, is the lack of market demand from feedlots for small frame weaned calves (weaners). This often results in farmers obtaining below market value for these calves. To overcome this trend, the farmer could decide to grow out Nguni weaner calves from a mass of about 150 kg at weaning (6-8 months of age) to about 280 - 300 kg at approximately 12-15 months of age. A study was conducted to investigate the economic viability of finishing Nguni weaners on natural veld versus planted pastures under dry land conditions.

Material and methods

This study was conducted in 2002 at the Bathurst Research Station in the Eastern Cape Province of South Africa. A group of 30 Nguni bull calves that is 15/group (7-9 months age) were randomly subjected to the following treatments: a group on Eastern Province Thornveld (Acocks, 1975) (natural veld) and a group on Panicum maximum pastures (planted pasture). The cattle in both treatments were weighed fortnightly. The purchase price of the weaners was R 7.30/kg live mass and the selling price at the end of the trial was R 6.30/kg live mass. Calves were dosed against internal parasites as soon as internal faecal egg counts exceeded 1000 eggs/gm faeces. The stocking rate of the veld and pastures were 5 ha/LSU and 1 ha/LSU respectively. An area of 45 ha veld and 9 ha planted pastures was allocated to the respective treatment groups. Protein and phosphorous licks were available ad libitum to both treatment groups. Panicum pastures were fertilized with 250 kg LAN/ha during March 2002 and September 2002. Average values for starting weight, ADG, final live weight and all direct allocated costs per treatment (feed, medicines, pasture costs, etc.) were used to calculate financial data. Product income was defined as the difference between the purchase price of the weaner and selling price of the same animal. The direct allocatable costs (DAC) were defined as the total of all the individual production costs that were incurred. Margin above DAC was calculated by using the following formula:

Margin above DAC = Product income – DAC.

Financial data were expressed per group, per animal and per ha. Comparisons between the two production systems were made in terms of margin above DAC per group, per animal and per ha.

Results and discussion

Cattle on planted pasture grew faster at 0.606 kg/day and reached their target mass of 324.3 kg after 230 days. Cattle on natural veld only managed to achieve their target mass of 301.6 kg after 272 days due to a lower ADG (Table 1).

Table 1 The effect of production system on animal performance

	Planted pasture	Natural veld
Initial weight (kg)	184.8 ± 18	183.7 ± 17
Final weight (kg)	324.3 ± 25	301.6 ± 27
Average daily gain (ADG) (kg/day)	0.606 ± 0.08	0.434 ± 0.08
Finishing period (days)	230	272

The product income per animal was R 758.91 and R 619.39 and the profit per ha was R 1264.85 and R 206.46 for the Pasture group and Veld group respectively. Although the highest margin above D.A.C. per animal was realised by the Veld group, the Pasture group (R 536.40/ha) were more economical in terms of margin above D.A.C/ha when compared to the Veld group (R 189.47).

Table 2 Economical analysis of finishing weaned Nguni calves on natural veld and planted pastures

	Planted pasture			Natural veld		
	Per group (n=15)	Per animal	Per ha (9 ha)	Per group (n=15)	Per animal	Per ha (45 ha)
Gross income						
Product income (R)	11383.65	758.91	1264.85	9290.85	619.39	206.46
Direct allocatable costs (D.A.C.)						
Feed cost (R)	492.30	32.82	54.70	439.15	29.28	9.76
Medicinal cost (R)	322.40	21.49	35.82	325.70	21.71	7.24
Pasture cost (R)	5741.36	382.76	637.93	-	-	-
Total cost (R)	6556.06	437.07	728.45	764.85	50.99	17.00
Margin above D.A.C	**4827.59**	**321.84**	**536.40**	**8526.00**	**568.40**	**189.47**

Cattle raised on planted pasture grew faster than those raised on natural veld. The higher input cost to maintain the Panicum maximum pastures was the main contributing factor affecting the total margin above direct allocatable on planted pasture treatment. Cattle raised on natural veld achieved R 246.56 higher profit margins per animal than cattle raised on planted pastures. But when production per hectare is calculated, the highest returns per ha was achieved from animals raised on planted pastures. It is therefore, economically viable to finish weaned Nguni calves on Panicum pastures than on natural veld.

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