



grass roots

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Newsletter of the Grassland Society of Southern Africa

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restoration of degraded rangelands

The evaluation of a number of technologies for the restoration of degraded rangelands in selected arid and semi-arid regions of South Africa.

by

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JULY 2003 in this issue:

- 1: *The evaluation of a number of technologies for the restoration of degraded rangelands in selected arid and semi-arid regions of South Africa.*
- 3: *Administration Issues*
- 4: *REGIONAL NEWS*
- 5: *Silage for Dairy*
- 5: *Dairy Feeding Strategies to Maximise Profits*
- 6: *Abstract of MSC Thesis*
- 7: *GSSA Annual General Meeting Preliminary Agenda*

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Please contact me if you have any suggestions or queries regarding your membership details, subscription fees, the journal, the newsletter, etc..

Evidence of degradation in South Africa's arid and semi-arid rangelands is clearly visible and is characterized by changes in the ratio between palatable and unpalatable species. The loss of herbaceous cover will result in factors such as increased soil erosion, formation of soil crusts, and loss of favourable microsites necessary for germination and establishment of seedlings. Degradation can mainly be ascribed to environmental (especially low and erratic rainfall) and anthropogenic factors such as: poor management practices, mining, industry as well as deforestation.

Combating the degradation process in South Africa has recently become a priority in large parts of the country. An understanding of the vegetation changes that are taking place in the arid and semi-arid grasslands is of fundamental importance for devising sound management and conservation strategies. Depending on the degree of degradation, it is well known that these severely degraded areas cannot recover only by means of natural succession processes, but that active intervention in the form of restoration technologies have to be applied. The type of restoration practice will depend on the degree of degradation. This study has followed a theme of restoration ecology, the science behind ecological restoration and repair of disturbed ecosystems.

Combinations of different restoration technologies were applied in eight degraded study sites throughout South Africa. These eight study sites were chosen to represent the Savanna as well as the Nama Karoo Biome in the

Northern, Northern Cape, Western Cape and Eastern Cape Provinces. The technologies included cultivation treatments, over-sowing with selected species, brushpacking as well as the addition of organic material.

Quantitative vegetation sampling procedures, which included frequency, density and biomass measurements, were undertaken over a period of two years within a three year period (1999 - 2002), to describe the establishment and dynamics of the sown-in species. Density data was subdivided into the number of seedlings, vegetative and reproductive growth stages of each species in order to evaluate the sustainability of the sown-in species over the long-term. Data analysis included the analysis of variance (GenStat), multivariate analysis (Principle Component Analysis) as well as general analysis, such as graphs and tables done with the Windows Excel Program.

The over-sown species used in the restoration trials were tested in the laboratory, using methods prescribed by The International Seed Testing Association (ISTA). The purity and germination capacity for all the species used in the over-sowing treatments was determined. Laboratory germination rates were compared with results obtained for germination and establishment rates of species in the field trials.

The composition of the soil seed bank was determined as an indication of the species present in the soil in the degraded areas prior to the application of restoration technologies.

All of the sown-in species have established in the restoration trials, with the exception of species such as *Pteronia membranacea* and *Eriosephalus ericoides*. The climatic and soil conditions at the different study sites determined to what extent different species established in each study site. From the results of the multivariate analysis, it is clear that in most cases the over-sown species were positively correlated with the treatments where over-sowing was applied, while local annual pioneer species such as *Enneapogon cenchroides* at the Vhembe study area, were mostly correlated with the control and cultivation only treatments. From the frequency, density as well as biomass surveys, it was clear that it is essential to apply a cultivation treatment to ensure the success of any restoration project. A combination of ripping, over-sowing, brushpacking and organic material showed the highest establishment of all sown-in species in most of the cases. In all the cases the species composition and thus the field condition of the study sites improved after restoration application during the course of the study.

The results of the purity analysis indicated that seed obtained from a registered seed merchant showed higher purity percentages than seed locally collected as seen from the purity results of the two different *Themeda triandra* ecotypes used at the Middelburg study site. The coated seed used in the over-sowing treatments showed a high purity percentage but a low germination capacity in the laboratory tests. In most cases there was a poor correlation

between the purity percentages and the germination capacity when seeds were tested in the laboratory. In some cases species established better in the field trials than in the laboratory tests, as is the case with *Cenchrus ciliaris* used in the trials at the Vhembe study area. The opposite was also true for species such as *Eriosephalus ericoides* and *Tripteris sinuata* used in the over-sowing trials at the Middelburg study site.

The soil seed bank has been identified as an important determinant of the floristic and structural changes in field succession. There was great variation in the results of the soil seed bank analysis from the different study sites. The results of the soil seed bank analysis showed that the average amount of plants germinating from the soil samples varied between 0 plant/m³ at the Hillmore study site to 303 plants/m³ at the Sekgopo study site. This can be attributed to the fact that the Hillmore study site was totally void of vegetation, while at the Sekgopo study site there was enough vegetation cover on the old cultivated land to provide a good soil seed bank. This indicates that the density of the emerging seedlings decreased with an increase in the degradation at the different study sites.

It is important to note that it is necessary to conduct germination tests as well as soil seed bank analysis prior to any field restoration trials. The conduction of seed purity and germination capacity tests is of the utmost importance before any recommendations can be made regarding the species to be used in over-sowing treatments. The results from purity and germination capacity tests can shed some light on the poor or good establishment of the species in field trials. The soil seed bank results could be used to evaluate the necessity of over-sowing treatments or whether the soil seed bank is rich enough and that only a cultivation treatment is needed to stimulate the dormant seed.

A few shortcomings was identified for this study and should be taken into consideration in similar studies in the future:

- In the case of the Mier study site the over-sowing was done at the wrong time of year and this contributed to the poor results obtained at this study site.
- It is necessary to ensure better communication and participation between agriculturalists, local communities and researches.
- In one case no seed was kept after the restoration application and therefore no purity and germination capacity tests could be conducted in the laboratory.
- Methods for breaking the dormancy as well as germination requirements are not known for especially shrub species and this poses a big problem in ensuring good results from restoration trials.

Keywords: Degradation, restoration technologies, over-sowing, brushpacking, purity and germination capacity tests, soil seed bank analysis.

ADMINISTRATION ISSUES

Firstly, thank you for your fantastic response to my request for updated information.

Secondly, a few bits of housekeeping:

1. Please note the new contact details at the top of the front page of "Grassroots". Several postal and fax items arrived at Stuart Communications with the NEW details on their page headers!!
2. My computer hard drive did what computer hard drives are best at and died near the end of May. This was shortly after the fax machine went haywire! All in all, it was a frustrating time. However, both are now in an excellent state of repair, so please feel free to use these modes of communication again.
3. Unfortunately, all of my e-mails have been lost. So, if you sent me any e-mail between 22 and 25 May 2003, this is why I have not replied. I updated all database details from e-mails sent up to the end of 21 May 2003, so if you had a different query (for example, those outstanding fees, etc.), please bear with me and resend if I haven't contacted you. Thank you.

Thirdly,

"The matter of outstanding membership fees, and the payment thereof"

- Payment using credit cards can no longer be done. The previous Administrator had a machine for a little while, but no credit card payments have been possible since around April 2002.
- For several years, the GSSA collected membership fees using the debit order system. I have tried to have this system reinstated but it is not economically viable or practical. Sorry!
- I have tracked as many payments as possible, but have found that the majority of membership fees are outstanding. Please find enclosed with this newsletter a statement of your account as it stands at present. If you have paid outstanding invoices but this has not been reflected, I require proof of payment before I can update my system. This can be a deposit slip, a copy of the relevant section of your bank statement, etc. Otherwise please pay your fees as promptly as possible using the payment options below. Thank you.

Payment options:

1. Post a cheque made out to the "Grassland Society of Southern Africa" to:
PO Box 41, Hilton, Pietermaritzburg, 3245.
2. Deposit the money into the GSSA bank account electronically, as cash or as a cheque, using the following details:
Nedbank Cheque Account
Cascades Branch No 134325
Account No 1343011299
Then fax or post proof of payment to
(033) 390-3113 or PO Box 41, Hilton,
Pietermaritzburg, 3245.

And, lastly, do you know these people? The following list contains the names of GSSA members with whom we have lost contact or whose membership status is uncertain. If you can help, please e-mail (admin@gssa.co.za) or phone (083 256 7202).

Title	Initials	Surname
MS	F M	ARCHER
MR	N C	BADENHORST
MR	C J	BADENHORST
MR	S A	BARNARD
MR	J H	BRIERS
MR	A J	CATELLA
DR	M D C V	DE FIGUEIREDO
MR	E	DE LA REY
MR	R I	DE SOUSA CORREIA
DR	B	DE WINTER
	R A	DORRINGTON
MR	R H	DREWES
DR	L G	DU PISANI
MR	T J	DUGMORE
MR	L E	DZIBA
MR	J J	EKSTEEN
	A	ENGELBRECHT
	J L	FREEMAN
MR	D R	FULTON
MR	R J	GALLOW
MR	J R	GENIS
MR	C	GOWER
MR	P A	GUNTER
MR	D	HANNEKOM
MR	J R L	HARRIS
MR	P	HILDYARD
MR	M D	HOWARD
MR	J H	HUYSER
MS	M J	KLEYN
MR	O	KNESL
MS	H P	KONING
MR	W M	MARX
DR	V I	McCUSKER
MS	E E	MCKINNEY
DR	A	MOORE
MR	P G	MULDER
MR	D J	OLIVIER
	L B	PANSEGROUW
DR	P J J	PIENAAR
MR	J J	RALL
MR	E R	REED
MR	L	REYNEKE
	W E	RISTOW
MR	G T	ROOTMAN
MR	M J	SAN
MR	H	SCHNEIDER-WATERBERG
MR	C H	SCHOEMAN
	T G	SKINNER
MR	P J L	SMIT
MR	G O	SPEEDY
MR	J A	STONE
DR	G	STUART-HILL
DR	D R	TAPSON
MR	N C	THOMPSON
DR	F	VAN DER HEYDEN
MR	B	VAN GINKEL
MR	J L	VAN HEERDEN
DR	W L J	VAN RENSBURG
MS	E	VAN WYK
MR	A J	VILJOEN
MR	M	WALTERS
DR	V D	WASSERMANN
MR	J J	WATSON
MR	D	WIENERS

Regional News

Eastern Cape

African ecology short course

The University of Fort Hare has just offered the second African Ecology Short Course. The course was attended by 12 students from the University of Connecticut in the USA, and by a smaller number of South African students. For three weeks the students studied and worked together, principally on the Great Fish River Reserve, living in a restored 19th Century farmhouse. Subjects of study included veld monitoring and management in the Thicket Biome on the reserve, with visits to both communal rangelands and commercial farms as well. A variety of other practical experiences were possible, including participation in on-

going black rhino research. Lecturers from Fort Hare, Rhodes University and farther afield provided information on a variety of ecological and resource management topics and students were exposed to cultural aspects and environmental problems in communities adjacent to the reserve. Each student also completed a mini-project. These ranged from assessment of soils in bush clumps to necropsies of game animals.

The cooperation of both Eastern Cape Tourism Board and Eastern Cape Nature Conservation was an important element in achieving the goals of the course. After this second success, future courses are being planned to bring together overseas and South African students. For information on these contact Dr. P. Lent (plent@ufh.ac.za).

KwaZulu-Natal

Send news items to:
Richard Hurt, info@mvelo.co.za

Following on the success of the pasture tours held in 2001 (Eastern Cape & George) and 2002 (Mpumalanga), the GSSA together with SASAS and the Pasture Association are presenting a pasture tour of the KZN Midlands.

Date: 19 to 21 August 2003

We will be visiting eight farmers and trials at Cedara in the course of the three days.

Subjects covered will be different dairying systems off ryegrass pastures; dairying off perennial ryegrass; over-sowing of ryegrass into kikuyu; nitrogen fertilization of ryegrass; and silage production for high producing cows.

For details contact:

Erika van Zyl 082 321 3960, vanzyle@dunrs.kzntl.gov.za
Graham Peddie 083 691 6630, peddieg@dunrs.kzntl.gov.za

Awards:

Two GSSA Medals were awarded at the University of Natal, Pietermaritzburg. Caryn Rauff received her medal for "Best Performance for an Honours Research Project" and Nick Zambahs received his medal for "Best Performance for a Masters Research Project." Both were awarded their degrees cum laude.

North West

Send news items to:
Franci Jordaan, francij@potch1.agric.za

Awards



Annelie de Beer (vice-president, GSSA) hands over the GSSA trophy for the best third year student in Grassland Science to Christiaan deWitt at the awards function of the Potchefstroom Agricultural College.

Free State

Send news items to:
Ibe Oosthuizen, oosthib@sci.uovs.ac.za
No news this issue.

Limpopo

Send news items to:
Cornelius van der Waal, corwaal@mweb.co.a
No news this issue.

Gauteng

Send news items to:
Marika Trytsman, marike@veld.agric.za
No news this issue.

Mpumalanga Highveld

Send news items to:
Anneke Engelbrecht, anneke@laeveld1.agric.za
No news this issue.

Regional News contd . . .

Mpumalanga Lowveld & Eastern Limpopo

Send news items to:
Mike Peel, mike@frieden.agric.za
No news this issue.

Namibia

Send news items to:
Axel Rothauge, arothauge@unam.na
No news this issue.

Western Cape

Send news items to:
Annelene Swanepoel, annelenes@elsneburg.com

The GSSA congress moves to the Western Cape next year, and will be a combined congress with SASAS. Congress 39 will be held at Goudini Spa from 28 June to 1 July 2004. Please diarise these dates, and plan budgets accordingly. The organizing committee will be sending out the first notice and call for papers shortly.

Regional representatives have not been identified for: **Northern Cape, Mozambique, and Zimbabwe**. If anybody from these areas would be prepared to co-ordinate news from their region, please contact the editor – Graham Peddie, peddieg@dunrs.kzntl.gov.za

SILAGE FOR DAIRY

A Prestige Dairy Symposium hosted by the Grassland Society of Southern Africa, the Pasture Association and the KZN Branch of the SA Society for Animal Science.

23 July 2003
Cedara Auditorium

Chairperson: Charlie MacGillivray (Karkloof dairy farmer)

- 08h00 - 09h00: Registration, tea / coffee
- 09h00 - 09h45: Optimising production (Rene Stubbs, Karkloof dairy farmer)
- 09h45 - 10h30: Measure quantity, optimise quality (Gavin Brockett, fertiliser adviser)
- 10h30 - 11h00: Tea / coffee
- 11h00 - 11h45: Additives - do they make a difference? (Dr Robin Meeske, researcher, Western Cape Dept of Agriculture)
- 11h45 - 12h30: Why use a contractor? (Jeremy Grueneberg, KZN Midlands contractor)
- 12h30 - 13h15: Do the numbers add up? (Neil Whitehead, economist, KZN Dept of Agriculture)
- 13h15 - Discussion followed by exhibition of dairy equipment and lunch

DAIRY FEEDING STRATEGIES TO MAXIMISE PROFITS

A Prestige Dairy Symposium hosted by the Grassland Society of Southern Africa, the Pasture Association and the KZN Branch of the SA Society for Animal Science.

12 September 2003: Cedara Auditorium

- Chairperson: Dr Neil Miles (researcher, KZN Dept of Agriculture)
- 08h00 - 09h00: Registration, tea / coffee
- 09h00 - 09h30: Pastures (Prof. Kevin Kirkman, Dept of Grassland Science, University of Natal)
- 09h30 - 10h00: Silage (John Evans, dairy consultant)
- 10h00 - 10h30: TMR and concentrates (Trevor Dugmore, researcher, KZN Dept of Agriculture)
- 10h30 - 11h00: Tea / coffee
- 11h00 - 11h30: Economic strategies for feeding the dairy herd (Allan Penderis, economist and dairy consultant)
- 11h30 - 12h00: Discussion session
- 12h00 - 13h00: Annual General Meeting of the KZN Branch of the Milk Producers' Organisation
- 13h00 - Exhibition of dairy implements and equipment and lunch

Both events are being organised by MindMap Strategies, and full details and registration are available at mindmap.co.za or by contacting Rebecca on (031) 266-1344.

Abstract of MSc thesis

Title:

Comparative responses of fodder and grain teff (*Eragrostis tef* (zucc.) Trotter) cultivars to spatial, temporal and nutritional management

By Sigrun B Kassier

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Affiliation:

School of Agricultural Sciences and Agribusiness

Faculty of Science and Agriculture

University of Natal, PIETERMARITZBURG

January 2002

Teff has its origin in Ethiopia as grain crop, while in South Africa it is primarily a forage crop for hay and recently as summer grazing pasture. The response of teff herbage and grain production to planting date, growth stage at cutting, seeding rate and N fertilizer application was studied. Previously limited research data were available for teff production in South Africa.

Spring plantings (September to October) are required to maximise total herbage yield with 9.40, 8.48 and 7.64 t DM ha⁻¹ recorded for 1996/97, 1997/98 and 1998/99 respectively. Summer plantings (November to December) give maximum herbage yield from the first cut, yielding 4.42, 4.72 and 3.78 t DM ha⁻¹ for 1996/97, 1997/98 and 1998/99 respectively. The exact planting date is season dependent. Temperature and rainfall determine the beginning of the growth season regarding favourable conditions for teff germination and growth.

Herbage yield of cut 1 increases with advancement in growth stage at cutting. Cutting at the vegetative and piping stages gives most number of cuts, up to five yielding 7.45 t DM ha⁻¹ (1996) while the full flowering stage gives the

least (one or two cuts, 4.75 and 7.72 t DM ha⁻¹ in 1996 and 1997 respectively). Yield is also affected by environmental conditions influencing germination, biomass accumulation and regrowth after cutting and by lodging. A trade-off results between herbage quantity and quality. Yield increases while quality decreases with advancing phenological stage, resulting in reduced digestibility and CP and increased fibre content.

Seeding rate differences were manifested primarily in weed infestation level, which varied between cultivars depending on leafiness and associated sward density. Nitrogen application levels gave maximum response between 75 and 150 kg N ha⁻¹, with some cultivar differences. Split N application according to expected yield distribution related to planting date, is recommended.

Grain yield response to seeding rate and N fertilization levels could not be established. Heavy grain losses through thunderstorms and wet conditions at grain maturity precluded yield measurements.

Teff yield responses are influenced by daylength, environmental factors, such as temperature and rainfall, and phenological stage at cutting. These variables influence biomass accumulation and regrowth.

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Call for Nominations

The AGM of the GSSA will be held at the IRC in Durban at the end of July.

Nominations are required for several positions on the GSSA council:

Vice-president

Additional Members x2

Nominations must please be given to the secretary before the AGM. Nominations must be signed by the nominee, and the proposer and seconder, and must include a very brief CV and motivation.

Nominations are also called for deserving candidates for Honorary Membership. These do not need to be signed by the nominee, but must please have a good motivation and CV.

GSSA Annual General Meeting

Preliminary Agenda

28 July 2003 ICC Durban, Room 21 AG at 17h45

1. **Welcome**
2. **Present and apologies**
3. **Additions to and acceptance of the agenda**
4. **Approval of the minutes of 15 May 2002**
5. **Matters arising**
6. **Treasurer's report** TE
7. **Editor's reports**
 - 7.1 Scientific editor PS
 - 7.2 Bulletin editor: Grassroots GP
8. **Website Report** DH
9. **PRO report** JdT
10. **PAC report** RH
11. **Trust** KPK
12. **Election of office bearers**
 - Vice President
 - Additional members KK
13. **General**
 - 13.1 Congress 37 (2004) AS
 - 13.2 Regional representatives
14. **Presidential address (summary)** KK
15. **Date of next meeting**
16. **Closure**

GRASSLAND SCIENCE UNIVERSITY OF NATAL

The Discipline of Grassland Science provides the basis for an applied scientific training for careers in research and management of both natural and heavily modified systems with agriculture, wildlife conservation and industry (mining) as core areas. Career paths include agricultural science, conservation science, wildlife management, environmental management, agricultural extension, rural development, game farming, mine rehabilitation, revegetation, agribusiness, and education. Students of the discipline are exposed to a range of ecological systems, and upon graduation are well equipped for a wide array of challenging careers in South Africa and abroad.



Post-graduate focus areas include systems ecology, veld and pasture production ecology and social issues related to resource management.

For further details visit <http://www.grassland.nu.ac.za> or contact Prof Kevin Kirkman on 033-2605505