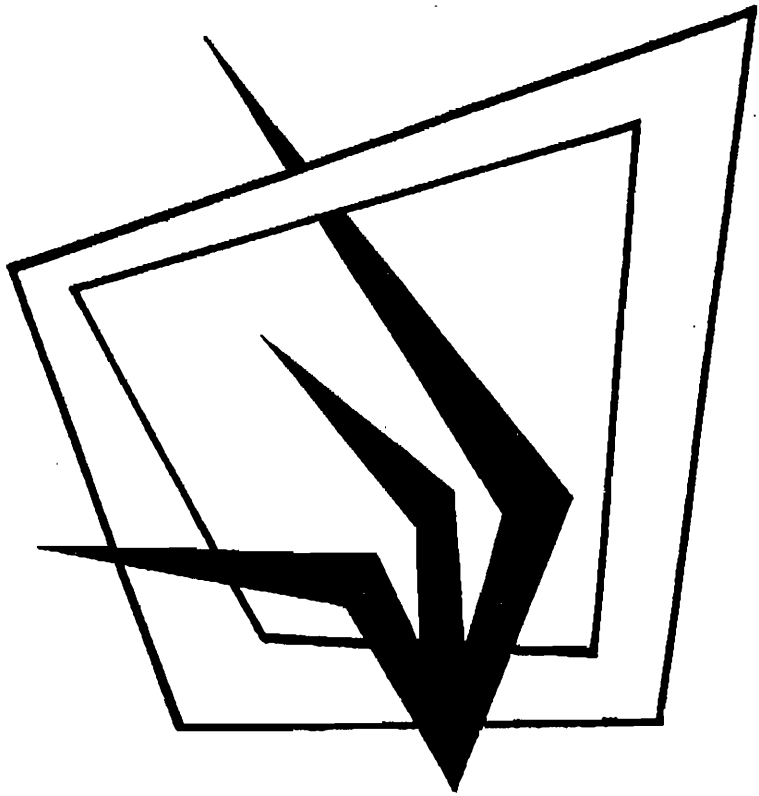
BULLETIN OF THE GRASSLAND SOCIETY OF SOUTHERN AFRICA



Volume 6 (1) March 1995

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BULLETIN OF THE

GRASSLAND SOCIETY OF SOUTHERN AFRICA

Volume 6 (1) **March 1995**

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EDITORIAL

The Grassland Society of Southern Africa is concerned about its relevance to the wider agricultural and ecological community of the sub-continent. This concern led to a thorough re-evaluation of the objectives and goals of the GSSA in 1992 (Bull. Grassld Soc. Sth. Afr. 3(2) & 5(1)); finally resulting in the formulation of a Strategic Plan to increase the effectiveness of the Society. One of the goals of this Strategy is to expand the focus of the Bulletin in order to promote the interests of the Society amongst other disciplines. Thus, the Bulletin should seek to highlight the benefits of an integrated and holistic approach to range (and land) management.

Increasingly, the multi-dimensional nature of range and forage science is being recognised. Natural resource management involves not only an understanding of the interaction between the resource and its use (e.g. the plant and the animal) but also an appreciation of the context of the management, *viz* the socio-economy. The manager is as much part of the system as the biological and abiotic components. Therefore, range science should encompass research toward understanding the environment that dictates the manager's actions (both economic and social) and the options available for management action. It is important for the GSSA to be in a position to offer clear and informed advice to guide policy makers in decisions concerning rangeland use.

In this issue of the Bulletin we examine the question of **tenure on rangelands**. We focus specifically on grazing land that is to be transferred to new owners through the Government's land redistribution programme. This redistribution is imminent: a Land Reform Pilot Programme has already been initiated. However, there is little guidance as to the most appropriate form of land ownership that should be instituted on redistributed grazing land to ensure its effective and sustained use.

Range Scientists and politicians have often decried "communal grazing" as the villain of rangeland degradation in Africa. Now an opportunity exists, through land redistribution, to change such practices (if indeed they should be changed) and to specify alternative and "better" forms of rangeland tenure. The articles presented in this Bulletin explore these various options as a step towards formulating a comprehensive strategy for rangeland tenure in South Africa.

A further way of increasing the impact of the GSSA in the sub-continent is to ensure that research undertaken by its members is reported in the most effective way. Scientific publications (i.e. in the Afr. J. Range For Sci.) play a role in such communication but have a limited and specialised audience. The Bulletin, with its wider and more general audience, is the forum for reporting results from research in an easily readable form to ensure their wide (and speedy) dissemination.

In this regard the Bulletin format is being revamped. The pending change is from the current A5 page format to a semi-glossy A4 format which will allow for inclusion of black and white photographs. This change is designed to make the Bulletin more marketable to a wider audience thereby increasing its circulation potential. To achieve this, scientific articles published in the GSSA journal need to be popularised and their results succintly synthesised. In addition, other popular articles aimed directly at practical management issues are required - basically what works and what doesn't work for land manager. The Grassland Society needs to create a greater awareness of the relevance of its activities amongst the agricultural/land manager sector. This can only be done by obtaining the support of the commercial sector through advertising. To obtain this support, the Bulletin needs to be able to target an applicable audience, namely the customer/consumer/land manager.

In the following two issues of the (new look) Bulletin (vols 6.2 & 6.3) we are focusing on specific research topics and we invite you to submit short articles describing the results of your research in these fields[1]. These articles should indicate the practical management implications of the research and outstanding research questions. Scientific jargon should be avoided in these articles, as far as possible, and a measure of speculation concerning the application of the results can be included.

[1]It would be appreciated if articles could be submitted on computer disc in a format compatible with Wordperfect 5.1, or in text format. Discs will be returned.

In volume 6.2, the **management of humid grassland** ("sourveld" & "mixedveld") will be considered along with options for its replacement with **cultivated pastures**. This includes research concerning pasture species selection and pasture management. In volume 6.3, focus will be on the **management of semi-arid grasslands and shrublands** ("sweetveld" & Karoo). Options for cultivated pastures in these regions can be included.

Finally, a third way of increasing the relevance of the Society it for the GSSA to form an allegiance with other related societies and organisations. Consideration can be given to the formation of a "Federation of Environmental Scientists", as suggested by Norman Owen-Smith (see overleaf). Such an allegiance may alleviate the anxieties of the smaller societies and increase the potential for multi-disciplinary (and even inter-disciplinary) research. However, such an alliance may threaten the identity of individual societies. We invite your opinions on this proposal.

Please note that the deadline for submission of articles for volume 6.2 is 15 June.

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GSSA IN A FEDERATION OF ENVIRONMENTAL SCIENTISTS?

Norman Owen-Smith
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The GSSA, like other learned societies, is confronting the dilemma of rising costs of publications and other expenses, while raising fees restricts membership to the more affluent. This occurs just at the time when a vigorous professional input into shaping the new South African order is needed. The South African Institute of Ecologists and Environmental Scientists (SAIE&ES) faces the same problem. I as a member of both associations (as well as several others) wonder how to rationalise the escalating costs of annual dues.

In a letter to the SAIE&ES Bulletin, I suggested that a way out of this dilemma would be to widen their membership to include not only the environmental engineers and landscape architects, but also the agricultural ecologists and wildlife managers. But would members of the vigorous GSSA want to team up with the ecologists and environmental consultants?

The most obvious benefit would be economy of scale. A larger membership would help support the journals and professional staff that both groups seek. The individual societies could still retain their identities through a federal form of association. The Ecological Society of America includes specialist sections, and could provide a model.

What do other members of the GSSA think? Under what conditions would the partial loss of independence be compensated by the benefits that a larger association would bring? How would we feel if our journal changed its name yet again, say to *African Environments, Rangelands and Wildlife?* Sections within the journal could help retain the specific focuses. Imagine a federal congress of African environmental scientists, with the ecologists, engineers, wildlife managers and agriculturalists debating the alternative routes to sustainable development.

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SOCIETY NEWS

REPORT ON THE EXPO FOR YOUNG SCIENTISTS 1994

K van Rheede van Oudtshoorn & C J Terblanche
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Everyone is aware of the critically important contribution of the Sciences, Engineering and Technology to the National Reconstruction and Development Plan According to the Council for Expositions for Young Scientists, the annual Expo is making a significant contribution towards the future development of South Africans. The aims of the Expo are:

a) to encourage scientific interest and activity amongst school pupils,
b) to identify, reward and encourage scientific talent in the participating exhibitors and
c) to bring scholars with scientific interests into contact with professional scientists.

The 1994 National Schools Science Expo was held in the Secunda Community Centre from the 29 September to 1 October. Twenty four Expo regions, as well as Namibia, Swaziland and Malawi were represented at the Expo. There were a total of 42 categories and 448 projects which had been selected from over 18 000 participants nation-wide who exhibited at internal school science exhibitions, and at circuit and regional exhibitions.

The authors represented the Grassland Society of Southern Africa, as judges and were responsible for the evaluation of projects that addressed Grassland Science. Judging was based on the scientific work and the effort that had gone into the exhibit, the initiative shown and scientific method followed by the exhibitor, the quality of the exhibitor's findings, the scientific and technical skills that had been acquired and the contribution made to what the pupil considered to be an interesting science. Special recognition was given to projects which were based on the following theme: "Grassland Science endeavours to create environmentally friendly and economically viable technology which will advance animal production".

The GSSA gold medal and cash prize was won, for the second year running, by Albert Geldenhuys, a standard six pupil at the Sentrale Volkskool, Goldfields, for his project entitled: 'Veldtoestand en weidingskapasiteit". Albert has an extraordinary knowledge and depth of understanding of the importance of correct pasture management and of the contribution it can make to the welfare of the people of South Africa.

A bronze medal and cash prize was awarded to Marc P. Lindsay, a matric pupil at Christian Brothers College in Kimberley, for his work on "The economic value of landscape-Dorper hybridisation'. Marc's project was an attestation of both hard work and insight into the value of economic farming systems. Both students were worthy recipients of the GSSA awards and we would like to congratulate them on their achievement.

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REPORT OF THE ARS TRAVELLING FELLOWSHIP 1994

Grant Hatch
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I was fortunate to be awarded the ARS Travel Fellowship for 1994 to attend the 8th Australian Rangeland Conference in Katherine and present a paper on my work on financial and environmental risk for extensive beef production systems in the semi-arid savanna of Natal, South Africa.

My visit began in Alice Springs with a talk at the CSIRO Centre for Arid Zone Research to members of the ARS on a project I have started looking at range dynamics and productivity on communal rangelands in Natal. Interestingly, it seemed that many of the problems faced by rural communities in Natal, such as rainfall and production variability, access to markets and information, were shared by Aboriginal communities in Australia.

From Alice Springs it was on to Katherine and the Conference and I was given an introduction to the vegetation and open expanses of the Northern Territory. While the vegetation at times appeared completely different to areas of southern Africa with similar climate in terms of species composition, there were remarkable similarities at the landscape level. The spinifex grasslands on fine red sands appear very similar to the *Stipagrostis* grasslands of the north-west Cape/southern Namibia region of southern Africa, but with very much lower potential stocking rates. The central arid woodlands further north seemed to resemble the bushvelds of the Northern Transvaal, but without the strong browse component which supports multi-species systems. Still north into the tropical and sub-tropical woodlands where the eucalypt tree layer and *Themeda triandra/Heteropogon contortus* understorey resembled, certainly in structure, the *Brachystegia* woodlands of central Zimbabwe. Interestingly, the *Themeda triandra* and *Heteropogon contortus* I was accustomed to were replaced by taller, stemmier varieties which resembled the *Hyparrhenia hirta* or thatch grass of the Natal midlands and *Hyparrthelia disoluta* of the semi-arid savanna or Lowveld.

I found the Conference in Katherine very interesting, particularly after I had presented my paper and could relax somewhat. The familiar problems of the consequences of attempting to manipulate environments to suit cattle and sheep production were well represented. The challenge of dealing with environmental variability amid declining property revenues was also common. I was surprised at how little work was aimed at solutions based on indigenous wildlife or alternate forms of land-use. These are increasingly becoming the focus for both commercial and subsistence systems in southern Africa. The magnitude of the problems of farming in an environment not adapted to grazing by domestic herbivores appeared more acute in Australia than those faced by southern Africa, which has adapted to relatively high numbers of wild herbivores. The implications of changes in land ownership following the Mabo judgement, which would lead to increased access to land for Aboriginal people and challenge existing pastoral leases, was very interesting, particularly as South Africa addresses the consequences of an inequitable land distribution through legislation such as the Land Restoration Act. The decision-support and software development work was impressive, particularly as a tool to deal with the consequences of environmental variability and is certainly an area where South Africa lags behind considerably. It was also interesting to see the problems created by southern African trees and grasses unleashed in a different environment, particularly as much effort is spent in southern Africa attempting to eradicate or control the spread of invasives introduced from Australia.

I then travelled 3800 km over almost half of Australia to Brisbane which certainly gave a broad overview of the vegetation. Striking was the uniformity over large areas such as the Mitchell Grasslands in contrast to the sharp topographic and vegetation variability in southern Africa, and yet vegetation boundaries appeared quite abrupt as soil changes occurred. The expansive, flat landscape often resembled areas of the western Orange Free State and central Transvaal.

After visiting Narayen Research Station, I presented a talk to the members of the CSIRO Division of Tropical Crops and Pastures in Brisbane on patch selective grazing in the midlands of Natal. It was interesting to see patterns in patch selection evident in the humid grasslands of Natal occurring in different environments such

as Narayen Research Station. Underlying determinants of patch initiation and subsequent soil and grass species change appear remarkable similar in very different environments.

I would like to thank the following people for their generous hospitality during my visit. Margaret Friedel and her family, who hosted me in Alice Springs. Ron McLean, and the staff of Narayen Research Station who outlined the GLASS experiment and research at Narayen, and his family who hosted me in Brisbane. Rosemary Buxton and Janine Kinloch who arranged an interesting drive up from Alice Springs to Katherine and introduced me to the Australian outback and swags. Mark Sallaway and Dave Waters, who offered me a lift from Katherine via Darwin and almost to Brisbane, and answered endless questions about the ecology of central Queensland. Finally the Australian Rangeland Society for the opportunity to visit Australia, attend the Rangeland Conference and gain exposure to an interesting country and people. I look forward to returning to Australia next year.

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REPORT ON LOWVELD CO-ORDINATED RESEARCH FORUM HELD AT THORNY-BUSH GAME RESERVE

Cheryl Thomson[1], Mike Peel[2] & Joe Venter[1]
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A Lowveld Co-ordinated Research Forum (LOCORES) field day which considered aspects of **SELECTIVE BUSH CLEARING** was held at Thorny Bush Game Reserve, in the Transvaal Lowveld, in May 1994. The day was jointly organised by Ecological Consultancy Services, Roodeplaat Grassland Institute and Thorny Bush Game Reserve (TGR), and was aimed at specifically at discussing the current "COMMUNITY EMPLOYMENT/SELECTIVE BUSH CLEARING PROJECT" being undertaken at TGR. Forty five people (comprising 7 students, 19 managers, 19 researchers and representing 21 organisations) attended.

The project should be seen in the light of the objectives of TGR. Bob Manthe* then General Manager of TGR, presented them as follows: to maximise profitability through the sustainable use natural resources; to gain acceptance as a worthy member of the local community; and to provide guests with a high quality African bush experience.

Prince Machimana representing the Independent Development Trust (IDT) spoke on behalf of the rural communities adjacent to TGR. Feelings are that the Community Employment/Selective Bush Clearing Programme would serve to improve the unemployment situation in the Bushbuckridge North area, as well as supplying a much-needed energy resource to local communities. Alleviation of the current situation could only come about with assistance of the present conservation landowners.

In giving some background to the implementation of the bush clearing project, Richard Slater, Habitat Manager for TGR, stated that the manual option for clearing had been chosen over mechanical means in order to create jobs. Initial clearing had been done on 1 ha test plots to establish estimated wood yields. From the results of the test plots, estimated yield (in three quarter ton bakkie loads) were 114 from heavily encroached areas, six from moderately encroached areas and three from lightly encroached areas. TGR's responsibilities in this programme are herbicide application, purchase of the wood from the contractors, transport of cut wood to the bulk fuel-wood depot and sale of wood to community wood vendors. The income derived from this sale operation would be split 50/50 between TGR and a community trust which is to be established.

Joe Venter reported that, according to a study done by Sheona & Charlie Shackleton in the Mhala district, 56-98% of the household energy was obtained from burning fuel wood. When 1944 and 1986 aerial photographs of the area were analysed, there is a consistent trend in loss of, or increasingly low densities of,

* Bob Manthe died tragically soon after this field-day and we dedicate this report to his memory and enthusiastic support of this project.

tall grass/open woodland for large herbivore species such as roan, sable and tsessebe. This encroachment detracts from the game viewing experience of paying guests. The actual clearing would be concentrated in areas identified as open in 1944. Two types of clearing would occur - ecological, with the aim being to reverse encroachment, and aesthetic, which is not based on ecological principles. The 1994 photographic analysis clearly showed that bottomland areas were historically more open and it was in these areas where clearing would be concentrated. The decision regarding *what* to clear is dictated by age classes and species identified from data collected on 33 transects.

Ecological issues relating to bush clearing have been reviewed and six broad ecological principles were identified. An important point is that bush clearing is just one aspect of what should be an integrated veld management programme. Clearing must be concentrated on those areas which were historically open. Coppice control must be undertaken by chemical or mechanical means, or biological control through high browser densities and veld burning.

Mike Peel of the Roodeplaat Grassland Institute outlined the ecological monitoring programme on TGR. For the initial inventory and follow-up monitoring programme, a stereoscopic analysis of aerial photographs would be done to determine the broad vegetation types. Based on the 1986 aerial photographs areas have been divided into riverine, sodic, *Combretum* upland and *Acacia* bottom-land communities. Riverine areas would not be considered for clearing and vegetation transects done in each community were allocated proportionally according to the area contribution of each to the whole of TGR. A Global Positioning System facilitates relocation of sites as well as being a valuable aid to GIS (Geographic Information System) applications.

Sheona Shackleton of Wits Rural Facility outlined a proposed socio-economic monitoring programme of the bush clearing project, and acknowledged that TGR had taken a different route by opting for manual clearing but they obviously believed in an integrated approach and the need for local communities to benefit. She explained the need for socio-economic monitoring as well as ecological monitoring, the former being necessary to evaluate whether benefits from this bush clearing project were actually reaching the communities. The socio-economic study would demonstrate whether the negative attitudes of local communities to protected areas can be changed by a participatory, community-based approach.

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REPORT ON LOWVELD CO-ORDINATED RESEARCH FORUM (LOCORES) FIELD DAY "THE USE OF FIRE AS A MANAGEMENT TOOL: WHERE AND WHEN?"

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Hosted by Ulusaba and organised by Eastern Transvaal Nature Conservation (ETNC); 29 August 1994.

1. Objective and background

Various land owners and managers in the Sabi Sands Private Nature Reserve (SsPNR) requested advice from the Ecological Services Division of ETNC with regard to a variety of issues, including veld burning. Due to the nature of land ownership within this reserve, i.e. numerous owners of relatively small pieces of land, it was necessary to consider these issues on a holistic basis and to involve as many properties as possible. It was also necessary to gather a significant data set to ensure that the advice given would be on a sound scientific basis.

It became apparent during this data gathering that there was generally a lack of understanding amongst the owners and managers of the reserve of the role of fire in the savanna ecosystem. In addition to this was evident that there was also a lack of co-operation with regard to resource management as a whole. It was, therefore, felt that a LOCORES field day would be the ideal opportunity to bring these people together and to examine the use of fire as a management tool, as well as review the findings from the data set.

2. Formal presentations

Dr Joe Venter acted as chairman for this section of the field day.

2.1 LOCORES: background, objectives and progress

Mr Mike Peel of the Roodeplaat Grassland Institute's Game Production Unit (GAPRU) gave a brief presentation on LOCORES for the benefit of those attending such a field day for the first time. After sketching the origins of the forum he indicated that the objective was to facilitate the co-ordination of research in the lowveld through the interactions between pro-active and open-minded managers and researchers. It is hoped that by doing so, research will be consumer driven.

A brief summary of the LOCORES field days held thus far gave a clear indication that they have become a popular event and have gone a long way in achieving the forum's objective.

2.2 Ulusaba: objectives of the private land owner

Through a very brief presentation and the answering of questions, Mr Louis Korb of Ulusaba gave an overview of the objectives of a commercial operation within the reserve. Emphasis was placed on what was required by the client and how the management of the natural resource could satisfy this need.

2.3 The role of fire in the savanna ecosystem and adaptions to its use as a management tool in the Kruger National Park

Mr André Potgieter of the Kruger National Park (KNP) gave a very detailed presentation in which he put much emphasis on the theory of the role of fire in the savanna ecosystem. This theoretical background served well as a basis for his discussion on the KNP's approach to the use of fire as a management tool.

He indicated that in the recent past the KNP's burning policy was one of complete control. The park was divided into relatively small blocks which were burnt on a rotation basis according to a fixed frequency, season and method. The importance of considering the species composition and standing phytomass to determine the desirability of burning a particular block then became apparent through work carried out by himself and Prof Winston Trollope.

The approach to burning has subsequently changed quite radically. burning blocks have been enlargened significantly and natural fires are allowed to burn within a block and are only controlled if they threaten an adjacent block. Although the new "point ignition" approach has not been applied, burns are only implemented if the standing phytomass and species composition indicate favourable conditions.

2.4 The use of fire as a management tool: where and when

With the detailed presentation by Andrè Potgieter on the theory and the approach to the use of fire in a very large conservation area, a good basis was laid for Mr Francois de Wet of ETNC to present the findings of his work in the SSPNR. After presenting his terms of reference, the methodology which was followed was briefly sketched. This was basically the determination of veld condition using the categorisation of the species composition into successional stages. Standing phytomass was also determined using a disc pasture meter along the same transects. Transects were set out within land types identified according to geology, soil type, position in the landscape and past treatment, i.e. cleared or not cleared.

The data set was illustrated on a large aerial photograph of the portion of the SSPNR ($\pm$7000 ha) on which he worked. Using different types and colours of pins he depicted the various categories of veld condition and standing phytomass. By doing so one could immediately determine which areas would qualify for a burn. The intensity of the surveys was such that these areas could be identified qualitatively as well as quantitatively.

Without any indication of proposals the field visit was undertaken with the participants being asked to formulate their own impressions on the desirability of burning or not.

3. Field excursion

After being given all the relevant information on the sites to be visited the participants were transported to sites which represented the various categories of veld from a high standing phytomass with high percentage of pioneer grass species. At each site the advantages and disadvantages of burning were discussed in the context of the prevailing conditions. After all the sites had been visited an informal discussion was held where the participants were encouraged to share their views on the question of if and where fire could be used within the study site.

Although no implicit answer was formulated from all the assembled wisdom and experience, it was generally accepted that the areas that qualified to burn were too small and that subsequent herbivory would

negate any positive effect the fire may have. In addition to this it was also emphasised that the data set represented only 10% of the SSPNR and it was imperative that all the land owners become fully involved to ensure a fully co-ordinated approach to the management of the reserve.

The next step would be to set up meetings with the land owners to establish what the objectives are for the management on their properties. It might then be possible to adapt the criteria used to evaluate the desirability of burning to suit their objectives. In this way it is hoped to achieve an inclusive - rather than a prescriptive - approach to the advice give.

4. Conclusion

If one considers the filed day in isolation it may be considered a success. It was, however, intended to convey information to the land owners of the SSPNR, and in this sense one has to be objective and accept that it was a failure. The apparent lack of interest shown at this event is, unfortunately the norm in many of these privately owned conservation areas in the lowveld. It is hoped that continued efforts by groups such as LOCORES will serve to inform these people of the responsibility they have of ensuring the sound management of their properties, hopefully in a co-ordinated and holistic manner.

Of the 33 people who signed the attendance register, 25 were scientists and 7 managers. One was a senator. Sixteen different institutions were represented. Of the 18 land owners in the SSPNR only one was present at the field day.

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HANDY ENVIRONMENTAL RESOURCE BOOKLETS AVAILABLE FROM THE COUNCIL FOR THE ENVIRONMENT

The Council for the Environment has produced booklets on environmental topics as part of an environment education initiative. The booklets are written in such a manner as to be of use to both the layman as well as the professional environmental practitioner as a background indicator to environmental matters that do not enjoy such a high profile in the public eye.

The following booklet has been released:

STREAMLINED ENVIRONMENTAL IMPACT ASSESSMENTS FOR RDP AND OTHER PROJECTS

The proposed mechanism of Streamlined Environmental Impact Assessment (SEIA), based on the principles of integrated environmental management (IEM) allows for environmental issues to be addressed in a low cost, pragmatic and rapid manner throughout the life cycle of a project or development. The concept is essentially a holistic planning process followed by holistic implementation which should, if adhered to, minimise damage to the environment as well as ensuring that the people of South Africa and the environment benefit form projects initiated under the RDP.

Availble from: Council for the Environment
Private bag X447
Pretoria
0001

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ARTICLES

VELD MANAGEMENT FOR THE EASTERN TRANSVAAL HIGHVELD

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1 Introduction

Sourveld in South Africa constitutes a valuable resource by providing cheap grazing for sheep and cattle enterprises. Evidence indicates that in general grazing value of sourveld in South Africa is well below the potential. This represents a serious economic loss to the livestock industry.

The degradation of sourveld essentially takes the form of a decrease in preferred species and an increase in unpreferred or less preferred species.

The continuing degradation of sourveld has been a matter of great concern to research and extension personnel for several decades. In an effort to reverse the trend the major thrust has been on trying to persuade farmers to adopt grazing systems, and especially multipaddock grazing systems with relatively short periods of stay. These were presumed to be a means of minimising selective grazing and preventing loss of vigour and eventual disappearance of the preferred species.

The farmer acceptance of these multipaddock systems has, however, been minimal (Roberts 1969; Tainton 1985; Scholtz 1987). Recent critical evaluations of the empirical base for such recommendations have indicated that they were seriously flawed (O'Reagain & Turner 1992; Barnes 1992). Indications are that even if these recommendations are applied, veld condition may still deteriorate.

In response to the identification of problems facing the local farming community, several trials were carried out locally over the past 10 years to investigate the effects of veld management on veld grasses and animal performance. Results from these trials, combined with results from research carried out elsewhere in southern Africa, led to the development of a new management approach for local sourveld.

2 Effect of grazing management on veld vigour

One of the knowledge gaps that existed during the development of previous grazing systems was the direct effects of grazing on veld vigour, and particularly vigour of the preferred grasses.

Grass vigour can be defined as the potential or ability of a grass plant to re-grow during the season following defoliation. This measure has direct bearing on management, as it gives an indication of management effects on production of grazing during the following year, and it also serves as a short term measure of the effect of grazing on the "health" of the individual species.

In recent local trials, treatment effect on vigour has been determined by applying a range of defoliation treatments to veld in a particular season. During the season after treatment application, the regrowth (production) of all species or a selection of species was measured on both the previously defoliated veld as well as a previously ungrazed control (usually in the form of exclosure cages). The results of several of these trials are presented, as they give the background to the development of new grazing management recommendations.

2.1 Trial 1

In the first trial, designed to determine the effects of sheep grazing on veld vigour, the following treatments were applied
(Barnes 1987);

1. Veld was rested throughout the growing season (ungrazed control).
2. Veld was grazed lightly until mid-January, then rested.
3. Veld was grazed heavily until mid-January, then rested.
4. Veld was grazed lightly until mid-March, then rested.
5. Veld was grazed heavily until mid-March, then rested.
6. Veld was grazed lightly throughout the growing season.
7. Veld was grazed heavily throughout the growing season.

A rotational grazing procedure was simulated, with sheep grazing all treatments for a period of about one week, followed by a three week absence.

The effects of these grazing treatments on the grass vigour was determined by measuring the production during the following season of *Themeda triandra*, *Heteropogon contortus* and *Trachypogon spicatus* as well as the total production of the veld. The results are shown in Figure 1.

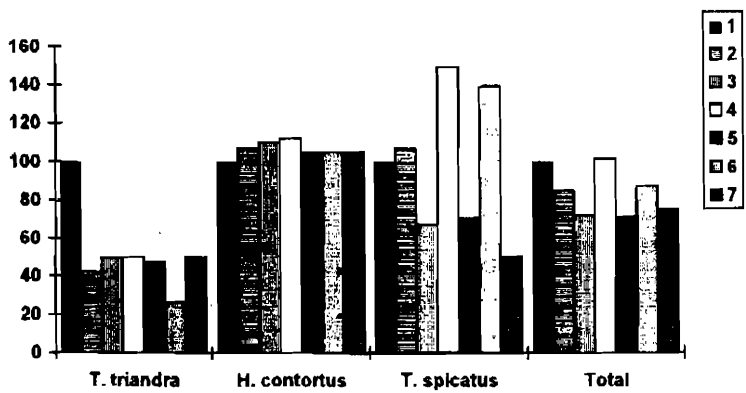

Figure 1 Shoot yields of three veld grass during the season after application of different grazing and resting schedules. Expressed as percentage of the ungrazed control. Treatments were as follows:

1 Veld was rested throughout the growing season (ungrazed control).
2 Veld was grazed lightly until mid-January, then rested.
3 Veld was grazed heavily until mid-January, then rested.
4 Veld was grazed lightly until mid-March, then rested.
5 Veld was grazed heavily until mid-March, then rested.
6 Veld was grazed lightly throughout the growing season.
7 Veld was grazed heavily throughout the growing season.

The grazing treatment negatively affected the production of Themeda triandra during the following season, while the other two species were not affected to the same degree. The effect on total veld vigour depended on the proportion of the sensitive species present. The unexpected drastic effects of grazing on the vigour of Themeda triandra, a locally common and important veld grass, led to further trials designed to quantify these effects under varying conditions.

2.2 Trial 2

A cutting trial with controlled frequencies and intensities of defoliation was carried out to obtain more clarity of the effects of defoliation (Moore 1989).

The following defoliation treatments were carried out on Themeda triandra:

1. Undefoliated control.
2. Cut three times at six weekly intervals at 40 mm above ground level.
3. Cut five times at six weekly intervals at 40 mm above ground level.
4. Cut three times at six weekly intervals at 20 mm above ground level.
5. Cut five times at six weekly intervals at 20 mm above ground level.

Treatments two and four, which were cut three times during the season, were left to grow undisturbed after the last cut at the beginning of January, while treatments 3 and 5 were cut twice more, totalling five cuts over the whole season. The results are shown in Figure 2.

All defoliation treatments negatively affected vigour relative to the undefoliated control during the following season. From these results it appears that increasing defoliation frequency has a greater depressive effect on vigour than increasing intensity.

2.3 Trial 3

A full scale grazing trial was then initiated. Included in the objectives was the measurement of the effects on veld vigour of sheep grazing when stocked at different intervals after a spring burn (Barnes & Demspey 1992). The first time of stocking was as soon after the spring burn as possible (treatment 1), the second time approximately three weeks later (treatment 2) and the third time was approximately three weeks after the second (treatment 3). The vigour indices for each of three palatability classes are shown in Figure 3 for each time of stocking relative to an ungrazed control. The trial was grazed rotationally using a four week cycle.

The production of the palatable grasses in all three treatments was reduced in the season following grazing to between 50 and 60 % of that of the palatable grasses in the ungrazed control. The production of the intermediate grasses in all treatments was approximately similar to that of the intermediate grasses in the control. The unpalatable grasses showed an increased production in all treatments relative to the unpalatable grasses of the control.

Vigour of the palatable grasses was depressed by grazing even when time of stocking was delayed in spring. Delaying the time of stocking in spring thus had a relatively small effect on fostering vigour. Sheep performance on the latest time of stocking treatment was approximately 50 % of the performance on the early time of stocking treatment.

3 Discussion

The development of methods suitable to easily measure the effect of grazing on vigour of veld grasses can be considered a breakthrough in the quest to understanding the interaction between grass and grazers.

From the results of the above trials, several important points are obvious:

- Grazing (or defoliation) negatively affects veld vigour. This effect is positively correlated to grazing pressure (intensity and frequency).
- Grazing has a greater negative effect on palatable grasses (which are subjected to a relatively high grazing pressure) than on unpalatable grasses (which are ungrazed or only lightly grazed). The vigour of unpalatable grasses appears to be stimulated by grazing, probably partly because of reduced competition from the palatable grasses.
- Delaying the time of stocking in spring has a small positive effect on veld vigour relative to stocking early. However, even stocking late in spring reduced vigour of the palatable grasses to less than 60 %, and reduced sheep performance by approximately 50 % relative to early stocking.
- Periods "out" in a rotational grazing procedure do not adequately compensate for vigour loss caused by grazing. The above three trials were carried out under simulated rotational grazing, cutting at predetermined intervals and rotational grazing respectively. This, along with results from Barnes & Denny (1991); Gammon (1978a; 1978b; 1978c) and Gammon & Twiddy (1990) indicate that grazing procedure (number of camps, periods in and periods out of camps) is relatively unimportant in terms of the effect on veld.

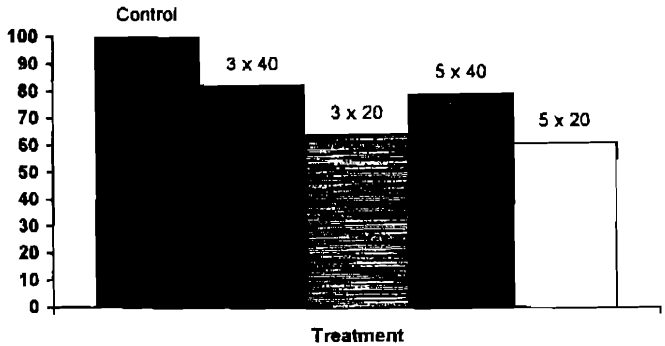

Figure 2 Effect of defoliation by cutting on the yield of *Themeda triandra* during the season following treatment application. Expressed as percentage of the ungrazed control.

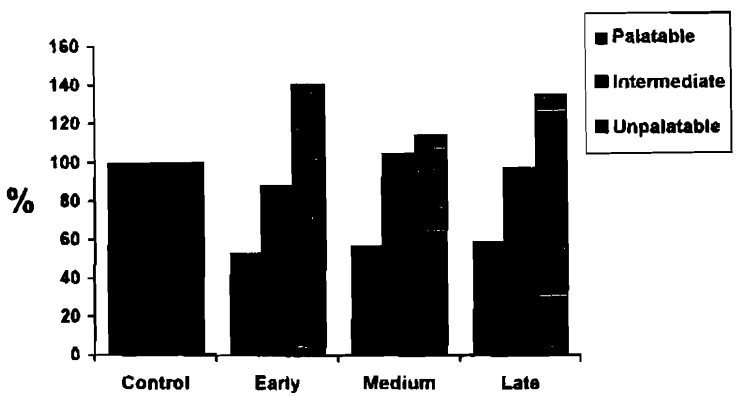

Figure 3. Vigour of veld grass grazed by sheep with three times of stocking after spring burning. Expressed as percentage of the ungrazed control.

- Results from current unpublished research indicate that, while increasing stocking rate has a greater negative effect on vigour, even grazing at light stocking rates has a serious detrimental effect on vigour of preferred species. Also, cattle have virtually the same negative effect on veld vigour as a whole, although the negative effect of cattle on the vigour of preferred species is smaller than in the case of sheep.

4 Compensation for vigour loss

It seems that any grazing, by sheep or cattle, irrespective of grazing procedure, will result in a decline in vigour of particularly the preferred species. The only way to compensate for this severe loss of vigour caused by grazing is to implement periodic long term rests (i.e. full growing season rests).

5 Incorporation of resting in veld management

Results indicate that veld that has rested for a whole growing season, produces significantly more during the season following the rest than veld that has not rested (Barnes & Dempsey 1992). Current unpublished research results reinforce this. In particular, the production of preferred species can be more than double that in comparable veld that has not been rested. This enables a stocking density higher than the long term average to be maintained during the season that the veld is being grazed after a full growing season rest. Experience has shown that if the correct proportions are rested, the stocking rate of the farm need may not need to be reduced when implementing resting, provided the farm was not overstocked initially.

Indications are that winter grazing of veld rested during the growing season has little or no effect on the veld. This rested veld is thus available for winter grazing, and can provide cheap roughage for dry animals (even on local sourveld). Results from local trials over three years indicate that pregnant ewes can be successfully wintered on rested veld with appropriate levels of lupin or soybean supplementation, at a cost of about 8 - 9 cents per ewe per day. Subsequent lamb birth mass and lamb performance up to weaning have been entirely satisfactory.

A veld management system based on full season rests in alternate years has been successfully implemented for five years on a demonstration unit farm, with positive results for veld condition, animal performance, fodder flow and economics. In addition, similar management principles have been successfully implemented for several years in six production systems on Athole Research Station, also with positive results.

6 Conclusions

Research is an ongoing process, and consequently new ideas are generated from new results, new research methods and new trials. Research is not complete until results are evaluated and, if suitable, implemented in practice.

From these results outlined above, along with the experience gained with the implementation of new management strategies based on these results, certain principles stand out.

- Any grazing has a negative effect on veld vigour, and in particular the vigour of preferred grasses.
- Number of camps per group of animals, and periods in and periods out of those camps within a season are relatively unimportant in terms of the effects of grazing on veld vigour.
- Deferring grazing at the beginning of the season is also relatively unimportant in terms of compensating for vigour loss, but leads to a marked decline in sheep performance.
- Grazing management systems should incorporate periodic long term rests (full growing season rests) as a means of compensating for vigour loss caused by grazing.
- This rested veld can form a source of cheap roughage for winter use with appropriate supplementation.
- Detailed veld management recommendations based on the above principles have been developed for various scenarios and applied successfully. Further information may be obtained from the author.

References

Barnes DL 1987. Reaction of three veld grasses to different schedules of grazing and resting. 2. Residual effects on vigour South African Journal of Plant and Soil 6:8-13.

Barnes DL 1992. A critical analysis of veld management recommendations in the south-eastern Transvaal. Journal of the Grassland Society of Southern Africa 9:126-134.

Barnes DL & Denny RP 1991. A comparison of continuous and rotational grazing on veld at two stocking

rates. Journal of the Grassland Society of Southern Africa 8:168-173.

Barnes DL & Dempsey CP 1992. Influence of period of deferment before stocking spring-burnt sourveld on sheep performance and veld productivity. Journal of the Grassland Society of Southern Africa 9:149-157.

Gammon DM & Roberts BR 1978a. Patterns of defoliation during continuous and rotational grazing of the Matopos Sandveld of Rhodesia: 1. Selectivity of grazing. Rhodesian Journal of Agricultural Research 16:117-131.

Gammon DM & Roberts BR 1978b. Patterns of defoliation during continuous and rotational grazing of the Matopos Sandveld of Rhodesia: 2. Severity of defoliation. Rhodesian Journal of Agricultural Research 16:133-145.

Gammon DM & Roberts BR 1978c. Patterns of defoliation during continuous and rotational grazing of the Matopos Sandveld of Rhodesia: 3. Frequency of defoliation. Rhodesian Journal of Agricultural Research 16:147-164.

Gammon DM & Twiddy DR 1990. Patterns of defoliation in four- and eight-paddock systems. Journal of the Grassland Society of Southern Africa 7:29-35.

Moore AC 1989. Sekere fenologiese en fisiologiese reaksies van *Themeda triandra* (Forsk.) op verskillende ontblaringskedules. MSc. verhandeling Potchefstroomse Universiteit vir Christelike Hoër Onderwys.

O'Reagain PJ & Turner JR 1992. An evaluation of the empirical basis for grazing management recommendations for rangeland in southern Africa Journal of the Grassland Society of Southern Africa 9:38-49.

Roberts BR 1969. Application of veld management in South Africa - an analysis of progress. Proceedings of the Grassland Society of Southern Africa 4:92-98.

Scholtz HPJ 1987. Die nie-aanvaarbaarheid van beheerde selektiewe beweiding as veld bestuurstelsel. M. Inst. Agrar. thesis Universiteit van Pretoria.

Tainton NM 1985. Recent trends in grazing management philosophy in South Africa. Journal of the Grassland Society of Southern Africa 2:4-6.

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WHY CAN'T DEVELOPED COUNTRIES CONTROL DESERTIFICATION?

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The authors were the South African delegates to the International Symposium and Workshop on Desertification in Developed Countries held in Tucson, Arizona from 24-29 October 1994. In addition to the 37 oral presentations and 32 posters presented by delegates from 14 countries, there were workshops and field excursions. Here we report on some papers, discussions and observations that are relevant to current landuse issues in southern Africa.

Desertification, or the loss of agricultural and rangeland productivity through changes in ecosystem function as a result of vegetation change, desiccation, salinization and erosion, is a concern of developed as well as developing countries, for although poverty may lead to land mismanagement, wealth does not ensure land conservation (Dregne, Jallow). Arid and semi-arid lands are more susceptible to desertification than mesic regions. However, as 20% of the world's population lives in arid and semi-arid areas (Schlesinger) the land cannot be taken out of production. What types of landuse are appropriate for such sensitive areas?

Appropriate and inappropriate landuse

Many delegates presented case histories dealing with examples of inappropriate uses of arid areas. These included ploughing of marginal land in Spain (Barth), irrigation procedures that polluted the ground water, prevented its recharge in Israel (Banin) or used surface water faster than it could be renewed as in the land surrounding the Aral sea in central Russia (Saiko). In the Americas, Australia and South Africa, an unrealistically high density of livestock rather than crop farming appears to be the primary cause of desertification (Garduño, Hess & Holecheck, Ludwig & Tongway, Dean et al.). Rainfall is variable in arid areas and the effects of inappropriate landuse are exacerbated when annual rainfall is below average (Hoffman et al.).

Few delegates ventured to suggest forms of landuse that might be appropriate for arid regions. When environmental damage is motivated by necessity, as often happens in over-populated rural areas, alternatives that are sustainable in the long term (century) but cause short-term (decade) declines in living standard are generally unacceptable. In the workshops as well as the plenary session it was clear that the need to address simultaneously the issues of social betterment and sustainable landuse caused an impasse that few delegates (whether administrators, managers or academics) seemed able to tackle. Among the concrete proposals for reorganizing landuse to protect resources and benefit user communities were those of Kerley (South Africa) and Lowe (USA).

Kerley suggested that an expansion in wildlife (elephant, black rhino, kudu) ranching for meat and ecotourism in Eastern Cape Thicket could generate additional income in this area to the benefit of poor rural communities, and may be a more sustainable use of the land than goat ranching which has already desertified large parts of the eastern Cape. In the densely populated Navajo Reservation in the Four Corners area of the USA, Lowe showed how community consultation and incentives for conservation management had led to full participation in planned rotational grazing and to an improvement in living standard.

Restoring lost function to desertified ecosystems

Workshop discussions identified changes in soil processes, energy fluxes and life-form diversity as indicative of desertification. Many contributors to the plenary session considered that recovery of desertified ecosystems depended on restoration of soil processes (Whitford). Excessive grazing reduces vegetation cover whereas trampling compacts the soil and removes bacterial and fungal crusts which fix nitrogen and trap moisture (Belnap). The resultant accelerated runoff and poor infiltration exacerbates grazing and trampling effects (Lomeli). Nutrients tend to be lost from desertified ecosystems, or to be redistributed to islands of deep-rooted shrubs that benefit from decreased herbaceous cover (Schlesinger). Ambient temperatures are 4°C higher over overgrazed Mexican rangelands than on the USA side of the border (Hutchinson). Similarly, in the Middle

East, temperature increases of 0.07°C per decade (1950-1990) have been attributed to soil exposure (Nasrallah & Balling).

Restoration of function (water holding capacity, nutrient cycling) to desertified soil can be facilitated by shading the soil (Imerson). Reducing rates of runoff through construction of barrages further facilitates infiltration and vegetation establishment (Ludwig & Tongway), but unless carried out on a small scale by land users, is extremely costly: it took US $1.3 million to restore grass and trees to the eroded San Simon valley in Arizona (Bureau of Land Management). Some attempts at restoration have only worsened the problem. For example, planting of pines on steep slopes in a seasonally arid region increased runoff and sediment loss (Williams et al.). If restoration is to be cost effective, it should be properly planned and monitored. In Chile, where desertification affects the lives of 1.5 million people and where mitigation is expected to cost over one billion US $, carefully planned state policy to ameliorate desertification focuses on the poorest and worst affected communities. Land use problems are addressed simultaneously through education and action-orientated projects (Arroyo).

People and policy

The South African government is committed to making agricultural land and other natural resources including water, grazing and game accessible to the rural poor. It is argued that unless such people benefit directly from the natural environment and take responsibility for its Management, they have no incentive to conserve it (Hanekom & Liebenberg 1994). Much of America's rangeland is state-owned and is rented to ranchers who, since they cannot own it, have little incentive to manage it sustainably. Land tenure systems undoubtedly influence attitudes to resources. But other factors, including population density (Arroyo, Lowe, Nasrallah & Balling) and legislation relating to taxation and subsidization may exert equally powerful influences on land management.

In the developed countries it appears to have been poor policy rather than poor people that has motivated abusive landuse practices. Policies that reward poor rangeland Management in the USA include legislation that re-allocates common land that carries no cattle, heavy taxation on ecotourism and other non-consumptive land uses, financial support for reclamation programmes that are not cost-effective, and subsidization of emergency feeds (Hess & Holecheck). Similarly, drought subsidies in South Africa have caused desertification by sustaining ranching in regions where rainfall is too variable to support settled agriculture (Milton & Dean).

Workshop sessions concluded that desertification was driven by human population growth and/or by increased per capita use of resources. The deployment of farmers on the land should not overstep the regional potential for providing forage and water in the driest years (Dean et al.). Past land distribution policies in Russia and South Africa concentrated people and animals on inadequate parcels of land and interrupted traditional stock rotation systems (Zonn, Boonzaier et al. 1990), resulting in rangeland damage which will take huge sums of money and many lifetimes to reverse. New decision makers should endeavour to avoid past mistakes. South Africa, in common with other semi-arid parts of the world, needs policies that discourage rapid population growth, facilitate environmental education and foster local involvement in planning the sustainable use of natural resources in rural areas. Good policy, secure tenure and international sharing of expertise have potential for breaking the spiral of poverty, violence and land degradation that plagues overcrowded, powerless rural communities (Fox, Jallow).

Developing countries

The provisional theme for a follow-up meeting planned for 1997 is *Science and community action to prevent desertification*. The proposed venue is once again Arizona, USA because the symposium will be organized and funded chiefly by the United States Bureau of Land Management and the US Environmental Protection Agency. The organizers hope to encourage interim preparatory workshops in developing countries because these should be the major contributors to the 1997 symposium. Those interested in interim planning should approach Beaumont C. McClure, USDI Bureau of Land Management, 3703 N 7th St, Phoenix AZ 85014 USA, Fax 01 602 650 0398.

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Symposium papers

Arroyo M. Extent of the desertification process and proposals for action-orientated measures to ameliorate its effect in seven regions.

Banin A. Secondary desertification due to salinization and sodification of intensely irrigated lands - the Israeli experience.

Barth HK. Environmental implications of socioeconomic change in southeastern Spain.

Belnap J. Soil surface disturbances: their role in accelerating desertification.

Dean WRJ, Milton SJ & du Plessis MA. Where, why and to what extent have rangelands in the Karoo, South Africa, desertified?

Dregne HE. Desertification control: a framework for action

Fox TH. Desertification: who needs to do what?

Garduño MA. Desertification in Mexico: problems and possible solutions.

Hess K & Holecheck JL. Policy roots of land degradation in the arid region of the United States: an overview.

Hoffman MT, Bond WJ & Stock WD. Desertification of the semiarid Karoo, South Africa: evidence from soil isotopes and matched photographs.

Hutchinson CF. Assessing desertification through multi-spectral and multitemporal sensing techniques.

Imerson AC. An integrated methodology for linking desertification to socioeconomic and policy factors at the ERMES field locations in Spain, Crete and Israel.

Jallow T. Challenges and opportunities in the implementation of the International Convention to Combat Desertification.

Kerley, GIH, Knight MH & de Kock M. Desertification of subtropical thicket in the Eastern Cape, South Africa: are there alternatives?

Lomeli B. Desertification responses of an international southwestern river.

Lowe NS. Communal grazing regulation and conservation grazing management adaptations on Navajo new lands.

Ludwig JA & Tongway DJ. Desertification in Australia: an eye to grassroots and landscapes.

Milton SJ & Dean WRJ. Southern African rangelands: why are they changing and can they be restored?

Nasrallah HA & Balling RC. Impact of desertification on temperature trends in the Middle East.

Saiko TA. Implications of the disintegration of the former Soviet Union for desertification control.

Schlesinger WH. Global consequences of desertification.

Whitford WG, Martinez-Turanzas G & Martinez-Meza E. Persistence of desertified ecosystems: explanations and implications.

Williams AG, Ternan JL & Elmes A. A field study of the influence of land management and soil properties on runoff and soil loss in central Spain.

Zonn I. Desertification in Russia: problems and solutions.

Other references

Boonzaier EA, Hoffman MT, Archer FM & Smith AB 1990. Communal landuse and the "tragedy of the commons": some problems and development perspectives with specific reference to semi-arid regions of southern Africa. J. Grassld. Soc. Sth. Afr. 7:77-80.

Hanekom D & Liebenberg L 1994. Utilization of National Parks with special reference to the costs and benefits to communities. Bul. Grassld. Soc. Sth. Afr. 5(2):25-36.

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RANGELAND TENURE - THE DEBATE

The following are contributions by various authors to the debate concerning appropriate forms of tenure for grazing land in South Africa that is to be redistributed through the Government's land reform programme.

LAND REDISTRIBUTION AND LAND TENURE ON RANGELANDS

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Introduction

The purpose of this contribution is to briefly review the major forms of land tenure and their implications for land use efficiency and equity. This topic is particularly relevant as the country embarks on a process of land reform designed to settle legitimate claims to land and to redistribute land currently held by the State and large scale commercial farmers. Restitution of land rights will transfer some land, but there is an urgent need to accelerate visible redistribution in order to promote political stability and economic growth in the long-term. The range of policy options that can be considered for land redistribution has been narrowed by the new constitution. In the case of privately-owned farm land, redistribution is to be effected by the land market, albeit a market distorted by grants or soft loans to new entrants.

The principle of voluntary market transfers has been endorsed by organized agriculture but may have created a misconception that new entrants and successful claimants will own their farms, and that ownership will strengthen their incentive to conserve, improve and use the land productively. The reality of the situation is that both private and State-owned land will tend to transfer to groups of beneficiaries rather than to individuals because (a) the cost of sub-dividing large farms into smaller and more affordable units is very high, and (b) it is difficult to negotiate with large numbers of individual claimants or buyers.

The result will be co-ownership of land. Group ownership is certainly not a new concept in South Africa and does not necessarily imply that productive land will become unproductive. Unfortunately, experience has shown that certain types of group ownership do curb productivity to the detriment of both consumers and the intended beneficiaries of land reform. Many people consider communal land tenure to be the root cause of poor agricultural performance and the over-utilisation of grazing resources in the homelands.

Objective information about the likely effects of alternative tenure arrangements on the long-term use of agricultural land is vital as these institutional rules establish the incentive structures that shape decisions taken by investors. If incentives are weak, agriculture will stagnate no matter how skilled the emerging farmers, or how good the extension and support services provided by the State.

Land tenure institutions

Figure 1 attempts to summarise the major forms of land tenure ranging from open access to private ownership. Open access implies that rules governing individual access to land are either absent or unenforced. This condition holds even if the community using the land is well defined, and regardless of whether the land is legally owned by the group, the State or an individual. At the other extreme, private land owners can effectively exclude other people from using their land.

Between these extremes, there exists a range of common property institutions. In this case, a well defined group makes and enforces its own rules to regulate access by its members and other individuals. If the rules are highly inclusive or weakly enforced the common property institution approximates an open access arrangement. It is convenient to distinguish between two basic common property institutions:

The first relates to user groups. Here members of the group exercise their own managerial decisions within the constraints established by the group as a whole. For instance, the rules may restrict the number of cattle that each member is allowed to graze on the common, but each member controls his or her own herd. To be successful, user groups must be small otherwise the costs of negotiating and enforcing rules will exceed the benefits gained by preventing over-utilisation.

The second relates to non-user groups. Here individuals surrender some or all of their use-rights to a

management team. For instance, the members may constitute themselves as a legal entity (eg. a business trust, corporation or company) with a formal constitution defining the powers and responsibilities of hired and elected managers.

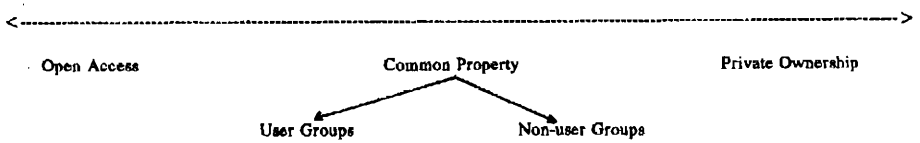

Figure 1. A continuum of land tenure institutions

Efficiency and equity implications

Efficient use of agricultural land requires:

(a) That farmers have an incentive to improve and conserve the land. This incentive is diminished if investors cannot capture all of the benefits generated by their investment.

(b) An efficient land market. If the land market is efficient land will transfer to the most effective farmers and lenders will accept land as security for loans. The market not only improves a farmer's ability to finance investments but also strengthens his or her incentive to invest as the land can be liquidated at any time.

Neither of these conditions is satisfied when access to land is open. First, the benefits of an investment made by an individual accrue to other users (free-riders) and second, the land market is constrained by high transaction costs because negotiations have to be conducted with a large number of users. These problems are only partly resolved when access to land is regulated by user groups. Following this logic, the conditions for efficiency are best satisfied when individuals or management teams (representing non-user groups) have exclusive rights to land.

It is often argued that efficiency is gained at the expense of equity. For example, if communal land is privatised, some farmers will not succeed and will have to sell out. Without land, these households are left destitute. This argument is much less convincing when applied to groups that purchase private land, and assumes that households will sell rather than lease out their land. It also ignores the welfare of consumers (who benefit when land is farmed properly) and prospective farmers (who rely on land markets to enter the industry and to 'scale the agricultural ladder').

Suggestions for future land tenure institutions

While a compelling argument can be made to partition farms bought by groups into smaller privately-owned units, it may not be feasible to fence and develop small areas of extensive grazing land. Likewise, it may not be practical to privatise communal grazing land.

In these instances, common property solutions would be preferable to open access situations. The user-group solution might be considered where small groups of farmers acquire freehold land from commercial farmers or from the State. Evidence presented by Olson (1971:54) and experience gained in New Zealand (Lyne, 1994) suggests that significant investment may be unlikely in groups comprising more than ten members. For large groups, the non-user group solution is recommended.

In New Zealand non-user groups constituted as private incorporations and business trusts promoted the productive use of Maori land without any loss in equity. An elected management team acts as trustee for members of a kinship group and is bound by a formal and transparent constitution. The constitution may forbid share trading outside of the group, and may prevent the committee from selling land. Otherwise, the committee is empowered to enter contracts. For example the trustees may hire a farm manager and labour or simply rent

the property to tenant farmers.

The profit or rental income is distributed to stakeholders, partly as cash dividends and partly in the form of services - like residential sites, housing, schools and clinics. Over time, dividends have become less important as services provide benefits that are less subtractive. Maori commentators claim that this trend has added to the popularity of the approach as it resembles the original tenure system where land rights served primarily to provide social security.

The success of these private initiatives eventually persuaded the New Zealand government to abandon its 'Development Schemes', which involved state management of land under-utilised by its Maori co-owners, and to support the voluntary transfer of decision-making power to private trustees and body corporates. Today it vigorously disseminates information about organisational structures, arranges meetings where groups draft their constitutions, brokers settlements when conflicts arise, provides managerial training, and assists with office space. In short, the State shares the transaction and administrative costs of building these new institutions.

Conclusion

When large groups apply for soft loans to purchase private land, or claim land as compensation for property that was taken from them, every consideration should be given to the nature of the group. In particular, there should be evidence of a transparent and binding constitution, and the achievements of private institutions like companies and business trusts must not be overlooked. The implication is that beneficiaries must be given objective information about institutions that work, and helped to launch the organisation that they choose. If the State does not provide this support, restitution and redistribution may well convert freehold land into an unproductive open access resource. Success could establish useful precedents for policy initiatives in the homelands.

References

Lyne MC 1994. Ownership and control of Maori land: Some lessons for South Africa. Development Southern Africa (in print).

Olson M 1971. The Logic of Collective Action. Harvard University Press.

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LAND TENURE FOR SMALLHOLDER LIVESTOCK SYSTEMS

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Introduction

The natural resources of South Africa are such that extensive livestock production is the only option available on some 85 percent of the land. A long history of research among the developing communities suggests that the most favoured form of agriculture is based on livestock, backed up by some form of crop production, even in bio-climatic zones which would not normally be held to support crop production. This pattern has developed as a favoured production system over centuries of occupation by the African population and was in fact adopted by the early European settlers on their arrival in the country.

It is likely therefore that one of the main thrusts of the land reform programme will be some form of livestock production, backed up by more or less risky cropping activities, depending on the site conditions which would apply. It is likely that the bulk of the livestock enterprises will be small, at least initially, which means that the topo-cadastral survey and transfer cost of lots to individual farmers will be high, if not prohibitive. Further, the costs of developing the micro "ranches" would be unlikely to be recovered from cattle farming operations.

The commercial "norm" of freehold livestock farms being held by individual title does not, in these circumstances, appear to be financially efficient. An alternative approach is proposed here, involving mixed tenure tailored to each farm unit resettled, which approximates to a more robust version of the institutional arrangements which exist in the so-called commmunal areas of the country.

Principles and assumptions

The most important principle being adhered to in the development of the land reform process is that translocating individuals and communities will be responsible for the planning of the land-use and production systems to be adopted on their new land. The Land Reform Pilot programme makes provision for the funding of resource persons or institutions to enter into planning partnerships with the communities for this purpose. For the rest the process will be congruent with the principles underlying the RDP.

It is assumed that the bulk of applications will be from communities desiring to re-locate, rather than individuals, which introduces the institutional complexity underlying the purpose of this article. Individuals requiring land under the reform process present no more problems than those associated with any other individual transfer in the market.

This proposal, therefore, relates to clusters of households who desire to move and who will mostly have relatively small numbers of livestock.

Technical framework

Regardless of the various routes by which the stage may be arrived at, the land reform process will eventually involve an identified community associated with a specific parcel of land which it will take over. The land reform process requires that the community be responsible for planning the proposed land-use. This process will have to be initiated by a resource inventory to define the type and scale of farming activities available to the planners. The livestock potential will determine the number of households who can be translocated, according to a to-be-defined income standard, probably unique for each community. This livestock carrying capacity will feature as part of a contract between the state and the community, as will be described below. It will not be sub-divided into individual land-holdings but will be used as a common property by livestock owners.

Arable land will be demarcated and allocated according to a formula defined by the households in the cluster. Residential plots should be large enough for appreciable food production to be possible and should be sited on the best available arable land, including irrigated land if this available. The land surrounding the homestead is traditionally the best tended and most productive in the village for many reasons, including the fact that it is more easily protected from livestock and can be more efficiently worked than more distant land. Efficiency in the provision of services dictate that the homestead sites be assembled into villages rather than scattered over the landscape as is the preferred primordial pattern.

This arrangement implies that each household will have rights to three classes of land, with three quite different economic values to the user. It is likely, therefore, that the naturally appropriate form of tenure will vary between the three and will require differing treatment as is outlined below.

Institutional framework

The fact of the concentration of homesteads into villages for technical reasons means that the translocating clusters of households must have some clear and compatible association with each other to increase the probability of social success. This factor is likely to shape quite considerably the nature of the applications received.

Plainly, given the technical outline above, the land-tenure system governing the occupation of the land is a crucially important institution. Secure individual tenure of the high-value homestead sites and arable lots is a pre-requisite. The low-value grazing land can be held under a more flexible right of access. It is proposed therefore that the farm unit be owned by the translocating group under a form of sectional title, similar to that under which individuals own flats within a building on an urban property and have common rights and obligations on the property as whole.

Thus, the homestead and arable lots would be held in freehold by the individual, with a separate title for each lot. These titles could be traded as freely as in the traditional property market, with the exception that the community might stipulate prior approval of the purchaser. This is fairly familiar, and should present no major impediments to the reform process. In addition to the title deed land, each new settler would be entitled to an equal number of grazing rights on the commonage, the total number of which would have been determined by the land-potential assessment carried out in the planning phase. These rights would be purchased as part of the total land transfer package, in terms of the land reform programme provisions and would be freely tradable, as with the title-deed land.

A body corporate (currently recognised as a community trust) would be established to administer the rules of the association. These rules would be drawn up by the members of the body corporate with one important exception. The state has the obligation to protect the environment and the primary production base for future generations. It is common cause that as a result of past distortions in the land market, some element of subsidy will be required to give the new settlers a chance of success. In exchange for the subsidy, the state can reasonably demand a *quid pro quo* in the form of including in the rules of the association, provision for the protection of the environment, most specifically in regard to total stock numbers.

The body corporate would extract levies for its own operation and to pay the rates levied on farm properties by local government. It would also attend to issues of public goods such as bulk infrastructure and social services. It would act in regard to the rights and obligations of the total farm in every sense as the owner of that farm. It and its individual members would have access to all the services which individual owners would be entitled to in the area and would be obliged to participate in their public obligations as well.

This proposal presents a radical shift in responsibilities and benefits for the translocating settlers, compared to their experience in the traditional areas. It is of crucial importance therefore that the state recognises its institutional responsibilities and makes provision for a corps of specialist counsellors to facilitate the change process.

Conclusion

The anticipated desires of translocating settlers who do not have the resources to purchase viable units as individuals and the dictates of economic and finacial efficiency demand innovative approaches to land reform. The model presented here combines the accumulated experience of traditional communities and the familiar legal and administrative processes of the conventional property market. It provides an approach which may meet the requirements of the communities in terms of settlement patterns and land management, and those of society in terms of the preservation of the resource base. It is sufficiently different to require specialist assistance to the new farmers, for which specific provision should be made by the state. It also requires a recognition by the settlers of their obligation to society in return for the subsidy they have received.

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LIVESTOCK PRODUCTION, RANGE MANAGEMENT AND LAND REFORM IN SOUTH AFRICA

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Introduction

South Africa's agriculture is facing the prospects of wide and far reaching agricultural adjustments and land reform. Agricultural land reform will be determined by a complex set of conditions in the agricultural sector, political considerations, social determinants, the present status of land, macro-economic considerations and the constitutional framework and provisions. The position of livestock in the household economy of rural dwellers and the intricacy of communal land tenure systems compound this complexity. It is argued that this complexity will require a multi-pronged approach to land reform. Options and strategies to implement such an approach for livestock production on rangelands is briefly discussed in this paper.

Objectives for land reform programmes in South Africa

A land reform programme in South Africa will have to accommodate the following objectives: (1) to enable access to land for all, especially those who were previously denied such opportunities; (ii) to restore land rights to those who lost such rights without fair compensation; (iii) to ensure that those who utilize the land are placed in a position to improve their quality of life and welfare position; (iv) to ensure that agriculture is restructured to optimise its contribution to economic growth, food security and sustainable rural development; and (v) to attend to the needs of those who will either be negatively affected by agriculture and land reform process or not included.

Reality tends to impose trade-offs and compromises any land reform programme. It can therefore be expected that a balance will have to be struck between efficient land use requirements, the political need to provide for the "land hungry" and to restore lost rights, and fair redistribution to structure a sustainable system of agricultural land use.

Options and models

Options to support land reform can be categorised into market assisted and administrative/state assisted categories. Land seizure could be viewed as an alternative but it is argued that market and administration assisted options could ensure an effective rate of land redistribution. Land seizures will also create a unstable rural environment and should be actively discouraged (World Bank 1993).

Within the above categories, the following options can be considered for agricultural land reform (Van Rooyen *et al.* 1993). The acquisition and utilization of land is considered in these options. The options are biased towards market assisted procedures supported by administrative measures.

(1) *Farmer settlement schemes*

Farmer settlement strategies imply (at least a degree of) transfer of rights to assets and decision making to farmers. Prospective farmers can settle by buying (or leasing) land, livestock and other farm resources.

On these schemes farmers are often supported by a co-operative type of service unit responsible for creating access and the management and delivery of support services such as input supply, credit and marketing, processing, training, extension and counselling. Regulatory and administrative arrangements are also centrally coordinated.

(2) *Farmer Services Provision Programmes (FSPP)*

A farmer support provision programme is different from a settlement programme and it is primarily directed at those already farming, i.e. small-scale, part-time, full-time, male and female in developing situations in the homelands. The programme is therefore not a land provision programme *per se* but rather a support strategy attempting to alleviate constraints under which farmers are operating. In homeland areas and especially on lands under tribal/communal tenure arrangements, farmers operate under severe constraints, ranging from a lack of appropriate infrastructure and support services to security of production rights. An FSPP approach to land reform should thus be structured as a comprehensive package of institutional arrangements aimed at creating access to farmer support services. Access to land rights will be considered as one important element

of the programme. FSPP can be specifically structured to cater for the needs of livestock farmers/holders in these areas.

(3) *Private land acquisition (PLA)*
The direct transfer of land (and other assets) through the market is a cost effective process of transfer. Direct land transfers are now possible since the scrapping of the Land Acts. It will thus be strongly recommended that opportunities be created for the settlement of farmers through a system which will promote and facilitate normal land transfers through the market to new farmers in commercial areas. Even when the state is in possession of land, transfer to individuals to farm must be viewed as a potentially useful strategy. Access to funds to buy land remains a problem. The financial dilemma which is presently manifesting in commercial agriculture, strongly accentuated by the present drought, however provides opportunities for land reform. Various approaches, whereby financial institutions such as the Land Bank, commercial banks and the state can intervene, can be argued. Equity swop arrangements have been proposed by commercial banks. The exchange of indebted land to be used for land settlement programmes through debt settlement arrangements and foreclosures provides some alternative options.

(4) *Broadening the farm asset ownership base (BAB)*
Land reform can be extended to accommodate various asset sharing and transfer opportunities to landless groups in commercial farming areas. Farm workers, for example, can be included in profit sharing arrangements, equity acquisition schemes, co-ownership of the livestock herd, etc. Such arrangements will broaden the ownership base on commercial farms and will provide for farming opportunities to farm workers while maintaining productivity. This will address a major problem experienced by farm workers, i.e. that of wealth accumulation and security.

(5) *Increase the supply of farm land through Administrative Support Measures (ASM)*
The above models argue increased access to land through market forces and "willing buyer willing seller" interactions. These models, however may not provide sufficient land for reform purpose, which may activate various politically motivated responses (compare with present Zimbabwe experience) and land invasions. One alternative strategy to increase land supply could be nationalization. This approach, however is not supported in view of alternative, less costly and disruptive methods to increase land supply. Another method is that of informal land invasion. The problem with this approach is that it will damage any trust in normal land market arrangements and create disincentives to invest in farming. Methods to entice "willing sellers" to offer their land, through market transactions, for resettlement purposes need to be developed. Guaranteed "pension schemes" and long term rental schemes, tax incentives etc. could be considered (World Bank 1993). The problem, however becomes acute when "willing buyers" are confronted by "non-willing seller" landowners. Administrative support measures such as expropriation at fair compensation may have to be considered in such circumstances to avoid invasions and political threats. The emphasis, however should still be on market based incentives and procedures to match demand and supply.

(6) *Restoration of land rights: forced removals and historical claims - "dispute lands"*
An important area of action refers to the history of forced removals in South Africa, which is inextricably linked to the way in which the agricultural sector has developed. Some 1.3 million people were dispossessed of their rights to land in the white farming areas up to 1982. The need for appropriate administration and legal processes to address such claims is of vital importance in lending credibility to any land reform programme. Apart from the specific restoration of land issues, it can be argued that a general restitution for the "victims" of apartheid should include mechanisms to gain access to land. If such a policy is adopted, market based mechanisms should be favoured. One example is the provision of start-up and matching grants, up to a certain level, to assist land purchases and access to services (World Bank 1993).

Developing a strategy: selecting particular options
A workable strategy for land reform will depend on many circumstances. Reaching "constitutional comfort" and political commitment to a policy is important for a successful strategy and programme. Present land tenure arrangements, the status of land, possible land claims and the maintenance, and improved productivity must

be viewed as important factors in deciding on a particular option. The following is proposed for livestock farming:

(1) *Communal tenure (including tribal range lands)*
Practical considerations dictate that a FSPP approach be considered as an optimal strategy on land under communal tenure arrangements, especially as no reallocation of land rights is required where many are already involved in some form of farming. Evidence from FSPP funded by the Development Bank of South Africa (DBSA) shows that the provision of the appropriate farmer support services will activate market forces to generate an economic value for land and farm assets. Such forces will encourage market related land transactions.

The co-operative utilization of rangelands, whereby sound management practices and the required services will be introduced for the productive use of grazing resources, can be considered. Clear "rules" of rangeland management must, however be adhered to in order to restrict over-utilization of communal land. Communities should be fully involved in the design of schemes and the setting of rules to ensure a "compact" of accountability and ownership.

(2) *State owned land*
Livestock farmer settlement projects and the selling of land to individuals and groups can be considered on state land. Strategies should be directed to the provision of opportunities to fully fledged commercial farmers as well as emerging farmers and to support poverty alleviation schemes. Existing "squatter" situations will require careful consideration of models that might be appropriate.

(3) *Private land*
Private land acquisition, farmer settlement and farmer support strategies can be considered on privately owned land. Where government decides to acquire private land for the purpose of land reform the principle of fair and just compensation should apply. Direct ownership of land by government should, however be avoided. Beneficiaries should rather be supported to purchase land. Arrangements to include landless farm workers through profit and equity sharing schemes, lease arrangements, out grower schemes, etc should be seriously considered in commercial farming as measures to redistribute ownership while retaining expertise and productivity (Mckenzie *et al.* 1993).

(4) *Urban and peri-urban farming*
An obvious area for providing access to land is to be found in urban and peri-urban farming, for smallholding. At present some 850 000 ha of land around towns and cities in South Africa are zoned as agricultural smallholdings (presently occupied by whites while large mine land areas are available). Some 50 percent of these are mainly for farming purposes. This type of farming has major attractions, namely the proximity of markets for flowers, vegetables and meat and dairy products. Co-operative grazing schemes could also be considered. Urban agriculture is one of the avenues through which relatively large numbers of part and full time farmers could gain access to land and farming opportunities in a relatively short period of time. Zoning to protect high potential agricultural land from urban expansion needs to be instituted.

Conclusions
A South African land reform programme will have to attend to a complex set of issues, motives and situations. A clear framework of reference, linking options to issues, will greatly assist in "unpacking" this complexity in order to design effective support systems and to ensure a politically acceptable, productive and sustainable land reform programme.

A range of options can be considered for livestock farming schemes. Communal rangelands present an opportunity through the introduction of co-operative land-use arrangements and the required support services. It will, however be important to ensure full commitment from participants in order to create ownership and compliance to the "agreed upon" rules of the scheme.

References

McKenzie CC, Van Rooyen CJ & Matsetela T 1993. Options for land reform and funding mechanisms. FSSA Journal.

Van Rooyen CJ, Vink N & Mosebjane M 1993. Agricultural change, the farm sector and the land issue in South Africa. Dev. South Africa 10(1).

World Bank 1993. Options for land reform and rural restructuring in South Africa. LAPC conference on "Land Redistributions Options".

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OPTIONS FOR SUSTAINABLE ANIMAL HUSBANDRY SYSTEMS IN SOUTH AFRICA'S LESS DEVELOPED RURAL AREAS

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Any attempt to reconcile a healthy environment (achieved and maintained through the sustainable utilisation of land and other natural resources) with human economic development in South Africa's less developed rural areas is beset with difficulties. Foremost amongst these is the problem of satisfying biophysical criteria for sustainability at the same time that (a) chronic social and (b) land tenure problems are substantively addressed. The land tenure question, which revolves around the relative merits and local acceptance of private ownership, land rental or communal use (open access or community managed) of land, is particularly important in respect of the management of rangelands and grazing animals.

When dealing with land use systems in South Africa's less developed rural areas we need to take account of (a) the complexity of household economics, (b) community development imperatives, and (c) the problem of really knowing when the sustainability state is under threat. It will be immediately apparent that there is no simple answer, no one land tenure prescription, and no universal panacea for productive and profitable animal husbandry in these areas.

It is pertinent to suggest that sustainability might be approached in a pragmatic way, through unsustainabilty or non-sustainability. This implies identification and analysis of indicators of unsustainability, their underlying processes, and the focused efforts required to reverse the same to restore sustainability to a system. Sustainability is a dynamic (not static) phenomenon compatible with development; it focuses on the primacy of the natural resource base (a key integrative element of a productive system) which cannot be stretched indefinitely without degrading it; it recognises the need for a system or system boundary, in the context of which the phenomenon becomes operative; and it focuses on the crucial importance of intersytemic linkages (a product of prevailing socio-economic arrangements) that help in enhancing the system's performance. The loss of the above-mentioned ability of a system would mean the emergence of unsustainability which, in turn, implies the loss of prospects of inter-generational equity (due to the system's inability to maintain/enhance performance), or the reduced range and quality (production/welfare) of current options for the present generation compared to preceding ones.

There is considerable uncertainty in South Africa at the present time about what to do about land. Should the traditional system (state ownership, with allocation powers in the hands of traditional leaders) be maintained or should there be privatisation of land holdings? There can be little doubt that, in the not-too-distant future, privatisation is inevitable and entirely desirable. However, one of the central tragedies in the history of southern African land and natural resources management to date is that the debate on tenure has largely been restricted to a discussion of the relative merits of state or private property regimes. Policy has assumed two options, privatise or nationalise, ignoring the further option of a communal property regime (not an open access system), even if only as an interim measure on the way to freehold land tenure.

In Zimbabwe's 'communal' lands (37% of the country) where 60% of the population live, a system of 'indirect rule' was in place prior to independence and traditional leadership structures were supposed to play a role in land and resource management. But the ability of these traditional structures had been seriously eroded

by their tenure status. They and the constituencies were on state land with usufructural rights only; they had no powers of exclusion and access to certain natural resources (for example, wildlife) were denied to them. Thus the conditions for a genuine communal property rights regime were removed. Under these conditions, and with the state effectively unable to manage the resources, the use of resources tended to acquire the characteristics of an 'open access' system. It is not surprising, therefore, that the communal lands have been the scene of some of the greatest environmental degradation in the country. Exactly the same conditions can be found at the present time in South Africa. We have a situation right now whereby, on the one hand, some African leaders want to retain the traditional land control system because therein lies the power base of the traditional chiefs; on the other hand, the ANC-led Government is keen to introduce democratic local government and explore various land reform possibilities.

It is worth noting that the policy myopia in Zimbabwe referred to above, which envisaged only privatisation or nationalisation tenure options, has continued in the post-1980 independence era. Land reform programmes have taken a further 8% of total land surface out of private hands for the resettlement of communal land inhabitants, but these resettlement lands are state lands, and are occupied under tenure conditions which if anything are more restrictive to a genuine communal rights regime than in communal lands.

Reference has already been made to the distinction to be made between open access and common property resources. In those circumstances wherein a community does not have control over a state owned resource, the members of that community will inevitably compete for use of that resource and over-utilise it. In South Africa's less developed rural areas, forest areas, water resources and grazing lands often fall into the category of open access resources, with resultant over-use. It is interesting to note that in Nepal, communities that have been given control of previously owned state land and forest areas have introduced management systems that have had a remarkable impact in slowing down and, indeed, in many cases, halting the process of environmental degradation.

Traditional local community management structures are often an appropriate starting point for raising environmental issues, but alone may not be the most effective instrument for coping with the complex present day problems created by competition for space and overexploitation. Conflicts of interest within an increasingly heterogeneous rural community, as well as between communities and 'outsiders'; complex management issues; and effective decision making and control procedures all need to be dealt with. These complex issues may be beyond the capacity and the mandate of the traditional local community organisation. Hence, there may be a need for new organisations to be established, or the traditional local community authority may need to be upgraded so that it can effectively implement environmental management programmes.

Providing that locally acceptable property rights regimes (private and communal) and community management structures are in force, it is evident that sustained development of animal husbandry through appropriate management of feeding systems for what are normally considered to be extensive grazers (cattle, goats and sheep) can bring about economic betterment of the inhabitants of the less developed rural areas in South Africa. However, small-scale farmers need help if they are going to profit from livestock farming. Until relatively recent times, indigenous rangeland management practices withstood the test of time and were sustainable. But now, with increasing human population pressure on available natural resources and the breakdown of social controls and sanctions, these practices are no longer sustainable no matter what land tenure system obtains. People with grazing livestock require fodder resources; it has always been assumed that this requirement will be met by placing the animals on rangelands, that is, on extensive grazing areas. Governments, agricultural development agencies and farmers in a number of developing countries, particularly in South East Asia, recognised long ago that there is only one way to maintain a sustainable animal husbandry sector in respect of grazing animals in conditions wherein there is (a) high and increasing human population pressure on the land, and (b) a rapid and very desirable transformation of the land tenure situation towards private ownership, and that is to change from extensive to zero grazing (stall feeding) systems. Is it not time for researchers and extensionists, working closely with smallholder farmers, to give urgent attention to the transformation of pastoral systems in the less developed areas of this country?

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STOCK IMPROVEMENT AS A MEANS OF OPTIMIZING COMMUNAL OWNED LAND

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Over utilisation and mismanagement of communally owned land is a common phenomenon in the former "homelands" of the R.S.A. This over exploitation of the natural resources can mainly be ascribed to a lack of individual land ownership or a legal responsible body.

On a farm or ward of approximately 1500 to 2000 hectare there might be 120 or more family's with land rights, that is people with direct access to arable land and/or grazing rights for livestock. The average number of livestock per family in Lebowa is 4.55 LSU. This figure exclude goats and draft animals like donkeys. On average the whole of Lebowa is overstocked by 282 percent calculated on the 92/93 livestock census.

To analyze the origin of the problem the reasons why so many people want to keep stock must be determined. Livestock usage can be divided into three major categories.

(1) *Private slaughtering's.* The highest percentage of herd reduction is due to private slaughtering's. The overriding coarse is for ceremonial and mainly funeral and other death related purposes. It has been observed that each family keep at least one or two animals in readiness for this purpose. The animals that is slaughtered for this purpose were mainly old cows and oxen (Ramaboa 1993).

(2) *Selling for profit.* According to the statistics, stock sales come second to home slaughtering's. Most cattle were old unproductive animals and oxen. In times of real need a farmer would rather buy stock for slaughtering rather than slaughter his breeding cows, even in times of severe drought, breeding stock will rather die than be sold.

(3) *Other usage* includes milking and animal draught power and to a very lower extend, the repayment of debt.

With this in mind, communal land tenure can be divided into two separate categories; Stock farmers - those people that are farming for commercial purposes and with its sole income from farming. Stock owners - people that keep stock for traditional or ceremonial reasons, most of these people earn their living away from the farm.

To overcome the problem of over utilization a program of intensive extension was launched early 1983 to convince all communities to practice stock improvement. This has been an extension campaign whereby the benefits and advantages of better pasture and stock management, as well as the responsibility of ownership of the existing infrastructure on a farm, were promoted amongst all members of the community.

When the project was initiated most communities were unorganised and livestock tended to roam all over the farm wherever they wanted to go and or where there was available drinking water. Stock owners in a community had different stock numbers that varied from one to a few goats up to a hundred or more LSU. Rotational grazing and stock management practices, except for dipping were absent.

By organizing the community as a whole and let them form a committee of livestock farmers responsible for all the livestock in the ward. The purpose of such a committee are to perform a management task. Rules of conduct for the committee were made by the community and a constitution drawn up as a guide to the committee and the community to be used as a management guideline for the livestock in the ward.

The first major benefit was that the livestock farmers were separated from the stock owners. Decisions that ought to be made in concern with the natural resources and infrastructure were much easier. Stock farmers could be properly trained in farming and management skills. Rotational grazing could be practised with the co-operation of the community as a whole.

When such a project was started there were a great difference in stock numbers between the farmers in a ward. Due to a lack in the recovering of the grazing fees and the very low fees charged there was no control over the number of livestock a individual farmer could keep. This system leads to unfair utilization of the natural resources between stock owners. The fact that there were no limits enforced on the number of LSU per individual or even the number of families without agricultural rights, that also keep livestock, the natural resources were totally over utilised and exploited. There was no practical way to decrease the stock numbers

without a disadvantage to one or more farmers. After a few years of extension and training of the stock farmers in improved farming principles and leading them towards commercial and more productive farming techniques, they as a community started to decrease their stock numbers and kept only the more productive stock. Some unproductive animals were kept to be sold for ceremonial slaughter purposes.

During this stage the community moved towards the second phase where they decided to decrease there stock numbers to adapt to the carrying capacity. They also decided that every farmer will still have his own cattle but equal numbers. This is a better method of utilization of the communally owned natural resources without advantage to one or more farmers. The community also started to farm as a unit where maintenance costs and management responsibility's were shared.

Some of the community's decided that they will farm on a co-operative system where all the animals belonged to all the participating farmers. Cost, management, maintenance and profits were shared equally. Selection and selling of livestock increased while the stocking rate of the farm stayed within the natural limits.

Since 1983, sixty four different schemes were started, twenty three of these were fully functional and run by the community itself. Due to the political turmoil and severe drought of the past few years only twelve of these schemes survived without extension, even though there was no further development on some of the schemes neither were there any decrease in their functionality.

The biggest threat towards all of these schemes was trespassing of stock from the adjacent farms into the camps that were rested with good grazing. The secret of the successes of these schemes was that in every case the community as a whole were involved right from the start. All decisions taken were made with the concern and blessing of the community. The governments only role was that of extension, training and financial support to material in erecting the infrastructure where necessary.

Reference

Ramaboa 1993. People Involvement in Animal Agriculture in Lebowa. Procedings of the annual SASAS National states branch. Aventura Eiland, October 1993.

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POPULATION GROWTH, SCARCE LAND RESOURCES AND LAND REFORM IN A DEMOCRATIC SOUTH AFRICA: ARE THEY COMPATIBLE?

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Political change and proposed land reform in South Africa has focused attention on land ownership and current systems of land tenure. This has led to increased demands for access to land and an equitable land distribution. The government is faced with the challenge of aligning political expectations for land reform with food production considerations. Current debate on the land issue has centred on the rights of individuals or groups of individuals to land, and the restitution of land rights to previously disposed communities. This gives rise to inflated expectations and heightened demands for land. Interestingly, little consideration is given to the relationship between environmental suitability i.e. production potential, population pressure, and land ownership and possible redistribution.

South Africa, with some perhaps noticeable exceptions, is an arid country. Range dynamics are strongly influenced by seasonal rainfall patterns although management actions (e.g. stocking rate) also play a major role in influencing system dynamics and determining production potential. This is clearly reflected by the influence of rainfall patterns on agriculture and the broader economy. Superimposed on environmental variability is the spectre of population growth and increased pressure on diminishing resources. While land reform initiatives may consider population limitations, environmental suitability is often overlooked. Importantly, land reform options are strongly tied to both environmental and population factors. This paper outlines the relationship between environment, population and options for land reform (Table 1).

Table 1 The conceptual relationship between rainfall, population pressure and land reform options in South Africa

High rainfall/low population pressure * rainfall and productivity consistent * agricultural potential high * land privatisation/communal range-use * development of commercial systems	**High rainfall/high population pressure** * rainfall and productivity consistent * agricultural potential high * form of land privatisation * development of semi-commercial systems
Low rainfall/low population pressure * rainfall and productivity variable * agricultural potential low * communal tenure and nomadic pastoralism * multi-species systems	**Low rainfall/high population** * rainfall and productivity variable * agricultural potential low * extreme pressure on resources * agricultural options limited * need for integration with urban strategy

The suitability and economic efficiency of formal management systems in arid environments, even for commercial production, is questionable where stochastic rainfall events influence spacial and temporal patterns in productivity. Attempts to redistribute land on the basis of permanent tenure may perpetuate past failings and commit the state to an extension of a 'drought' subsidy system. Under low population pressure in areas, such as the Northern Cape, conditions may favour a form of communal land tenure where a high degree of mobility would reduce the risk of forage deficits. Here an incorporation of multi-species systems into existing livestock systems may further reduce risk. At the other extreme, such as the valley systems of KwaZulu-Natal, high population densities coupled with low and erratic rainfall leads to extreme pressure on resources and environmental degradation, both of which perpetuate subsistence conditions. Open-access conditions prevail with livestock stocked at ecological carrying capacity and productivity is directly related to rainfall. Ecological and social constraints provide a major challenge, severely limiting agricultural production potential, and options for land reform may be extremely limited. Land reform aimed at encouraging agricultural production is likely

to fail. Realistic expectations would be for small-scale settlement leading to urban development around major centres.

In contrast, in humid environments, rainfall and hence productivity is seasonally reliable and system dynamics are driven primarily by management. A highly productive system, coupled with low population pressure, provides a number of land reform options. Capital-intensive development and private land ownership, which would lead to investment in land improvement, or conversely communal tenure with strong community control of access to resources through grazing management associations, may be viable options. Similar environmental conditions, but with high population densities, does allow some options for land reform. Although the pressure on range resources is likely to be severe and open-access conditions may prevail, highly productive soils make such regions suitable for some form of land privatisation of communal grazing lands and the development of small-scale, semi-commercial systems.

The present government is faced with a unique opportunity to reverse the effects of 40 years of social engineering and bring about an equitable land distribution. The challenge, however, is to achieve this without disrupting agricultural production. Claims that one third of all commercial farmland should be redistributed within five years are politically expedient but are unlikely to be achieved, and the land aspirations of many South Africans may be frustrated, if land reform initiatives are not aligned with environmental and population constraints. Success will see the emergence of black commercial producers and enhanced agricultural production as a catalyst to economic development, failure will see a repeat of past mistakes where people were settled in large numbers on marginal land at enormous social cost.

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SUMMARY

Craig D Morris (Co-editor)

The following are the main points of summary:

1. Redistribution of land will most likely be effected through the transfer of both private and State-owned land to groups of beneficiaries rather than to individuals. Extensive subdivision will be costly and often impracticable.

2. Where land is to be transferred to individuals, normal market forces and administrative procedures can be employed, with some form of financial assistance provided where necessary.

3. Transfer of land to groups creates unique problems and opportunities.

4. The complexity of the rural household economy and traditional ownership pattern dictates that a single model will not be applicable to all situations. Therefore, a multi-pronged approach to land tenure will be needed, with options tailored to each situation.

5. Land reform initiatives should be aligned with environmental and population constraints. Certain forms of tenure may be applicable only to certain environments.

5. Historically, usually only the options of privatisation and nationalisation of land have been considered. Common-property (group ownership) options have received little attention.

6. Certain forms of co-ownership (i.e. "communal grazing"), where access is open or rules of access are not enforced, have been blamed for environmental degradation. However, co-ownership of resources need not lead to impaired productivity and overuse.

7. A range of co-ownership options are available for management of common property rangeland, including options where the owners are directly involved in the management of the resources or where management is left in the hands of a selected group.

8. A mix of tenure forms may be required, e.g. private (freehold) tenure of residential, garden and arable land and co-ownership of grazing land (with co-operative management).

9. Existing traditional institutions may have to be upgraded, or new institutions created, for effective management of common property rangelands.

10. Individuals should be allowed to participate fully in decisions regarding the form of co-ownership, as well as in the planning and implementation of grazing and livestock management schemes. Clear rules for common-property management need to be defined and enforced by the group.

11. The State should not own grazing land but should rather facilitate co-ownership institutions and assist with the provision of infrastructure, support services and finance.

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CONGRESS 30 KEYNOTE ADDRESS

SOUTH AFRICA'S SECOND LIBERATION: HOW TO MAKE RECONSTRUCTION AND DEVELOPMENT WORK

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Introduction

To many countries in the post-Cold war era the key issue is to bring about a stable and sustainable transition to political democracy. The so-called Washington consensus, namely that political democracy will automatically create the conditions for economic development and growth has now been proven an erroneous assumption. History has shown that there are indeed different routes to development: From political reform to development; from economic liberalisation to political reform; and a simultaneous process of political reform and economic liberalisation.

Only a few countries in the world, the G7-group and a few others, fall in the third category of political democracy and economic efficiency. Despite the progress with extending democracy to other parts of the world during the past 5-6 years, many countries are marked by civil wars, social unrest and social disintegration. The latter turn of events pose a new threat to the progress with political democracy.

The poor are vulnerable during political and economic transition

Despite the promise to improve living conditions, it is often the poor who suffer most during transition (cf Streeten 1994). In Africa political democracy has not changed the plight of the poor - in fact the continent is today poorer and more marginalised than before, conditions which are often being aggravated by Structural Adjustment Programmes (SAPs). In the former Eastern Bloc countries the quantum leap from centrally planned to free market economies, has left the poor unprotected and more vulnerable than before.

Having made a miraculous transition to political democracy, the challenge for South Africa is how to bring about sustainable democracy that will accommodate the diverse political aspirations; alleviate the most pressing development problems such as poverty, unemployment, inequality and environmental degradation (cf Coetzee 1994); and reduce the cycle of violence and criminality which has plagued the country during the past few years. These factors have led to a less than optimal risk classification of South Africa by international risk assessment agencies and they have exerted a direct influence on the prospects for overseas and local investment.

South Africa's Second Liberation

From the above it could be gleaned that South Africa's First Liberation has been more successful than had been expected across the globe. However, some daunting political, security, developmental and economic problems are still unresolved. This calls for a Second Liberation which may be even more challenging than the first one.

The Second Liberation will have to establish a plural democracy which will go beyond a mere integrationist model. The challenge for the future is how to live "in and with diversity" (Max-Neef 1994), giving a new content to ethnicity and to exploit the possibilities which corporate federalism could offer. The criminality and violence calls for a comprehensive approach, which entails both short and long term measures.

The rising tide of violence is in no small way linked to the developmental problems of the country. With all its potential, South Africa remains a highly unequal society with an unacceptably high incidence of poverty and unemployment. The focus of the Second Liberation will therefore largely have to be on socioeconomic transition of the country, i.e. reconstruction and development. Here some complex developmental and economic problems await us and, as the new policymakers have discovered, it will be no easy ride to the Second Liberation.

The legacy of apartheid and South Africa's First/Third World economic dualism has saddled the country

with vast development problems (cf DBSA 1994; Coetzee 1994a, and Coetzee 1994b). On the score of human development we are, with a human development index (HDI) of 0,73, ranked 68th out of 130 countries for which the HDI is calculated.

Some 19,0 million people are subjected to poverty and our illiteracy rate of 38,4 % is far to high for a middle income, medium human development country. The population growth rate of 2,4% per annum exceeds the economic growth rate, leading to a declining per capita income. The new wave of urbanisation leads to a mushrooming of informal settlements, also around platteland towns, and the housing backlog is approximately 2,1 million units.

With a Gini coefficient of 0,69, South Africa displays one of the skewest income distributions in the world. Land and asset distribution is particularly skewed in favour of whites and access to the economy is curtailed by economic concentration. The official unemployment rate of 19,4% is probably an undercount and a 20-30% unemployment rate is probably more accurate. Some 13,0% of the labour force is absorbed in the informal sector and 43,0% is outside formal employment.

What complicates matters for South Africa is the fact that a low economic growth rate of 1,99% during the 1980's has not created the material base for development. In fact, growth prospects for the immediate future are rather modest, with some economists putting it at not more than 2,8% per annum during the period up to the 1999 election. The economy also faces low savings and investment ratios, high government debt, high consumption expenditure (more than 20% of GDP) and balance of payments (bop) problems (cf RDP White Paper 1994; De Wet 1994).

De Wet (1994) contends that the bop imposes a ceiling of 3,0% real economic growth per annum on the South African economy. Given the fact that the bulk of South Africa's imports constitute intermediate and capital goods, at a real growth rate of about 3,0% per annum, the value of imports begins to overtake the value of exports (De Wet 1994: 307-308).

On the positive side, South Africa displays a well developed physical and financial infrastructure, management competence, excellence centres of teaching and research, a high level of technological development and comparative advantages in mining equipment, chemicals, petrochemicals, wine, fruit and beverages.

In summary, the above picture shows a country which may find it particularly difficult to bring about a process of sustainable human development. However, there can be very little doubt that we shall have to upgrade the human condition and create sustained economic growth. This will in turn require a process of economic restructuring and economic liberalisation to address the structural economic problems of the economy and to create new competitive advantages to keep South Africa competitive internationally.

Government's response to the above crisis

The new government's response to the above development crisis was to adopt a Reconstruction and Development Programme (RDP) as a comprehensive policy framework to combat poverty, unemployment and injustice. The RDP is based on the following principles (Reconstruction and Development Programme 1994):

- An integrated and sustainable programme.
- A human centred process.
- Peace and security for all.
- Nation-building.
- Linking reconstruction and development.
- Democratization of South Africa.

To execute the RDP five programmes, which are linked to one another, will be implemented:

- The satisfaction of basic needs.
- The development of human resources.
- Rebuilding the economy.
- Democratizing the state and society.
- Efficient and appropriate structures to implement the RDP.

Particular foci of the RDP basic needs programme include land reform, housing and services, water and sanitation, energy and electrification, telecommunication, transport, the environment, nutrition, health care and

social security and welfare.

The development of human resources include:
- A restructuring of education and training to focus on women and girls, pre-schooling, adult basic education and a new education system.
- A new arts and culture policy.
- Sport and recreation policy.
- Youth development and capacity building programmes.

The RDP submits that the above development programmes can only be addressed if the economy is restructured to focus on poverty, unemployment, deprivation, inequalities, gender inequalities and if economic concentration is countered by new competition practices and small business development.

Since the publication of the RDP base document, Government has issued an RDP White Paper which spells out the role of government, the economic policy framework, the financial constraints, the restructuring of the public sector, the planning framework and the way in which consultation, participation and capacity building should take place.

From the RDP White Paper it is clear that Government has moved considerably in its policy stances since the 1994 election. There is an understanding of the financial constraints and the RDP and RDP projects will have to be launched on the basis of "business plans". Yet, some concerns remain regarding a number of issues. These concerns are addressed in the last section of the paper which provides a framework of thinking on "how to make the RDP work".

How to make the RDP work

Human development versus human resource development

Government must be commended for developing an integrated and comprehensive development framework as a "people driven process" (RDP: 5) aimed at human development. However, to what extent will this process be people driven and will it be a true human development process?

Here one has to caution against a whole new bureaucracy and a plethora of committees and forums (cf White Paper 1994: pp 13-14) which have been established to manage the RDP. How much involvement will there still be of communities and the so-called civil society which played a crucial role during the liberation struggle. One finds only scant reference to civil society in the White Paper document. It is clear that Central Government will play a leading role in implementing the RDP in what may quite easily be tantamount to "institutionalized charity" (van Zyl 1994: 194). As van Zyl (1994: 194) has succinctly stated: "The basic choice is clear: empowerment or charity? Developing people or handing out physical facilities?"

Quite clearly development cannot be brought about by handouts. It should be development of, for, and by, people. People must be developed, become actively involved and be more self-reliant if true and lasting development is to be achieved. Local communities must be involved in the planning, implementation and management of development projects.

The above suspicion regarding the RDP approach to human development is strengthened by the RDP (1994: 58) reference to human resource development. This equates human development with "human capital theory", rather than to adhere to the contemporary view of human development "...as the improvement of human capabilities and capacities and to improve the range of choices of people" (UNDO 1990 and 1994). Human development focuses on human security, not only in a physical sense, but in a comprehensive way. It is pro-people, pro-jobs and pro-nature and seeks to protect the life opportunities of future generations, as well as the present generations, and respect the natural systems on which all life depends (UNDP 1994: 4). Sustainable human development also addresses inter- and intra-generational equity and seeks to enable all generations, present and future to make the best use of their potential (UNDP 1994: 17).

If approached in the above way, it is clear that a rethink is necessary to bring about human development which will avoid the pitfalls of past development exercises. A rethink regarding the meeting of basic needs also inevitable.

Meeting basic needs: The need to prioritize

The RDP quite correctly points to the importance of addressing the basic needs of the population. One should really applaud government for moving away from the growth doctrine and adopting a developmental framework.

However, closer inspection leaves the nagging question, especially in view of the lower than expected growth prospects, how are we going to satisfy all these needs within the context of scarce resources? Here a number of issues come to mind: What is basic needs, whose basic needs, who determines basic needs and how to deliver it? (cf van Zyl 1994).

The extended RDP list of basic needs includes jobs, land reform, housing and services, water and sanititation, energy and electrification, telecommunications, transport, environment, nutrition, health care and social security and social welfare. The question is however, which basic needs will have the greatest developmental effect and impact on the prospects for economic growth?

It is interesting to note that Streeten and Burki (1978) identified, as the basic needs, five core areas of: drinking water and sewerage, nutrition, shelter, health and education. In the debate of the 1970's (Coetzee 1980) controversy surrounded the inclusion of jobs, the environment and basic human rights.

Manfred Max-Neef *et al* (1989) adds an important dimension to the debate with his "human scale" development theory. He argues that it is not so much basic needs which are at stake but rather the question: What are the satisfiers of basic needs? He identifies subsistence, protection, idleness, creation, identity and freedom as the nine "deep-going", interactive needs which determine the quality of life. The question to Max-Neef is then: What are the satisfiers of these basic needs? According to this approach sustenance and shelter are the satisfiers of the need for subsistence and education a satisfier for understanding. The major advantage of his approach is that a methodology has been developed which brings representatives of communities together to determine their deprivations in all dimensions of human needs and to identify specific satisfiers to address them.

This resolves the issue of who determines basic needs - it is done in a bottom-up rather than top-down fashion. Despite the mechanisms of consultation envisaged by the RDP, one gets the uneasy feeling that basic needs are determined by central government rather than by communities themselves. Some of the centrally determined basic needs may indeed not be basic subsistence needs in some communities.

One of the unresolved issues is of course how to reach the poorest, i.e. the poorest 20-30% lowest income group, as envisaged by the ILO (1976). The RDP does not specify the poor, neither do we have data bases in the different provinces to identify these groups. This should be one of the highest priority areas of central and provincial governments.

But the basic needs approach should also seek to optimize its economic impact, i.e. create new job opportunities and income, generating economic growth as a prerequisite for social development at levels upwards of 8%. This is borne out by the literature on successful developing countries. As was explained above, the bop has imposed a ceiling on the level of economic growth at more or less 3,0% per annum (cf de Wet 1994). In addition the economy experienced a flight of capital since the mid-80's, a high debt ratio, low savings and investment ratio's, a low skills base, an inflation rate higher than those of our competitors and declining capital investment which has only started to improve in the past year.

The above structural problems point to the importance of restructuring the economy. The RDP White Paper (1994) should be commended for its prudent economic policy recommendations regarding investment, industrial, trade, fiscal and monetary policy. However, if the government gives effect to its intentions to provide services to the poor to satisfy the extended list of basic needs as specified in the White Paper, they may find it impossible to reduce consumption expenditure - in fact according to the Stellenbosch BEO (1994) it may indeed increase at a rate of 2,5% per annum. Although government capital investment is expected to grow at 10% this year, it may still be insufficient, given the backlogs which have built up (van Rensburg 1994).

What government will have to manage, is a balancing act between promoting economic growth and human development. This they are well aware of. However, the White Paper still does not come to grips with the challenge of liberalising the economy to improve economic efficiency and increase manufacturing exports (cf de Wet 1994). The past few months have witnessed a change in policy by government regarding privatisation, yet it is still very tentative and the policy package still displays overtones of nationalization in certain spheres of the economy.

Sustainable development: Has it been shelved?

Whereas the original RDP document (1994: 38-41) alluded to the importance of the environment for development, the White Paper (1994) totally ignores it. The international debate on development since the mid-80's has pointed to the importance of the environment for sustainable long term development and "...meeting the needs of the present generation, without compromising the needs of future generations" (World Bank 1992: 8). As the World Bank Report (1992: 8) on Development and the Environment has stated: "There is no difference between the goals of developmental policy and appropriate environmental protection. Both must be designed to improve welfare".

It is important to note that South Africa's environmental degradation takes place in both the urban and rural context. In the rural areas there are clear signs of population pressures on land and erroneous grazing practices. In the cities air pollution is increasing and rapid urbanisation pose a threat to water and other resources. It is therefore deemed prudent that the integrated development approach of the RDP should be a "sustainable development" approach.

The role of the state and other factors

Lastly the question can be posed: Who should be responsible for implementing and executing the RDP? The RDP document (1994: 80) refers to the leading and enabling role of government in guiding the economy and the market towards reconstruction and development". The White Paper (1994: 13-16) discusses the role of the President and an extended system of committees (Specialist Cabinet Committee, Core Committee, Standing Committee of Parliament, etc) and the role of Provincial and local Government (1994: 20-23) and forums (business, labour and NGO's).

Despite the reference to the role of other actors, one cannot escape the conclusion that central government is assuming the major responsibility for the RDP in a service delivery mold. This concern is confirmed by the reference to the important developmental role of NGO's during the apartheid years in planning, education and policy development but that "...Government, especially at local and provincial level, must now carry out these functions as part of its normal operations."

Whereas Government has a crucial role to -play in South Africa's development, and the argument which is developed here is not advocating the minimum states position, one really has to question the above approach to development since it raises expectations that development could be magically solved "from somewhere else"; it leaves the impression that individuals, communities and NGO's are not responsible for development; and it create very little room for local forums of self-reliant development. Although sub-regional and local development forums are envisaged (White Paper 1994: 49), it certainly is not a "people driven" process where people take charge of their own actions and destiny. At the moment the structures for local development are simply not in place in South Africa.

The RDP policymakers will be well advised not to smother local initiative, but rather to actively encourage it and to develop partnerships with the private sector (cf CBM 1994). The strategy should be for Government to select strategic interventions and to enable and facilitate local development and to put communities in charge of their own development actions. The RDP's proposals regarding support for small and medium sized enterprises is much more in line with this philosophy and should be extended to the other areas of development policy.

References

ANC 1994. The Reconstruction and Development programme. ANC, Johannesburg.

ANC 1994. The Reconstruction and Development programme. Umanyano Publishers, Johannesburg.

Buro Vir Ekonomiese Ondersoek, Desember 1994. Sake-Beeld. HOP drome sal nie so gou verwesenlik word nie - BEP, Sake-Beeld, Johannesburg.

Consultative Business Movement (CBM) 1994. Building a winning nation: Companies and the RDP. Ravan Press, Johannesburg.

Coetzee SF 1994a. Research and development in the North West Province. In: Woord en Daad, Summer 1994, 3-7.

Coetzee SF 1994b. Die herkonstruksie- en ontwikkelingsprogram: Enkele kritiese suksesfaktore (The reconstruction and development programme: Some critical success factors). In: Woord en Daad, Julie.

Coetzee SF *et al* 1994. A paradigm shift to make justice and social cohesion embrace: The case of South Africa. Paper presented at a UND Round Table on Social Integration (Stockholm).

Coetzee SF 1980. Die ekonomiese basisteorie geëvalueer binne die kader van resente denke oor die ontwikkelingsvraagstuk: 'n Toepassingondersoek vir Qwa-Qwa. D.Phil.-tesis, UOVS.

Development Bank of Southern Africa 1994. South Africa's nine provinces: A human development profile. DBSA, Midrand.

de Wet GL 1994. The RDP and a structural problem in the South African economy. South African Journal of Economics 62(4):307-332.

International Labour Office (ILO) 1976. Employment, growth and basic needs. A one-world problem. ILO, Geneva.

Korten DC 1990. Getting to the 21st Century. Voluntary action and the global agenda. Kumarian Press, Connecticut.

Max-Neef M ,*et al* 1989. "Human scale development: An option for the future". Development Dialogue Volume 1.

Max-Neef M 1994. Comments at the World Development Conference of the Society for International Development, Mexico City, April 1994.

RDP White Paper. Discussion Document 1994. CTP Book Printers, Cape Town, South Africa.

Streeten P 1994. Strategies for human development. Global poverty and unemployment. Handelshojskolens Forlag, Copenhagen.

United Nations Development Programme (UNDP) 1990-1994. Human Development reports. UNDP, New York.

van Zyl J 1994. What should government deliver in terms of the RDP? Africa Insight 24(3): 194-199.

World Bank 1992. Development and the environment World development report. Oxford University Press, New York.

World Bank 1993. The East Asian miracle. Economic growth and public policy. A World Bank Policy Research Report. Oxford University Press, New York.

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CONGRESS 30 PRESIDENT'S ADDRESS

KENNIS EN DIE WEIDINGKUNDIGE IN 'N VINNIG VERANDERENDE SUIDELIKE AFRIKA

KNOWLEDGE AND THE GRASSLAND SCIENTIST IN A RAPIDLY CHANGING SOUTHERN AFRICA

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Die onbekende toekoms wat vir Suid-Afrika en veral die landbou voorlê, skep juis geleenthede vol beloftes, wat nie net deur die Weidingsvereniging van suidelike Afrika nie, maar deur elke weidingkundige ten volle benut moet word. Alleen diegene en vakdissiplines wat kans sien om die uitdagings te aanvaar en kreatiewe denke in 'n vinnig veranderende politieke en finansiële omgewing te openbaar, sal oorleef. Daar moet nie net teen veranderinge in opstand gekom word nie, maar die oplossing lê eerder in die effektiewe bestuur daarvan. In die strewe na volhoubare landbouproduksie binne ontwikkelde sowel as ontwikkelende gebiede in suidelike Afrika, is dit van kardinale belang dat daar in die toekoms meer in die mens as hulpbron belê sal word. Die mens is 'n hulpbron wat se potensiaal nie net deur verskeie opvoedkundige instansies altyd ten volle ontgin word nie, maar ook deur ons as individue en as 'n Vereniging. Die Weidingsvereniging van suidelike Afrika moet homself heroriënteer na die besef dat sy grootste bate juis opgesluit lê in sy mense en nie slegs in die land se natuurlike landbouhulpbronne nie. Die waardevermeerdering van die mens as hulpbron lê veral in die verrykingsproses, wat hom met effektiewe denke en doenvaardighede toerus.

I wish to share with you the challenges, opportunities and adjustments that exist for developing and utilising the potential of the human resource (grassland scientist) optimally, and our contribution as members and as a professional society to this end. I see this involvement and task, which must be carried out with responsibility, in four aspects of knowledge, namely gathering, transfer, integration and implementation.

Gathering, transfer, integration and implementation of knowledge

All over the world universities and other tertiary institutions, experienced a period during which they were closely scrutinised. Financial pressure was exerted and searching questions were asked about their role and meaningful contribution to the benefit of the community. Now there is a new universal awareness of the important role that creative education and thinking can play in a world of rapid social and economic change. Criticism has now made room for new challenges. In South Africa too, one feels a spirit of expectation in the broad community in respect of a possible educational revolution.

Suid-Afrika staan voor 'n tydperk van vinnige en verreikende veranderinge wat al groter eise aan kennis insameling, oordraging, integrering en die toepassing daarvan gaan stel. Die ontwikkeling van menslike hulpbronne mag nie bloot net 'n reaksie van die owerhede op sosiale en ekonomiese druk wees nie. Dit moet deur die breë gemeenskap gesien word as 'n wyse waardeur ekonomiese groei bewerkstellig kan word, om ook neerslag te vind in sosiale vooruitgang. Dit is onteenseglik so dat die ekonomie en die opleiding, en die ekonomie en die navorsing, besig is om so te verander dat hul onderlinge afhanklikheid vinnig toeneem. Die rede hiervoor kan volgens navorsing gevind word in 'n globale magsverskuiwing wat plaasgevind het. Aanvanklik het fisiese oorheersing en militêre mag gedomineer, waarna monitêre oorheersing (die mag van geld) die meeste getel het. Vandag is kennis en kundigheid deurslaggewend, alhoewel finansiële en fisiese mag wel 'n outomatiese gevolg van kennis is. Hieruit kan afgelei word dat 'n kennisvoordeel tans die belangrikste is om 'n magsposisie te beding. Dit wil dus blyk dat Winston Churchill se opmerking "empires of the future are empires of the mind" profetiese woorde was.

Elke weidingkundige sal kennis moet neem van hierdie magsverskuiwing, dit ontleed en binne hierdie veranderinge nog sterker sy of haar doelwitte nastreef. Opleiding, nou meer as ooit tevore, is elkeen se mede-verantwoordelikheid en eis 'n breë betrokkenheid, nie net van die gemeenskap nie, maar ook van ons

as Vereniging. Die weidingkunde dissipline vorm 'n fundamentele faset in die opheffing van landelike verarmde gemeenskappe in suidelike Afrika. Weidingkundiges word toenemend gekonfronteer met uitdagings om meer betrokke te raak by landboukundige en sosio-ekonomiese veranderinge binne ontwikkelende gebiede, in 'n poging tot die opheffing van hierdie gemeenskappe. Elkeen moet die geleentheid hê, maar ook 'n verpligting om 'n bydrae te maak.

'n Land se kennisfabrieke naamlik, skole, kolleges, technikons en universiteite word deur hierdie magsverskuiwing, van die mees strategiese aktiwiteite. Ons kennisfabrieke waar mense toegerus word met insig en vaardighede, is nou net so strategies belangrik as wapenfabrieke toe bloot militêre mag getel het. Hierdie kennisfabrieke sal hulle moet instel om die gemeenskap wat hulle bedien, 'n magsvoorsprong te gee, wat ekonomiese groei en sosiale vooruitgang sal verseker. Die WVSA moet hom van tyd tot tyd vergewis of daar nog aan 'n suksesvolle weidingkundige se behoeftes, in hierdie snel ontwikkelde wêreld met sy asemrowende tegnologie, deur hierdie kennisfabrieke voldoen word. Weidingkundige behoeftes, asook vereistes van die omgewing en natuurlike hulpbronne behoort aan die kennisfabrieke deurgegee te word, waarin die Vereniging in die toekoms dalk 'n verpligte rol sal moet vervul. Daar moet nie voorskriftelik opgetree word nie, maar slegs raadgewend.

In the rapidly changing economic and social environment in southern Africa, it is essential that agricultural institutions should reconsider how they are going to develop their students' potential in agriculture, such that they will show a strong commitment to quality of life, equity and excellence in work. In an era of rapid change, agricultural educational institutions are facing the challenge of making their education programmes relevant and cost-effective without sacrificing standards. The challenges in agriculture requires a fresh evaluation of existing curricula. New models are required for updating and upgrading the skills and competence of South African agriculturists, for both the commercial and communal farming sectors. Education is a strategic issue in the competitiveness of southern African agricultural industries. In the face of economic recession and budget cut-backs, agriculturists will have to be trained to do more for their discipline with the same inputs. I believe that such educational changes will definitely affect future membership of the Society.

In order to educate a grassland scientist successfully, certain basic requirments are expected of an educational institution, namely

(1) excellent scientific education must be given, which will effectively serve the grassland science and the profession;

(2) skills must be developed in students to enable them to compete successfully in the labour market, or to be a successful entrepreneur;

(3) the institution must keep up to date with the latest developments in the field of pasture and grassland science at all times and must implement such developments in the education programme; and

(4) the student must be developed as a total person, and professional ethics must be promoted.

Every country which is serious about the optimisation of its agricultural sector for the sake of promoting economic and social welfare, will treasure its agricultural research system. I trust that the South African government, totally dedicated to a programme of reconstruction and development, fully realises the indispensable role the agricultural research system will have to play in southern Africa, and will therefore support it with confidence. To allow the agricultural sector to fulfil its role in a well-coordinated and well-directed development programme, the following established facts should be taken into account: (1) the history of the world has shown that development is based on the availability of applicable technology; (2) applicable technology is the result of well-directed, effective and dedicated research, and (3) effective research is only possible when sufficient resources for that purpose, namely expertise, infrastructure and funds, are available.

Over the past few decades grassland science and resource-oriented research did not receive the attention it deserved. The research carried out by limited manpower with limited funds, was fragmented and uncoordinated without a purposeful plan of action. The likelihood that the financial and manpower position will improve in future is slim, and therefore the time for doing research for the sake of research is gone.

Research should be undertaken for the benefit of the agricultural industry and the community. Consquently there has been a radical re-think with regard to sponsorship (cut-backs) of agricultural research which directly affects our Society. There has been a worldwide shift in emphasis from subject-oriented to problem-oriented, applicable and integrated research, which will eventually have economic advantages for agriculture and the community. The GSSA should act as a forum for communication between all its members, where we can improve our skills and knowledge and where the discipline can set standards and norms to achieve a unity of purpose.

In the field of research, the grassland scientist should strive to meet the following basic objectives, namely

(1) to make a contribution to the development of pasture and grassland science by means of effective, basic and applied research of a high standard;

(2) to develop new technology;

(3) to promote cooperation between grassland scientists and to develop specialist expertise;

(4) to furnish the agricultural industry with the required knowledge for the optimum utilisation and conservation of the grassland ecosystem; and

(5) to produce high-quality scientific publications, but also popular publications that serve the public and farming community.

Interdissiplinêre samewerking op landboukundige gebied raak weens die beperkte mannekrag, opleidingsgeriewe en fondse 'n vereiste. Hierdie beter samewerking sien ek as koördinering op drie fronte, naamlik

* die tussen verskillende wetenskaplike dissiplines,
* verskillende opvoedkundige inrigtings en dié
* tussen verskillende voorligtingsaksies.

Beter samewerking tussen verskillende wetenskaplike vakdissiplines kan nie oorbeklemtoon word nie, omdat die belangrikheid van die werk as weidingkundige, daarin lê dat dit multidissiplinêr is. Die weidingkundige dien gewoonlik as skakel tussen baie vakdissiplines deurdat op die omgewing/plantinteraksie, die plant/dierinteraksie of ook meer komplekse interaksies soos die plant/dier/menskompleks gewerk word. Solank almal binne die Vereniging hulle werk met die korrekte professionaliteit hanteer, sal die gevaar nie bestaan dat weidingkunde sy identiteit sal verloor nie. Daar moet daarteen gewaak word dat professionaliteit nie slegs gemeet word aan bloot akademiese kwalifikasies nie, wat so maklik verkeerdelik gebruik kan word. Net soos landsgrense in die wêreldgemeenskap besig is om te vervaag, moet kompartemente in navorsing en opleiding uitfaseer word.

Indien op landboukundige gebied, werklik vordering met tegnologie-skepping en -oordraging gemaak wil word, wat nodig is om die natuurlike landbouhulpbronne doelmatig te benut en te bewaar, is 'n veelsydige spektrum van opleidingsinstansies nodig. Alhoewel elke landbouverwante opvoedkundige inrigting sy eie fokus het, behoort daar beter koördinasie tussen hulle te wees, waarin die WVSA as fasiliteerder vir weidingkundige opleiding behoort op te tree. Daar word met groot verwagting uitgesien na die nuutgestigte nasionale Landbouopleidingsraad (South African Board for Education and Training in Agriculture - SABETA) se inisiatiewe om beter koördinering binne die RSA in die hand te werk. Hierdeur kan oorvleueling uitgeskakel word en daar kan meer taakgerig opgetree word, sodat dit sal lei tot meer koste-effektiewe opleiding. Dit is belangrik dat die klem by sommige instansies op markgerigte landboukundige opleiding sal val. Sekere instansies moet weer fokus op loopbaanspesifieke opleiding, maar met 'n buigsaamheid wat dit vir die afgestudeerde moontlik maak om aan te pas by 'n veranderende omgewing. Die weidingkundige moet dus toegerus word met meer as blote vakkundigheid. Daar moet voorsiening gemaak word vir aanvanklike onderwys, sowel as voortgesette opleiding, asook vir lang en kort kursusse, asook vir die koördinering en inisiëring van internasionale samewerking. Die professionele leiding wat die WVSA behoort te bied, moet soveel aansien by landboukundige opleidingsinstansies geniet, dat spontaan na die Vereniging opgesien sal word

vir die moderering en evaluering van kurrikula en sillabusse binne die weidingkunde dissipline. Lede van die Vereniging moet die inisiatief neem in die motivering van opleidingsinstansies om tot so 'n besluit oor te gaan.

Binne 'n kontinue spektrum van onderrig- en opleidingsgeleenthede is dit van minder belang of landboukundiges vanuit 'n universiteit, technikon of 'n kollege kom. Die belangrikste is dat opleiding en navorsing van hoë gehalte beskikbaar is, wat mense oplewer wat 'n bate as landbou- en weidingkundiges sal wees. So 'n benadering sal dit moontlik maak om beskikbare hulpbronne vir opleiding en navorsing meer effektief in te span met maksimum mobiliteit, deur middel van koördinasie en integrasie tussen sektore en instansies. Venootskappe tussen instansies wat die opleiding, navorsing en voorligting aanbied, en dié wat fondse en dienste kan voorsien, sal 'n natuurlike uitvloeisel hiervan wees. Hier moet die gevaar van akademiese snobbisme en selfvoldaanheid nie misgekyk word nie, want dit kan lei tot stagnasie en uiteindelik wetenskaplike agteruitgang.

Dit is nie slegs wetenskaplike en tegnologiese kundigheid wat vir 'n weidingkundige belangrik is nie, maar ook kommunikasiekunde, bestuursvaardighede en mensekennis. Daarom moet die verskillende vakdissiplines nie teen mekaar afgespeel word nie, maar eerder saam deel vorm van die totale kundigheidsbasis wat nodig is om sukses te behaal, veral ook in terme van die Heropbou- en -ontwikkelingsprogram van die Suid-Afrikaanse regering. Dit sal uiteindelik lei tot die ideale situasie waar mense se waarde nie slegs van hul kwalifikasies sal afhang nie, maar veel eerder van hul vermoëns. Mense sal beoordeel word volgens die bydrae wat hulle kan maak en nie slegs volgens 'n dokument wat sê waar en wat hulle studeer het nie. Daarom is dit ook 'n strewe van die WVSA om deur sy lidmaatskap en aktiwiteite, 'n breë spektrum van suidelike Afrika se gemeenskap te betrek.

Although the Society did not pay much attention to the developing areas of southern Africa in the past, the first steps were taken in 1992 with the founding of the Developing Areas Branch of the Grassland Society of southern Africa. While there is certainly a need to maintain the solid scientific basis of grassland science, the approach to problem-solving in developing areas may differ from that applied in developed situations. This may require a re-evaluation of the type of tertiary education which grassland scientists receive, and may include increased emphasis on the socio-economic aspects of rangelands and objectives of use other than for commercial production. The belief that developing areas require a reduced research effort input is false. An imaginative and innovative approach is required for grassland scientists to contribute meaningfully to the challenges facing subsistance, small scale and communal farmers. In these developing areas the emphasis should shift from a prescriptive approach (where the resource is conserved), to a development approach (where people are developed). Reconciliation should always exist between conservation and development. The Developing Areas Branch of the Society will in future serve as an important forum, from where research and information needs for the developing areas can be identified and discussed. Although contact has always been maintained with many countries within the southern African Development Community (SADC), recent political changes in South Africa have ensured our full return to the southern African community. However, members of the GSSA sometimes find it difficult to get government funding for attending congresses, symposia and conferences in SADC countries.

Wat gemeenskapsdiens betref, behoort die volgende van 'n suksesvolle weidingkundige verwag te word, naamlik

(1) dat die weidingkundige kennis, kundigheid en vaardighede deurlopend tot beskikking van die landboubedryf gestel word en

(2) dat hy of sy betrokke sal wees by die bewaring van die weidingekosisteem deur die beskikbaarstelling en verspreiding van inligting.

Gemeenskapsdiens vorm die hoeksteen van ons betrokkenheid met die publiek daarbuite, wat nog nie almal weidingkunde as 'n professie beskou, soos waarna ons streef nie. Vir die voortbestaan van die mens is dit belangrik dat ook die stedelike, plattelandse en veral die ontwikkelende gemeenskappe emosioneel gereed gemaak moet word vir die bewaring en volhoubare produksie van die bodem. Dit is belangrik dat die ontwikkelende landbou ten doel moet hê, die versekering van 'n balans tussen die volhoubare produksiepotensiaal van natuurlike hulpbronne, sosio-ekonomiese vermoëns, bevolkingsgrootte en bevolkingsgroei. Dit is juis hier waar die WVSA 'n geweldige taak het om 'n duideliker persepsie van die weidingkunde dissipline

en hulpbronbewaring by die algemene publiek en die owerheid tuis te bring. Hierdie heroriëntering behoort reeds by die jeug te begin. Die eenvoudigste weidingkundige hulp aan 'n skolier of student, moet nooit as te gering geag word nie. Die Vereniging moet deur middel van gereelde strategiese beplanningsaksies, hom beywer vir die deurlopende bemarking van die dissipline. Dit is ook belangrik dat boer, navorser en voorligter mekaar moet vind en elkeen se goedertrou aanvaar.

Die verhouding waarin die mens tot sy omgewing staan, dui volgens Erasmus (1990) op sekere stadia van ontwikkeling, naamlik

mens/self, mens/medemens/gemeenskap, mens/dier, mens/plant, mens/grond, mens/water, mens/lug en mens/see.

Volgens hierdie model sal 'n individu eers in homself belangstel, dan in sy medemens, totdat hy buite homself tree en begin belangstel in die lotgevalle van komponente van die sisteem wat verder van hom verwyder is. Die mees ontwikkelde verhouding is die een waar die mens bekommerd is oor die lotgevalle van dinge wat niemand kan besit nie, soos die lug en die see. Die mens word dus al hoe minder selfsugtig. Die omgewingsetiek waarna 'n land behoort te streef, is juis laasgenoemde. Sommige lede van die bevolking of gemeenskap mag bly vassteek in vroeë stadiums soos byvoorbeeld mens/gemeenskap, wat dan die omgewing ignoreer of mens/dier wat dan die res ignoreer. Dit is baie belangrik dat hierdie aspekte wel deur die Suid-Afrikaanse regering in die Heropbou- en -ontwikkelingsprogram verreken sal moet word, omdat die land se grondgeskille (herverdeling, -vestiging, besitreg, eienaarskap en mees geskikte grondgebruik) sentraal staan tot die opheffing van landelike verarmde gemeenskappe.

Weidingkundiges sal ook in die internasionale arena hulle bydrae tot 'n al groter mate moet maak, nie net tot voordeel van hulleself nie, maar ook tot dié van ons Vereniging. Dit is dus net so belangrik dat opleiding en navorsing 'n uitwaartsgerigte benadering by weidingkundiges moet vestig. Dié persone wat die insig en vaardighede het om internasionaal te kompeteer, sal ook in verhouding daartoe vergoed moet word. Indien tersiêre landboukundige opleidings- en navorsingsinstansies dus nie in staat is om uitblinkers voor te berei om internasionaal te kompeteer nie, sal nie net individue nie, maar die hele gemeenskap daaronder ly. Die WVSA behoort presteerders binne die weidingkunde dissipline nog meer uit te lig. Hier moet dit nie net gaan oor voortreflike navorsing nie, maar uitblinkers op die gebied van onderwys en voorligting moet ook erkenning geniet. Daar is niks wat iemand meer kan motiveer as om erkenning aan hom te verleen vir prestasies gelewer nie. Hierdie erkenning moet ook deurgetrek word na primêre, sekondêre en tersiêre onderwys. Die instel van studiebeurse aan voornemende weidingkundige studente is iets wat dalk op die Vereniging se weg lê, waarin die opbou van 'n Trustfonds 'n groot rol kan speel. Indien dit nie reeds op voorgraadse vlak aangebied kan word nie, is dit op nagraadse vlak 'n hoë prioriteit.

Weens die snelle groei van die WVSA en die besonder baie jong navorsers wat lede daarvan is, het die senior navorsers nog meer as ooit tevore 'n verantwoordelikheid, maar ook 'n verpligting om hulle kennis en ondervinding aan jonger, onervare navorsers oor te dra. Die innoverende denke van jonger navorsers moet net nie oor die hoof gesien word nie. Met die regte leiding aan hulle, kan hierdie Vereniging net van krag tot krag gaan. Ons moet krities wees, solank dit net opbouend is. 'n Suksesvolle navorser moet oor die volgende drie eienskappe beskik, naamlik

* hy moet kan begin,
* moet kan werk (verkieslik in 'n span) en
* moet kan ophou of saamvat.

Toekoms van die vereniging

Die Weidingsvereniging van suidelike Afrika het gegroei van 122 lede en 14 lede-organisasies tydens die eerste kongres in 1966 tot meer as 600 lede en 24 lede-organisasies tans. Almal sal saamstem dat ons Vereniging met sy 30ste kongres wel goed gevestig is en daar baie vermag is. Ons geniet internasionale erkenning, ons het 'n suksesvolle Tydskrif en Bulletin, lede kan registreer as 'n Professionele Lid van die Vereniging, daar is verskeie projekte wat geloods word om weidingkunde se beeld na buite te verbeter en ons probeer die boodskap na die uiteindelike verbruiker, naamlik die boer uit te dra. Ten spyte van alles wat reeds bereik is,

kan ons nie bekostig om selfvoldaan te wees nie. Elke lid van die Vereniging behoort in die nuwe Suid-Afrika ernstig na te dink oor sy of haar bydrae en betrokkenheid tot die uitbouing en instandhouding van die Vereniging, sodat ons nie net in getalle sal groei nie, maar ook in uitsette.

'n Ernstige beroep word gedoen dat weidingkundiges in die WVSA se tydskrif sal publiseer, eerder as in internasionale tydskrifte. Die tendens mag wel bestaan dat in die evaluering van navorsingsuitsette, artikels wat in oorsese tydskrifte gepubliseer word, deur verskeie instansies hoër aangeslaan word as publikasies in plaaslike tydskrifte. Dit mag ook skyn dat oorsese publikasies beter in navorsers se Curriculum Vitae vertoon. Veral vir akademici is dit belangrik om in tydskrifte te publiseer waar hulle navorsing so wyd moontlik gelees en aangehaal sal word. Dit het tot gevolg, dat in die evaluering deur die Stigting van Navorsingsontwikkeling (SNO), publikasies in oorsese tydskrifte 'n groter bydrae tot die toekenning van navorsingsfondse maak. Ten spyte van bogenoemde, het elke lid van die WVSA 'n eerste verpligting ter ondersteuning van sy eie tydskrif, met die besef dat die onmiddellike voordeel dalk nie so groot mag wees as dié wat dit vir die toekoms sal inhou nie. In die Tydskrif van die WVSA moet daarna gestreef word om die weidingkunde dissipline uit te bou, maar net so belangrik is om die behoeftes van sy lede te bevredig. Groter begrip en ondersteuning is absoluut noodsaaklik in die beoordeling en keuring van Afrikaanssprekendes se voorleggings vir publisering. Swak taalgebruik mag nie meebring dat hoogswetenskaplike navorsing, wat van groot nasionale en internasionale weidingkundige waarde kan wees, dalk afgekeur word nie. Landboukundige opleidingsinstansies behoort dit ernstig te oorweeg om kursusse oor die evaluering en skryf van wetenskaplike artikels in hulle kurrikula in te bou, wat tot voordeel van alle vakverenigings sal strek.

Die WVSA sal soos reeds uiteengesit die vinnig veranderende politieke en finansiële omgewing op geen manier kan ontkom nie. Dit is dus noodsaaklik dat die Vereniging in die nuwe Suid-Afrika, 'n groter bydrae tot ontwikkelende landbou sal moet maak, sodat dit kan bydra tot verwesenliking van die Heropbou- en -ontwikkelingsprogram van die regering. Die vinnige herverdeling van landbougrond wat deur die Suid-Afrikaanse regering en streekregerings beplan word, laat die vrees ontstaan dat 'n magdom nuwe boere wel grond gaan besit, sonder die nodige landboukundige agtergrond en opleiding. Hierdie aspek dui op die absolute noodsaaklikheid ter bevordering van toekomstige landbou opleiding en kennisoordraging aan nuwe boere, asook duideliker beleidsuitsprake oor nie-formele en gevorderde formele tersiêre landbou opleiding en navorsing deur die sentrale en streeksregerings. Die bystand wat die Vereniging in hierdie verband kan bied, is deur die fasilitering van nog meer gekoördineerde en geintegreerde simposia, prestige boere- en inligtingsdae binne en tussen die verskillende streke. 'n Algehele nuwe strategie is nodig om veral nuwe boere by die weidingkunde dissipline te betrek. Die insluit van meer ontwikkelende gebiede sessies en boereforums tydens die jaarlikse kongres van die Vereniging, soos die afgelope paar jaar die geval was, is saam met die Ontwikkelende Gebiede Afdeling van die Vereniging, baie belangrik vir ons betrokkenheid met ontwikkelende landbou en behoort nog verder uitgebou te word.

The GSSA must be developed so strongly professionally, that the policy makers at all levels in agriculture will turn to us for advice and guidance in decision-making on grassland science matters, and on land issues. We can indeed not remain silent on these issues. The Society although reimaining politically neutral, has a role to play in this debate by providing a forum for the exchange of ideas through conferences and symposia, the Journal and, most importantly, the Bulletin. This presents an enormous challenge to each member of the Society to act professionally at all times to ensure that we are accepted, recognised and ensured a right of existence.

In seeking to fulfil its mission and desire to continue existing as an autonomous, professional organisation, the GSSA should always concentrate on taking note of the changing circumstances and challenging times in which we find ourselves. According to Charles Darwin, "you can adapt, mutate, migrate or die". By acting innovatively the GSSA has the ability to remain dynamic and be a representative leader to the benefit of every grassland scientist, the community it serves, and eventually the entire southern Africa. The GSSA should now embark on an active outreach campaign to increase membership, influence and the status of the discipline, within the region and Africa as a whole. This is important because it will strengthen our relationship with sister organisations elsewhere in the world. Too much is at stake, to allow delimitation and artificial hierarchies to undermine the objectives of the Society. It will not be possible for education/training, research, extention and community service to stand up to the new agricultural challenges in southern Africa without effective coordination. In southern Africa a wealth of undeveloped potential is locked up in the human resource, which must be unlocked and developed in future in order to obtain sustainable agricultural production

from grassland and cultivated pastures in developed and developing areas. If all in the agricultural community do not use the natural resources in a sustainable manner, people from outside agriculture and perhaps from outside the country, may prescribe to us how it should be done.

We look forward with excitement to the initiatives that will flow from our Society in future. With the right approach and pride in of the Grassland discipline, a bright future awaits the Grassland Society of southern Africa. Such a positive attitude should include all the aspects in the following quotation:

> "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 finds spiritual, mental and bodily satisfaction, and the medium in which he offers himself to God."
>
> Dorothy Savers

Verwysings

Erasmus T 1990. Public accountability. Veld Trust Conference on the conservation status of agricultural resource in the RSA, Pretoria. 19 October.

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YOUNG SCIENTIST AWARD

On application, previous recipients of the "Best Young Scientist Award" will be able to receive a certificate to that effect. Please contact the Secretary, GSSA.

CONGRESS 30 PAPER ABSTRACTS

PROBLEMS FACING THE EMERGING FARMER
Land: Its Acquisition, Ownership and Utilization

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This paper deals specifically with the South African situation, where land reform is high on the government's political agenda. Where necessary, however, examples are drawn from the experiences of other countries in Southern Africa.

Access to land (acquisition, ownership and utilization) is the most important issue facing South African agriculture, with particular reference to historically disadvantaged communities. At the heart of agricultural transformation is the question of security of tenure, which affects efficiency and, Ipso facto, production. Re-distribution of agricultural land to accommodate emerging farmers will be meaningless unless it offers them real security as opposed to the uncertainties of "Permission to occupy" and "Right to use" practised under the old dispensation.

The advantages and disadvantages of communal tenure, which is closely associated with chieftanship, need to be examined with a view to increasing production, protecting the environment and stabilising rural communities.

Apropos of land surveying and convenyancing in townships and rural areas, I fully concur with the views expressed by Leon Louw (Free Market Foundation) in the STAR of 26th June, 1991:

"Declare all blacks who lawfully occupy land in "black" areas to be the owners without any prior requirement for surveys or Deeds Registration."

For efficient and sustainable agricultural production, access to land needs to be dovetailed with training, credit availability and technology transfer which are not the topics for this presentation.

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THE COMMUNAL FARMER AND LAND REFORM

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The agricultural debate is dominated by two issues: land reform and food security. Communal farming plays a significant role in both issues. Preliminary results from a research programme into the demand side of land reform indicate that for many poor communal communities land reform means resettlement of part of the community on previous commercial farms or expanding their current commonage by adding commercial land unto it. Great expectations exist that the land reform programme will provide more land for communal use. This is a reality that cannot be ignored, and the need for this kind of land reform will have to be satisfied. At the same time it will enhance the entitlement side of the food security equation by expanding food production for own consumption. It is furthermore important to realise that land reform should not only deal with the inequities between white and black, but also with the inequities of communal land use as currently practised. Within the communal system access to agricultural resources are highly skewed. Reforms in the communal sector should take cognisance of the following characteristics of the system. Communal farmers face a set of inter-related problems which are primarily of an institutional rather than a technical nature. Some of these are: agricultural policy paradigms favouring food self-sufficiency rather than food security; inadaquate infrastructure; unsecure tenure; lack of an appropriate legal framework for the use of common property; and poor access to information. Pastoral agriculture is not primarily intended to provide cash income, but rather for (i) domestic purposes from which the community as a whole often benefits (ii) as capital investment, and (iii) as insurance. Direct and indirect losses due to poor condition, low conception rates, high pre-weaning mortality rates, and inappropriate drought relief schemes is the major problem faced by livestock owners. Livestock owners do not derive full benefit from their livestock. The major reasons for this erosion of their benefits are the absence of a legal framework regulating the use of common resources (access control to grazing is more important than rotational grazing), and the lack of fodder flow planning by the farmer (integration with arable and/or supplementation). So-called upgrading of indigeneous livestock with unadapted breeds have further aggravated the situation. The dominant farmer perception (in our studies) on veld management is that they require more land. Stock reduction is not even considered an option. The difference between the veld condition of commonages and adjoining commercial farms are primarily interpreted as being due to the size of the land. This is a

reality that will need clearcut conditions on land use on new communal developments. Rural households have achieved a remarkable efficiency with regard to survival strategies. Agricultural resource use is but a part of these strategies. On average most households derive less than ten percent of their income from agricultural production. One of the consequences of this is insufficient management time and a scarcity of able-bodied men to engage in agriculture. A true farmer class do however exist and comprises about 20% of rural households. An important study area for pasture scientists in collaboration with social scientists is to quantify these differences and ascertain the reasons for the quite noticeable differences in the condition of commonages in the same area.

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THE EMERGING FARMERS REALITY

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The decision to expand the definition of farmer in the draft White Paper on Agricultural policy issued by the Department of Agriculture within the context of the broader government policy of reconstruction and development had led to the recognition of a new subgroup in the sector often referred to as the "emerging farmer". Whilst there is still no clear definition of their profile, these farmers are mainly black, women and often operating from smaller holdings. The question remains is this where they will remain or not.

Their farming reality includes the need to secure the tenure of holding and in some cases access to more agricultural land; the need to access financial services including credit on favourable terms and with support systems which will not result in unprecedented debt burdens. Furthermore, many of them do not have access to the basic support services normally provided in agriculture which includes research and extension; information and access to markets and these need to be provided for in a cost efficient and accessible manner. The challenge therfore is to reorient the provision of services to the extent that these farmers truly emerge from their positions of deprivation and exclusion.

The Broadening Access to Agriculture Thrust - essentially the reconstruction and development strategy of the Department of Agriculture seeks to establish an integrated system through which the capacity of the emerging farmers to farm successfully is realised. The ultimate is the attainment of a balance between national and the household level of food security. The factors that will influence this are among other issues of tenure reform, technology development, human resource development, and access to information and financial assistance. Success will ultimately be defined in terms of the increase in incomes, improved productivity per resource unit, the creation of job opportunities in relation to agriculture and which will contribute to a better quality of life for all.

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DEVELOPMENTS IN LAND REFORM AND AGRICULTURAL POLICIES

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Since the elections of April 1994, there has been a period of rapid change as regards policy development. Many of the policy positions held by the ANC at the time of the elections have been translated into government policy, and subjected to intense scrutiny in the process. Other positions have simply been dropped.

This paper will outline the new policies of government and analyse their likely effects in the country. As regards land reform it will examine the following;

- Restitution Act
- Development Facilitation Act
- Land Reform Pilot Programme
- Other land transfer mechanisms

As regards Agriculture, the following will be examined:

- Agriculture White Paper

- Marketing legislation
- The "Broadening Access to Agriculture" initiative
- Rural Credit
- Extension and Training

The paper will also touch on new policies affecting water affairs and forestry.

The division of responsibility between provincial and national government, and the implementation of policy at provincial level, will also be covered.

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WHERE TO FOR RANGE SCIENCE IN SOUTHERN AFRICA?

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Range science seeks to understand and predict the interaction between herbivores and vegetation, but this interaction is embedded within a complex network of extrinsic factors and indirect flows. Climate, soil, nutrients and fire are some of the extrinsic influences on the productivity, composition and structure of vegetation. Time scale is important because productivity is constrained by composition and structure, but dramatic changes in productivity can occur within a year whereas changes in composition and structure manifest slowly. Complexity of this interaction is increased because herbivores can vary according to number, type and distribution, because herbivores can directly influence key processes such as nutrient cycling, and because effects on one part of the landscape may be transmitted elsewhere.

Targets of our understanding are management, usually concerned with short to medium (< 10 yr.) considerations, and policy makers, whose obligation to ensure economic and ecological sustainability demands long-term perspective (> 100 yr.). Policy makers make strategic decisions at a national or regional scale, whereas land-users make a few strategic decisions in their lifetimes (e.g. type of enterprise) but continually make tactical decisions in response to an ever-changing financial and biological environment. Their knowledge requirements differ. Increasing demands of society regarding conservation, water quality, recreational area and other vegetation products add a further complexity.

How successful have range scientists been in meeting these diverse knowledge requirements? As an example, we analysed the research conducted in grassland. Much of this has been empirical cataloguing, with generally limited insight gained of mechanisms and processes, is time and location specific and not readily extrapolated. We suggest that a mechanistic, process-oriented approach is essential for further development of range science in southern Africa, with long-term research a necessity by which to gauge our conceptual and quantitative models of agricultural systems and to assess strategic options. Decision support technology has been all but ignored, but is essential for tactical decisions.

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BEPALING VAN OPTIMALE RYSPASIëRING EN SAAIDIGTHEID VAN DROëLAND LUSERN IN DIE SENTRALE GRASVELDGEBIED TE GLEN.

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Die optimale ryspasiëring en saaidigtheid van droëland lusern is vanaf 1984 - 1990 in die Sentale OVS ondersoek. Die studie was genoodsaak aangesien geen navorsing in die verband tot en met 1984 gedoen is nie.

Proefuitleg: 'n 4 X 3 faktoriale proef met drie herhalings is met vier ryspasiërings: 400mm, 700mm, 1000mm en breedwerpig en drie saaidigthede: 1.5 kg/ha, 3.0 kg/ha en 4.5 kg/ha uitgevoer.

Data ingesamel: reënval, bogrondse fitomassa produksie, standdigtheid, onkruidindringing en die statistiese ontleding van die data. Die data moet egter met groot versigtigheid hanteer word aangesien blok verskille voorgekom het. Die opsomming van die statistiese ontleding is as volg: Blokke ** Saaidigtheid (S) NB, Ryspasiëring (R) NB, SXR NB, Jare (J) ** RXJ **.

Resultate: Betekenisvolle verskille het tussen blokke voorgekom. Saaidigtheid en ryspasiëring toon geen betekenisvolle verskille nie. Persele met die hoogste saaidigtheid (4.5 kg/ha) lewer die hoogste produksie oor die ses

jaar termyn, terwyl die breedwerpige ryspasiërings persele die hoogste produksie gelewer het.

Gevolgtrekking: Ongeag die blok verskille, kon waardevolle inligting ingesamel word. Die proef het uitgewys dat daar na ses jaar 'n ekwilibrium bereik is in die aantal lusernpolle van al die behandelings. Verder is bevind dat nat seisoene die hoë saaidigtheid persele se produksie aansienlik verhoog het teenoor die van die laer saaidigtheid persele. Die aantal polle/eenheidsoppervlakte het geen rol gespeel by die verskille in produksie nie. Ook is bevind dat droëland lusern 'n definitiewe bewerking vereis vir volgehoue produksie en onkruidbeheer.

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MANAGEMENT INFLUENCES ON TILLER MORTALITY IN TWO CULTIVARS OF TALL FESCUE (FESTUCA ARUNDINACE)

RL PHILLIPS
Cedara Agricultural Development Institute

The study determined the effect of various row spacing/seeding rate combinations, close-down times for seed production, and nitrogen (N) fertilization levels on tiller mortality in two tall fescue cultivars, namely Cajun and Grasslands Roa. The effect of time of tiller initiation on tiller mortality was also investigated.

In the first season (April 1992 to December 1992) eight plants were randomly selected from each plot and the second (Tiller 2) and fifth (Tiller 5) primary tillers marked. All daughter tillers produced by the marked primary tillers were marked, on a monthly basis, using coloured wire rings. The following treatments were applied:

Row spacing/seeding rate	Close-down time	N fertilizer	
T1 : 15 cm at 20 kg ha^{-1}	July	High	Low (kg N ha^{-1})
T3 : 15 cm at 5 kg ha^{-1}	August	425	325
T6 : 60 cm at 5 kg ha^{-1}	September		
	October		

In the 1993 season methods were amended with all tillers present within four randomly placed quadrats (7.5 cm^2) being marked. All new tillers were marked on a monthly basis. Monthly tiller mortality was recorded. The T3 treatment was replaced by a 30 cm at 5 kg ha^{-1} (T4) treatment and N fertilizer rates were reduced to 300 and 200 kg N ha^{-1}. The October close-down was not considered.

Percentage tiller mortalities were significantly ($P<0.01$) higher in the Tiller 5 than Tiller 2 daughter population (13.54% $\pm$1.64). Row spacing and seeding rate only influenced tiller mortality significantly ($P<0.01$) in the establishment year, with mortality declining as row spacing was increased and/or seeding rate reduced. Nitrogen fertilization level influenced tiller mortality significantly ($P<0.01$) in the second season, but not the first season. The high N level (300 kg N ha^{-1}) resulted in a significantly higher ($P<0.01$) tiller mortality than the low N level (200 kg N ha^{-1}) (10.31% $\pm$1.47). Close-down time did not influence tiller mortality significantly in either season. However, the close-down time by cultivar interaction, in the second season, was significant ($P<0.05$). Later close-down times reduced tiller mortality in Cajun, but increased tiller mortality in Roa. Cajun had a lower tiller mortality than Roa in both the first (5.8% $\pm$2.53; $P<0.01$) and second (3.03% $\pm$1.47; $P<0.05$) seasons. This implies that Cajun is a stronger competitor than Roa under the conditions prevalent at the trial site. Tiller Mortalities remained low until the end of August, followed by a period of high tiller mortality until the end of December. This period of high tiller mortality coincided with rapid herbage production and the production of flowering stems. This may be due to a shading effect or increased competition for available nutrients. Month or stage of tiller initiation had a strong influence on tiller mortality. Lower tiller mortalities occurred in those tillers produced before June than those produced after June. This suggests that the smaller, less developed tillers are more susceptible to environmental stress than older, better developed tillers.

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WATERVERBRUIKSDOELTREFFENDHEID VAN MEERJARIGE GEMATIGDE WEIDINGS ONDER BESPROEIING

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Aangeplante weidings word op 'n redelike groot skaal op intensiewe veeplase gebruik. Skaarser wordende besproeiingswater noodsaak dat dit so doeltreffend as moontlik aangewend word. Verskeie faktore, soos spesieverskille, het 'n invloed op waterverbruiksdoeltreffendheid (WVD) maar min inligting is beskikbaar oor hoe aangeplante weidings met mekaar vergelyk in hierdie opsig. Verder is inligting oor die spesie x besproeiingspeil wisselwerking gebrekkig. Hierdie proef is gedurende die herfs van 1991 op klein persele op die Hatfield Proefplaas van die Universiteit van Pretoria gevestig en vir twee seisoene gemonitor. Lusern, langswenkgras en wit klawer is onder andere ingesluit. Vier besproeiingspeile is gehandhaaf, wat gevarieer het vanaf 'n goed besproeide kontrole tot 'n ernstig gestremde behandeling. Droëmateriaalopbrengste is sporadies bepaal deur met die hand te sny sodra die blaardak van die kontrole 'n sekere hoogte bereik het. Lusern is in die tweede seisoen gesny op grond van die groei van die sekondêre krone. Die totale jaarlikse opbrengs van langswenk het goed vergelyk met dié van lusern terwyl witklawer se opbrengs laer was. Die gemiddelde WVD oor besproeiingspeile was dieselfde vir lusern en langswenkgras. By lusern was daar 'n tendens dat WVD toegeneem het met toename in stremming terwyl dit relatief konstant gebly het oor besproeiingspeile vir langswenkgras. Witklawer se WVD van ongeveer 10 kg ha-1 mm-1 was sowat vyf eenhede minder as dié van die ander twee weidings. Daar was ook 'n duidelike tendens dat WVD afgeneem het met toenemende stremming, wat die droogtesensitiwiteit van witklawer beklemtoon. Daar is ook aangetoon hoe WVD oor seisoene gevarieer het. Die hoogste WVD-waardes is in die lente behaal. Dit het saamgeval met piek groeitempo's. Die proef het duidelik getoon dat indien 'n hoë WVD behaal wil word, moet witklawer op 'n hoë vlak bestuur en besproei word terwyl lusern en langswenkgras meer verdraagsaam is teen laer besproeiingsbestuursvlakke

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THE INFLUENCE OF SOIL WATER AVAILABILITY ON THE ROOT DEVELOPMENT OF FIVE SUB-TROPICAL GRASS SPECIES

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During the 1991/92 and 1992/93 growing seasons the influence of five levels of soil water availability on the above ground phytomass production was studied using a soil water gradient along a dripper line. Species evaluated included Cenchrus ciliaris cv. Molopo, Digitaria eriantha:eriantha cv. Irene, Eragrostis curvula cv Common, Panicum coloratum cv Selection 75 and P. maximum cv Gatton. At the end of the experimental period the total root production and vertical root distribution was determined by removing a soil core directly below monitor plants situated at each watering point. The dripper at point A supplied 10 lh^{-1} and the soil water was brought up to field capacity each week. Points B, C, D and E received 80%, 60%, 40% and 20% of this water supply each week. In terms of above ground production Cenchrus recorded the highest average yield (15% more than Eragrostis, 21% more than P. maximum, 40% more than Digitaria and 59% more than P. coloratum) and was the least sensitive to soil water availability. While the above ground production of Cenchrus declined by 45% from point A to E, the production of Eragrostis, Digitaria, P. maximum and P. coloratum declined by 55%, 73%, 75% and 76% respectively. In contrast Cenchrus and Eragrostis recorded dramaticlaly lower root masses (66% and 73% less than P. maximum, which had the best root development). The ability of a species to cope with limited water availability might be ascribed to different adaptations. While Eragrostis was characterized by remarkably little difference in total root mass at different moisture levels (gradient between A and E was negligible) in the case of Cenchrus it was notable that it was the mass of roots between 40 and 100 cm that was relatively unaffected by water availability, while the other species had on average 33% less roots at that depth where water was limiting. All species were characterized by having at least 70% of their roots concentrated in the upper 40 cm and future root studies should include an investigation of horizontal distribution in addition to vertical distribution.

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THE PRODUCTION OF SIX SYSTEMS BASED ON VARIOUS COMBINATIONS OF IRRIGATED AND DRYLAND PASTURES IN THE OUTENIQUA AREA OF THE SOUTHERN CAPE

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Dryland and irrigated pastures are the most important feed sources in animal production systems in the Outeniqua area of the southern Cape. Different farming enterprises in the area, however, have varying proportions of land under irrigated and dryland pastures. Much has been done to evaluate either dryland or irrigated pastures in the area. The relative and combined value of different proportions of these two pasture types for animal production has, however, never been determined. Six pasture systems consisting of various proportions of irrigated and dryland pastures were therefore evaluated over three seasons (1989/92) at Outeniqua Experiment Station, using S A Mutton Merinos in a six paddock put-and-take system of grazing management. The six systems were based on three pasture types, dryland lucerne (Medicago sativa) (LU) and two irrigated grass/clover mixtures based on red (Trifolium pratense) and white clover (T repens). One irrigated mixture had perennial ryegrass (Lolium perenne) (CR) as the grass component, while the second mixture consisted of both perennial ryegrass, tall fescue (Festuca arundinacea) (CF) and the two clovers. One of the systems consisted entirely of dryland lucerne (LU) and two were grass-clover mixtures (CR and CF) only. The other three systems consisted of various combinations of LU and CF. During the trial period the annual precipitation was respectively 62mm higher (1989/90), 247mm lower (1990/91) and 200mm higher (1991/92) than the annual average of 770mm. On the irrigated pastures an additional 691mm (1989/90), 750mm (1990/91) and 611mm (1991/92) of irrigation was applied. The pure CF pasture had the highest DM production during spring, autumn and summer and overall stocking rate ($P < 0.05$), but the lowest overall ADG ($P < 0.05$) and was botanically very unstable resulting in a sharp decline in legume content. The CR pasture, however, had the highest DM production in winter, a higher overall stocking rate ($P < 0.05$) than the LU pastures and was botanically more stable than the CF pasture. The DM production of the LU pasture and combinations of LU and CF was limited by the annual precipitation. The dryland (LU) and three mixed systems, therefore, had significantly ($P < 0.05$) lower stocking rates than the two systems consisting of irrigated pastures only (CR and CF), but were botanically much more stable than these two pastures. On the dryland and mixed systems the ADG's were significantly ($P < 0.05$) higher, but the meat production was significantly ($P < 0.05$) lower than that of the irrigated pastures. The higher cost of production of the irrigated pastures resulted in the gross margin indices being very similar on the dryland and irrigated systems during the first and third seasons, but higher on the irrigated pastures during the second season. The viability of irrigated pastures for sheep in the Outeniqua area is therefore questionable.

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CHEMICAL COMPOSITION OF FOURTEEN DIFFERENT VARIETIES OF JAPANESE RADISH

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Livestock reportedly do well on root crops. Root crops can fill an important gap in the fodder flow as they can be stored on the land until needed in the late winter, when other feed is limited. Japanese radish is the most popular root crop. Although crude protein, crude fibre, TDN and dry matter have been determined in the most common cultivars in South Africa (Nooitgedacht and Sakurajima), little is known about the chemical composition of other varieties and their chemical variation throughout the growing season. The aim of this study was to determine the chemical variability of 14 different varieties of Japanese radish grown in a trial at Cedara. Leaves and roots were analyzed separately for digestibility, total non-structural carbohydrates (TNC) and dry matter (DM).

The TNC content of the leaves decreased in all varieties from the third cut (27/7/94) to the fourth cut (26/8/94). Throughout the season the variety PE 78 showed the highest decrease (58.94%) in TNC and the variety Resal the lowest decrease (19.47%). Digestibility of the leaves decreased in all varieties from the first cut (25/6/94) to the end of the season and DM content increased throughout the season by as much as 493 % (UK 78). Nooitgedacht, Sakurajima and Mator varieties showed the highest yield of leaves at cut 1, while the rest of the varieties reached their peak at cut 2 and Resal at cut 3.

The TNC content of the roots of Nooitgedacht 1, 2 and 3 increased from the beginning to the end of the season. On the other hand, the TNC content of the other varieties decreased throughout the season. With the exception of the varieties Mator, Sakurajima, Nooitgedacht 4, Rutina and Rufus the DM content of the roots of the other varieties

decreased throughout the season. The digestibility of the roots of all varieties decreased throughout the season.

Considerable chemical variability existed between the different varieties evaluated in this trial. However, the choice of variety will depend on when one needs to make use of the Japanese radish, since different varieties reache their highest content of TNC, DM, yield and digestibility at different times of the growing season.

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INFLUENCE OF LENGTH OF REST PERIOD ON THE PRODUCTION OF FOUR GRAZED LUCERNE CULTIVARS UNDER IRRIGATION IN THE BOLAND AREA OF THE WESTERN CAPE

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Irrigated legume-based pastures have always been an important component of the fodder flow in animal production systems in the winter rainfall region of South Africa. Irrigated lucerne (Medicago sativa) was previously evaluated as a component of grass-legume mixtures, but never as a pure stand. With the appearance of large numbers of lucerne cultivars of diverse winter activity and grazing resistance on the South African market it, however, became imperative to evaluate the response of a diverse range of cultivars to grazing management under irrigation (rainfall = 696 mm annum^{-1} and irrigation = 764 mm annum^{-1}). The production of four lucerne cultivars was therefore investigated in different systems of grazing under irrigation over two seasons (May 1990 to May 1992) at Elsenburg Experiment Station near Stellenbosch on a Hutton soil. The cultivars were CUF 101 (winter active), WL 516 (non-winter dormant), SA Standard (intermediate winter dormant) and Meteor (semi-winter dormant). Production was determined in three grazing management systems (four, five and six paddocks, rotated weekly), using a put-and-take method. A mixture of non-lactating Merino and S A Mutton Merino sheep were used as experimental animals. During the first season there was no significant influence of management system on production, but during the second season the dry matter production and stocking rate, averaged over cultivars, increased significantly ($P \leq 0.05$) with an increase in the rest period from 21 to 28 days (four versus five paddocks). However, the response of individual cultivars differed and only the dry matter production of SA Standard and CUF 101 benefited significantly ($P \leq 0.05$) from this increase in the length of the rest period. Averaged over the two seasons CUF 101 had a significantly ($P \leq 0.05$) lower stocking rate than the other three cultivars, which did not differ significantly. The persistence of the four cultivars did not differ significantly. Although there was, averaged over cultivars, a significant ($P \leq 0.05$) difference in the number of plants on the four and six paddock systems, the rate of decline in plant population was the same for all three grazing systems during the trial period. The four cultivars therefore responded similarly to the treatments but, while the length of the rest period exercised a major influence on lucerne production, it had no influence on plant survival. Semi-winter dormant lucerne cultivars therefore tend to be more productive in terms of dry matter production and grazing capacity than the winter active types. Both types, however, were more productive when afforded a longer rest period, when grazed rotationally.

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THE PRODUCTION, WATER USE EFFICIENCY AND QUALITY OF FOUR CULTIVARS OF PANICUM MAXIMUM AT DIFFERENT LEVELS OF APPLIED NITROGEN

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Four cultivars of Panicum maximum, Gatton, Green Panic, Mutale, and Vencidor were evaluated in terms of production, water use efficiency and quality as fodder, with different levels of N fertilization. A pot trial was conducted in a controlled environment, with 5 levels of N (equivalent to 0, 80, 160, 240 en 320 kg N ha^{-1} a^{-1}). Pots were lined with plastic to prevent leaching and filled with 12.5 kg of black clay soil. N, in form of LAN, was applied in one dressing. Pots were regularly watered to 90% of mass at field capacity. Material was harvested at early flowering stage, dried at 75°C, weighed and analyzed. Stubble mass was determined at end of season. Green Panic was first to be harvested (84 days), followed by Gatton (105 days) and Mutale (121 days). Vencidor never flowered and was harvested for the first time, after 160 days. With Gatton, Mutale and Vencidor, >70% of production was taken with the first harvest. For Green Panic, it was only 47%. At 160, 240 and 320 kg N, Vencidor produced significantly more than any other cultivar(cv.), with the

exception of Green Panic at 320 kg N. There was a significant interaction between N application and cv.'s. At 0 N, Green Panic produced significantly more than Mutale. First significant increase in production with Green Panic, Mutale and Vencidor was at 160 kg N and with Gatton at 80 kg N. Efficiency, in terms of kg DM kg N^{-1}: significantly higher with Vencidor and significantly lower with Mutale. Highest efficiency was always achieved at lowest level of N (80 kg) (no significant interaction between N applied and cv.'s). An analysis of water use efficiency showed a significant interaction between cv. and N applied. Significant increases with Gatton and Mutale were at 240 kg N and with Green Panic at 320 kg N. With Vencidor it was at 160 kg N and was significantly higher than with any other cv.. Stubble mass: significantly higher with Vencidor than with any other cv.. Increased significantly with increase in applied N, up to 240 kg N. Vencidor had the lowest crude protein content (3.6% at 80 kg N - 5.2% at 320 kg N) and Gatton the highest (7.5% at 0 N - 11.75% at 160 kg N). Concentration of other elements varies between cv.'s, was not influenced by N application. In vitro digestibility ranges from 62% for the first harvest of Mutale to 87.7% for the first harvest of Vencidor. Vencidor had the lowest ADF and NDF and highest IVDOM. According to this study, there are big differences between cv's. In the interpretation of these results, it must, however, be remembered that the grass was grown under optimum water conditions.

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IMPROVEMENT OF THE FLOODING PAMPA RANGELAND CONDITION THROUGH CONTROLLED GRAZING

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The Flooding Pampa region, south of the city of Buenos Aires, is utilized for breeding cattle. This extensive plain of almost six million hectares with shallow and low fertility soils and very slight slope, is dominated by native grasslands that comprise almost 80% of the area. Climate is temperate and humid with an annual precipitation of 900 mm, evenly distributed throughout the year. Topography and climate result in recurrent floods of lowlands or infrequently extensive floods during rainy years. Although the vegetation of the area may also suffer summer droughts, grasses maintain productivity during the entire year and almost 6 tons ha^{-1} per year is produced.

Previously ungrazed by large herbivores, cattle roamed freely on these rangelands since Spanish colonization and were confined during the last century. Continuous grazing provoked some deterioration of these grasslands consisting in (i) severe reduction of cool season grasses and partial reduction of tall warm season grasses, (ii) increase in exotice planophiles, bare soil and soil salinity (iii) reduction of stocking rate, animal performance and secondary productivity and, (iv) business lack of profit.

Controlled grazing methodology has been applied during the last decade in several ranch operations with the objective of preventing deterioration. Consists of (i) concentration of animals in large herds, (ii) non-selective grazing of senescent or freezed C_4 grass vegetation during autum and winter, (iii) selective grazing during spring and summer. Rotational grazing guaranteed adequate rest periods to grazed plants. Intense and slow grazing performed when temperatures decrease tend to stimulate tillering and establishment of cool season grasses. Lenient and fast grazing performed when temperatures rise, procured maximum animal ingesta and abundant plant fructification.

Several evaluations of this grazing methodology showed that, although no increase in primary productivity was achieved, it was possible to reverse the actual trend though increase in: (i) cool season and tall warm season species, (ii) litter and soil cover, (iii) rangeland receptivity and animal production per hectare and, (iv) profit. Through controlled grazing it will then be possible to achieve a sustainable utilization of these grasslands.

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DINITROGEN FIXATION OF THREE ANNUAL CLOVER SPECIES

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Three annual clover species, Trifolium subterraneum, Trifolium resupinatum and Trifolium vesiculosum were evaluated for their N_2 fixation potential during the growth season under field conditions. Different methods were used in order to compare the variation in proportion and quantity N2 fixed for the clover species. The methods used included the ^{15}N dilution, ^{15}N natural abundance and nitrogen difference techniques. The ^{15}N dilution technique involved the addition of a small quantity of ^{15}N

fertiliser (ammonium nitrate, 5% enriched), whereas the ^{15}N natural abundance technique no additional N fertiliser was applied. The nitrogen difference method calculates N_2 fixation based on protein production. Annual ryegrass was used as a reference crop in all methods. The proportion of total N_2 fixed differed between methods, the lowest calculated with the nitrogen difference method (26 - 86%). However, all methods showed the same ranking order, namely the highest for T resupinatum and the lowest for T vesiculosum. The total quantity of N_2 fixed for the season was 248, 100 and 90 kg N/ha for T resupinatum, T subterraneum and T vesiculosum respectively, using the ^{15}N dilution method. The direct transfer of symbiotically fixed N_2 from clover to grass was estimated at 22 kg N/ha for the season. This study has shown that the nitrogen difference method underestimates the proportion and quantity of N_2 fixed whereas the other two methods are more reliable to determine N_2 fixation potential in temperate pastures.

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VELDVERSTERKING: OORSAAITEGNIEKE MET DIGITARIA ERIANTHA EN DIE INVLOED DAARVAN OP VELDREHABILITASIE

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Navorsingsresultate ten opsigte van veldversterking is skaars en twaalf tegnieke is in twee proewe met Digitaria eriantha as oorsaaispesie uitgevoer. Swak veld is gebrand en straf bewei om kompetisie te beperk waarna behandelings gemik op die skep van 'n gunstige mikroklimaat toegepas is. Met die tweede proef is kaal kolle (geen kompetisie) gëevalueer. Meganiese bewerkings in vergelyking met lae inset (biologiese) metodes is hier beskou. Saailingtellings is 6 maande na vestiging uitgevoer. Die data is mbv die SAS program geanaliseer. Op swak veld het saad bedek met hooi; gevolg deur saad onder fyn kraalmis en saad onder klippe (in dié rangorde), positief gereageer. Sukses het grootliks afgehang van die kompetisiefaktor. Op kaal kolle het die tipe tegniek gebruik o.a. grondkonsistensie beïnvloed. Grondwaterinhoud is positief deur bewerking beïnvloed, maar met slegs 'n hooibedekking is die tweede hoogste waterinhoud verkry. Bedekking van saad met 'n tipe organiese materiaal toon in beide gevalle die hoogste potensiaal, veral aangesien kostes minimaal is. Die skep van 'n mikroklimaat is deurslaggewend en die uitskakeling van kompetisie is essensiëel.

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MYCORRHIZAL INFECTIVITY OF KALAHARI DUNES: IMPLICATIONS FOR VEGETATION RESTORATION

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Mycorrhizas are an integral element of terrestrial ecosystems because most plants are reliant on them for successful establishment and development. Removal of the mycorrhizal fungi as a result of the destruction of the vegetation influences the composition of subsequent plant communities. Dunes in the southern Kalahari have been exposed to various levels of transformation due to grazing and fire. It is hypothesised that where plant cover has been reduced mycorrhizal fungal populations will be eliminated. This study examines the potential for establishing plants becoming mycorrhizal using a bioassay to measure mycorrhizal infectivity of the substrate. Sand was collected from four parallel transects along the crest, midslope of the N E and S W sides of the dune, and the dune street, from seven dunes. Mycorrhizal inoculum was patchily distributed with areas of bare sand supporting no mycorrhizal fungi. The dune streets had the highest mycorrhizal infection levels while the crests were the least infective. There was also an association between degree of infectivity and identity of nearest plant species. Implication of these results for plant community establishment and the development of a revegetation strategy are discussed.

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REHABILITATION OF GRASSLAND AFTER CONTROL OF SILVER WATTLE

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Silver wattle (Acacia dealbata) is a woody alien which invades and replaces grassland. In this trial over four years rehabilitation was incorporated into follow-up wattle control, to improve the grazing capacity of low-value riparian ground on a stock farm in Southern Tall Grassveld near Estcourt, Natal. Silver wattle was felled and Tordon Super 1% in diesel applied to the cut stumps. Eragrostis curvula, an E. curvula/E. tef mix and Chloris gayana were broadcast-sown at rates of 6, 4/4 and 6 kg ha-1 respectively. These were compared to each other and to indigenous grasses in establishment, suppression of wattle regeneration, recovery after fire and rehabilitation of the grazing land. Relative abundance (RA) was determined by a modified step-point method. A basal cover index (BCI) was estimated by recording hits. All sown grasses established equally well at 60% RA. Indigenous grasses in control plots achieved 16% RA. Adding E. tef (annual) to E. curvula did not improve establishment but did reduce cost by around 27%. E. curvula was significantly reduced by fire ($P < 0.01$); it recovered after two post-fire growing seasons on E. curvula/E. tef plots, but not on E. curvula plots where its seeding rate was higher. Fire did not reduce RA of C. gayana or indigenous grasses. Wattle regeneration was significantly suppressed by the sown grasses ($P < 0.01$). In control plots, initial dominance of suckers over seedlings was reversed during the second season due to residual herbicide action. Fire controlled wattle regeneration significantly in all treatments ($P < 0.01$) except E. curvula. It is concluded that sowing grasses ensures a more rapid cover, reducing erosion and runoff and accelerating rehabilitation; available grazing is increased, wattle regeneration is suppressed and high fuel loads are provided for burning. Of the sown grasses C. gayana has shown the best overall performance to date. From DM yields on demonstration plots Panicum maximum (broadcast seeding rate of 6 kg ha-1) was successful and is recommended. Burning of sown grass augments wattle control by reducing regeneration and follow-up costs. Hot fires also kill seeds.

Acknowledgements: Thanks to Mr Barry Symons for allowing and assisting the trial on his farm.

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COMPARATIVE GROWTH OF TETHERED AND FREE-RANGED GOATS SUPPLEMENTED WITH LEUCAENA LEUCOCEPHALA

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Tethering ruminants is a common practice in many peri-urban and urban settings where the scarcity of communal pasture, the high cost of shepherding or the prevalence of theft preclude free-ranging animals. Goats, with their highly selective browsing habits, in particular suffer dry-season weight losses as a result of this restraint. To test the effects of tethering on goats and to test the efficacy of supplementing this species with Leucaena leucocephala leaves, groups of six young male Landim goats (15 kg LW average) were submitted to the following treatments in a 2 factorial, split plot design for two years (1992 and 1993): 1. Tethered, 2. Tethered & Leucaena, 3. Free-ranged, 4. Free-ranged & Leucaena. The area selected was a well-drained Maputo coastal sandy soil; rainfall was 327 mm during the first year and 723 mm the second year. The trial ran from the late rainy season to the early rainy season (April-December) while pastures rested during the remaining months. The herbaceous layer of the paddocks used was dominated by native grasses (approximately 1.8 T ha-1 DM, whole plant) including Urochloa mossambicensis, Cenchrus ciliaris, Cynodon dactylon and Eragrostis spp. with a secondary story of Dichrostachys cinerea at 630 plants ha-1. Animals were on the pasture 6 h day-1. The free-ranged goats rotated amongst 4 1200 m2 paddocks whilst the tethered goats were pegged on 3m ropes in a new location every day. Leucaena leaves, averaging 26% CP and 53% IVDMD, were fed daily after grazing at 2% LW (DM basis) to the supplemented animals. 1992 data indicated that there was no interaction ($P=0.25$) for ADG between the two factors and no effect on carcass percentage. The difference ($P=0.002$) between tethered and untethered animals was 26.7 g ADG for free-ranged animals and 5.0 g ADG for tethered animals. The leucaena supplemented animals ($P=0.004$) averaged 20.5 g ADG while the unsupplemented animals had 11.2 g ADG. 1993 carcass percentage data indicated an effect ($P=0.015$) of free-ranging (43.1%) and tethering (40.1%). There was no ($P>0.50$) ADG interaction between the two factors. The ADG for free-ranged animals ($P=0.0001$) was 26.4 g and for the tethered animals 9.7 g. The ADG for supplemented animals ($P=0.0001$) was 22.6 g and for unsupplemented animals 13.5 g. In conclusion, tethering was detrimental to goat nutrition and supplementation with leucaena was beneficial during the dry season.

POST GRAZING MANAGEMENT OF DOHNE SOURVELD: ANIMAL PERFORMANCE

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Growing sheep (*c.* 35 kg at the start of each season) were grazed on Dohne Sourveld that was subjected to treatment combinations of grazing time (early (within 10 days of the fire) vs late (once *c.* 120 mm of regrowth had developed)), burning frequency (annual vs biennial) and grazing system (continuous vs rotational) for six years in a replicated (twice) split-split-plot design. Fortnightly masses were determined and compared using analysis of variance and stepwise polynomial regressions.

Early grazing of annually burnt veld resulted in a six year combined improvement of 180% in performance over animals grazing later. For biennially burnt veld the advantage of early grazing was 140%. However the bulk of the improved mass gains was achieved in the first two years of the trial with smaller differences in later years. Inter-seasonal fluctuations confused the pattern but it seems that the advantage in animal performance from early grazing with annual burning is shortlived (2 to 3 years). Early grazing on biennially burnt treatments only held an advantage in the years when the plots were burnt; there being no differences between early and late graze treatments in the non-burn years.

A comparison of continuous vs rotational grazing systems showed no advantage of either system, although continuous grazing gave marginally higher gains. These were only significant ($P < 0.05$) in a few years.

The economic implications of these results will have a major impact on the profitability of sheep production in the Dohne Sourveld.

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DIE ONTWIKKELING VAN 'N INTENSIEWE VETLAMPRODUKSIE STELSEL IN DIE HOë REENVAL SUURVELD VAN DIE SUIDOOS TRANSVAAL

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As gevolg van die beskikbaarheid van besproeiingsgeleenthede op verskeie plase op die Oostelike Hoëveld word gepoog om 'n vetlamproduksie stelsel daar te stel waar:

* effektiewe benutting van besproeide winter weidings 'n prioriteit is;
* alternatiewe goedkoop hoë kwaliteit weidings gebruik word om die voer tekort in die winter aan te vul;
* gapings in die voervloei gevul word met beproefde en relatief goedkoop alternatiewe soos veld en oesreste.

Hierdie stelsel is gebaseer op 2 ha besproeide raaigras, 2 ha ongeoeste mielies, 22.8 ha veld en 10.6 ha mielies. Die voer en kuddevloei kan as volg beskryf word: Die ooie word aan die begin November gedek op besproeide raaigras waarna hulle verskuif na gebrande veld. Hulle lam vanaf April op die veld. Na die binding tussen ooie en lammers verskuif die tweeling ooie na die raaigras, terwyl die eenling ooie na die ongeoeste mielielande gaan. Die tweelinge word teen 15 Julie gespeen waarna die ooie ook na die oesreste gaan. Die lammers bly op die raaigras waar die eenling lammers by hulle aansluit teen die middel Augustus. Ook hierdie ooie gaan dan na die oesreste. Die lammers word op die raaigras afgerond en daarvandaan bemark Die stelsel word gedoen met 80 SA Vleismerino ooie en die diereprestasie van die vorige seisoene lyk as volg. Die lampersentasie vir die 1993/1994 seisoene was onderskeidelik 84% en 94%, die fekunditeit was onderskeidelik 138% en 136%,en die gemidelde geboortemassa 4,5kg vir beide seisoene. Die besettingssyfer vir die ou ooie vir die 1993,1994 seisoen was onderskeidelik 95% en 100%, terwyl die van die jong ooitjies 58% en 70% was. Voorlopige ekonomiese reultate toon 'n bruto marge van R13774,50 vir die stelsel as geheel. Die brutomarge per KVE is R71,00 wat as goed bestempel kan word. Biologiese sowel as ekonomiese resultate vertoon tans goed en die stelsel toon 'n goeie wins.

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EVALUATION OF DIGITARIA ERIANTHA FOGGAGE FOR WINTERING SHEEP ON THE SOUTH-EASTERN TRANSVAAL HIGHVELD

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The evaluation of Digitaria eriantha foggage for wintering sheep was carried out on different quality foggages created using two initiation dates, namely mid-January and mid-February. Supplements in the form of protein, (cotton seed oil cake meal), energy (maize) and a combination (urea and maize meal mixture) were supplied at various levels. During the first season (1991/92), the January foggage produced 5700 kg dry material from which 4313 small stock unit (ssu) grazing days were obtained. The crude protein level was 8.4% and the in vitro dry matter digestibility (IVDMD) was 54.8%. The February foggage produced 2200 kg of dry material from which 3400 ssu grazing days were obtained. The crude protein was 12.7% and the IVDMD 56.75%. The second season (1992/93) was a drought year, and the foggage production was considerably lower. The January foggage produced 1263 kg of material from which 1831 ssu grazing days were obtained. The crude protein level was 9.98% and the IVDMD 56.23%. The February foggage produced 565 kg of material from which 1165 ssu grazing days were obtained. The crude protein level was 11.37% and the IVDMD was 57.23%. The average daily gains (ADG) of the January 1991 control group was 6.6 grams per sheep per day (g/sheep/day) and that of the February control group 55.6 g/sheep/day. The ADG of the January control group of 1992 was -4.6 g/sheep/day and that of the February control group was 53.6 g/sheep/day. The growth trend achieved from the urea/maize meal mixture had the lowest effect on animal performance. The protein supplement had a greater effect on animal performance than the energy supplement. Considering these results, Digitaria eriantha foggage has the potential to provide at least a maintenance feed. Smuts foggage is a relatively high risk, unpredictable feed source that relies on the late season rainfall for production. This complicates fodder flow planning. On the positive side, Digitaria eriantha foggage has relatively high quality and this facilitates acceptable sheep performance. Compared with other local sub-tropical pasture grasses, Digitaria eriantha has possibly the highest potential as a foggage.

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DIE EVALUASIE VAN TWEE WINTERWEIDINGS MET MERINOHAMELS IN DIE OOSTELIKE KAROO

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Koring is die vernaamste gewas wat tans vir die oorwintering van vee, in die Oostelike Karoo, aangeplant word. Die doel van hierdie studie was om koring (Triticum sativum) en 'n mengsel van raaigras en persiese klawer (Lolium multiflorum & Trifolium resupinatum) as oorbruggings alternatiewe, in die Oostelike Karoo, te evalueer.

Vyf beladingspeile is per weiding toegepas deur die beskikbare oppervlaktes te wissel. Elke belading is opgemaak deur agt negemaande oue Merinohamels.

Ten einde die hoeveelheid materiaal benut, geproduseer asook beskikbaar voor elke beweiding te bepaal, is 10 lesings met 'n skyfweiveldmeter direk voor beweiding asook direk na beweiding in elke kamp geneem. Die massa van die diere is weekliks bepaal, al die proefdiere is geweeg en geen uithongeringsperiode is toegelaat nie. Hierdie syfers is dan gebruik om gemiddelde daaglikse toenames, diereproduksie per hektaar en gevolglike optimale weikapasiteit te bereken.

Die resultate, oor die twee jare, toon dat die mengsel betekenisvol meer droëmateriaal produseer ($p \mu 0.05$) as koring. Belading het 'n wesenlike invloed op die droëmateriaalproduksie en groeitempo van albei weidings. Altwee die weidings se droëmateriaalproduksie daal soos die belading styg. Belading oefen nie 'n betekenisvolle invloed ($p \mu 0.05$) uit op die kwaliteit (ru-proteïen en TVV-inhoud) van die voer wat die diere vanaf die weidings inneem nie.

Die massatoename van die vee op die mengsel is deurgaans betekenisvol hoër ($p \mu 0.05$) as dié van die vee op die koring. As gevolg van die hoër produksie per dier en langer groeiseisoen produseer die mengsel per belading dus meer vleis per hektaar as koring. Dit beteken dat die mengsel dus 'n hoër optimum weikapasiteit as die koring het. Hierdie optimum weikapasiteit verskil egter tussen seisoene en jare.

Ten opsigte van die ekonomie blyk dit dat die produksiekoste van die koring die hoogste was. Die hoofrede hiervoor is die koste verbonde aan die stikstofbemesting. Verder toon die koringweiding nêrens 'n positiewe Bruto Marge nie.

Lae koste hoë produserende weidings is onontbeerlik vir die veeboer. In hierdie opsig het die raaigras/persiese

klawer mengsel 'n definitiewe rol te speel.

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SELECTION FOR HIGH DRY MATTER AND NONSTRUCTURAL CARBOHYDRATE CONTENT IN LOLIUM MULTIFLORUM EFFECT ON OTHER NUTRITIVE QUALITY PARAMETERS

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The voluntary intake of pasture grasses by ruminants is decreased if the dry matter (DM) content of the grass is less than ca. 20g/ kg fresh forage. Furthermore, high concentrations of total nonstructural carbohydrates (TNC) in forages improve the palatability and voluntary intake, as well as certain growth characteristics of the grass. In selecting for these desirable characters, some less desirable features could be introduced, since certain genetic traits are linked on the same chromosomes. The aim of this investigation was to establish whether a high DM and TNC content are linked to other traits affecting nutritive quality. Twelve seed from each of 16 plants in a polycross were grown in speedling trays and each plant cloned to form eight genetically identical plants. The clones were grown in a spaced-plant trial using a simple random design. Top growth (above 50 mm) was removed every four weeks and was analysed for DM content, TNC content, neutral detergent fibre (NDF), acid detergent fibre (ADF) and digestibility *in vitro*. Results showed that the NDF content of the grass was negatively correlated with TNC content (r = -0.458) and DM content (r = -0.420). The ADF content was negatively correlated (r = -0.566) with digestibility *in vitro*, while the TNC and DM content were poorly correlated with ADF and digestibility. It was concluded that selection for high DM and TNC content in Lolium multiflorum does not affect adversely the cell wall composition and digestibility of the grass.

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DIE EVALUERING VAN ONGESTROOPTE MIELIES ALLEEN EN IN KOMBINASIE MET PROTEÏENRYKE GEWASSE MET LAMMEROOIE EN SPEENLAMMERS TE ERMELO

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Ongestroopte mielies het hoër potensiaal as skaapweiding gedurende die Herfs/Winter periode. Twee beperkende aspekte by die benutting van ongestroopte mielies is die inherente lae proteïen-inhoud van ryp mielieplante, asook die voorkoms van Asidose by weidende diere. Die verbouing van proteïenryke gewasse in kombinasie met mielies kan beide die proteïen-tekort verlig en te hoë energie-innames beperk. Op Nooitgedacht LOS is mielies alleen en in kombinasie met onderskeidelik sojabone, hawer, japanese radyse en SSR 729 rog vir twee seisoene met lammerooie en speenlammers geëvalueer. Insiggewende resultate is behaal wat bewys dat sulke weidings baie hoë potensiaal vir beide lammerooie en vir die afronding van speenlammers het. Betekenisvolle verskille in diereprestasie en koste van afronding is verkry. Voorspeense massatoenames wissel tussen 191 en 283 g per lam per dag en naspeense massatoenames tussen 140 en 229 g per lam per dag. Die koste per kg lam gespeen wissel tussen R0-84 en R2-18 terwyl die koste van afronding wissel tussen R0-67 en R1-37 per kg lewende massa. Die koste van afronding van speenlammers op hierdie weidings is laer as 33 persent van die koste in 'n voerkraal. Die resultate beklemtoon die belangrike rol wat mielie-gebaseerde weidings in voervloeiprogramme kan speel.

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COMPARISON OF THREE TECHNIQUES FOR ESTIMATING WOODY PLANT DENSITY

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Data for comparing three different techniques for estimating woody plant density have been collected. Techniques used were line-based (line intercept), distance-based (closest plant) and area-based (quadrats). Twelve plots, each 50 m X 48 m, which have been subjected to thinning, herbicide and non-herbicide treatments, were used as they represent woody plant communities of differing plant and stem densities. Line-intercept data were gathered with 6 m intervals between adjacent parallel lines; a six metre spacing between successive points was used in closest plant data collection, also with 6 m spacing between adjacent parallel lines of points; and, a contiguous grid of 1 m X 1 m quadrat data was recorded for each plot. Techniques are compared for statistical and sampling effectiveness and efficiencey and descriptive effort.

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PATCHINESS IN SEMI-ARID DWARF SHRUBLANDS: EVIDENCE FOR SATELLITE-DERIVED INDICES OF ELEVATED PHOTOSYNTHESIS

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Satellite-derived vegetation indices were used to identify sites of higher productivity (HP) in a semi-arid rangeland. We further determined whether these sites are occupied by plants with higher photosynthetic rates and reduced physiological stress, as is often assumed for mesic ecosystems. Plant cover on and off the HP sites were also determined. Three woody species with high contributions to canopy cover were selected for intensive investigation of rates of gas exchange and accumulation of foliar nutrients. Two of the species, Rhigozum obovatum and Eriocephalus ericoides, exhibited increases in net photosynthetic rate of 59% and 28% respectively. Similar net photosynthetic rates were recorded on both sites for the third study species, Pentzia incana. In an attempt to find a mechanistic basis for the observed elevated photosynthetic rates, the relationships between soil factors, foliar nutrients and photosynthetic capacity were also examined. Our results suggest that the elevated net photosynthesis was not mediated via improved soil or plant water relations on the HP sites, nor through a difference in nitrogen levels in the soil or plant material, but possibly by way of the higher soil phosphorus levels measured for the HP sites. These findings demonstrate how plant individuals of the same species occurring on adjacent sites of dissimilar substrate, may differ in their functional responses to the environment and to herbivory. Plant height and cover cannot therefore be the sole criteria for rangeland condition assessment in semi-arid regions, since localized elevated soil nutrient status (patchiness) contributes to greater photosynthetic carbon gain which may confer superior browsing responses to plants occurring on these sites.

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DIET SELECTION BY DIFFERENT SMALL STOCK SPECIES IN THE NOORSVELD

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Methods are investigated in an effort to raise meat production off Karooveld. The diet selection of various small stock species were studied on the Noorsveld (Veld Type no. 24, Acocks, 1988). An hypothesis which states that different small stock species utilize different components of the veld and that the degree of difference in the selected diet can be exploited to advantage, was postulated and tested. A definite grazing capacity is laid down for a specific small stock species, in a specific veld type. The reasoning behind the hyposthesis is that by combining different small stock species and by incorporating the degree of difference in their selected diet, a heavier stocking rate can be applied to the veld, without deterioration occurring to the vegetation.

Dry ewes and wethers/kapaters of Merino and Dorper sheep and Angora and Boer goats were fistulated at the

oesophagus. They were allowed to freely graze the veld and to become accustomed to it. Oesophageal fistula sampling was carried out during the winter, spring, summer and autumn of three consecutive years. Botanical surveys were carried out simultaneously. The percentage contribution that the palatable, less palatable and unpalatable karoo bushes, grass and ephemeral plants and trees and shrubs made to the diet, was established for each species and sex, and for each sampling period.

The selected diets were compared to the results of the botanical surveys. On average it can be said that during winter, stock graze the available forage to a greater or lesser degree, Willmott's (1982) index of agreement **d**, between the selected diet and the survey range from 0.73 to 0.97. During spring stock concentrate on grass to a large degree, **d** ranges from 0.26 to 0.56, except for the boergaot kapaters which tend to largely browse what is available, **d** = 0.72. During summer sheep tend to concentrate on grass, **d** ranges from 0.16 to 0.46. The angora goats concentrate on noors and grass and the boergoat kapaters concentrate on trees, shrubs and noors, while the boergoat ewes take in a good proportion of grass, for the goats **d** ranges 0.36 to 0.78. In autumn the sheep concentrate on the less palatable karoo bushes, but take in fair amounts of the available forage, as indicated by **d** which ranges form 0.77 to 0.92, the goats select a diet closely resembling that which is available, based on the botanical survey, **d** ranges from 0.78 to 0.97. During the growing season (spring and summer), the mean index of agreement in the selected diet between the different small stock species, ranged from 0.72 to 0.79. During autumn **d** was 0.70, while during winter **d** was 0.78.

The difference of 21 to 30% between the selected diets, during the growing season, in the Noorsveld, is large enough to consider raising the stocking rate, through mixing small stock species. This will have to be approached circumspectly. It remains questionable whether the gain realised in meat and fibre production will offset the greater expenditure in materials and managerial time necessary to deal with two different small stock enterprises.

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ON THE ANALYSIS OF ANIMAL PERFORMANCE DATA FROM MIXED-SPECIES GRAZING TRIALS

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The effect of grazing cattle and sheep together (and varying stocking rates for each ratio) on animal performance off veld or pasture has received little attention in southern Africa. This is despite the fact that mixed-species grazing is a common practice in commercial and subsistence pastoral systems.

Mixed-species grazing systems may be based on one species following another through the grazing area or the various species grazing the area simultaneously. Species of grazing animals differ in their grazing patterns and habits. These differences may be complimentary in that mixed-species grazing may result in increased out-put per unit area. One of the objectives of such practices is therefore to ensure the most efficient utilization of the forage resource and thus to maximize livestock production. Achievement of this aim is determined principally by selection of the appropriate animal enterprise and by the quality and quantity of feed ingested by grazing animals. Animals of the same species have more similar requirements than animals of different species, so inter-specific competition is less intense than intra-specific competition. Thus, substitution of a proportion of the individuals of one species by individuals of another species could result in increased outputs (of animal products) i.e. complementary effects occur.

It is important to identify the complementary elements in mixed-species grazing and to use them in developing production systems superior to single-species grazing. The complementary effects would be expected to be greatest where grazing efficiency of either one or all of the animals species is low, the sward is botanically complex, and topographical variation is large.

In this paper animal performance data derived from a mixed-species grazing trial are used to illustrate methods of analysing such data. The results of these analyses are used to discuss the potential advantages of mixed-species grazing over single-species grazing of veld and cultivated pastures.

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FACTORS AFFECTING THE BOTANICAL COMPOSITION OF THE DIET OF AFRINO SHEEP ON ARID KAROO VELD

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Knowledge of the botanical composition of the diet of animals on veld is needed to quantify the impact of the animals on the veld. For the purpose of veld management, it is not only adequate to know what species are grazed, but also when specific species are consumed. A study was conducted over a period of one year on Pentzia spinescens dominated veld on the Carnarvon Experimental Station to quantify the effect of a number of factors on the botanical composition of the diet of Afrino sheep Eight oesophageally fistulated Afrino sheep were used four times during the year to collect forage samples at the end of a three month grazing period, in four stocking rate treatments. Samples were collected, washed and fixed on four consecutive days and were also pooled for treatments, in order to obtain representative samples. Botanical composition of the samples was determined by means of a microscope point technique (on a dry mass basis). A diet score was calculated to investigate the effect of specific factors on diet selection.

Significant negative correlations between the amount of grass and palatable bush ($r = 0.488$; $P \mu 0.01$) in the diet, as well as between the amounts of less palatable bush and the more palatable plant components, "opslag" ($r = 0.446$; $P \mu 0.05$), grass ($r = 0.422$; $P \mu 0.05$) and palatable bush ($r = 0.422$; $P \mu 0.05$) in the diet, indicated the existence of relationships between the amounts of different plant components in the diet. Stocking rate was found to have a significant effect on the botanical composition of the diet. Significant correlations between stocking rate and the amount of less palatable ($r = 0.619$; $P \mu 0.01$) and unpalatable ($r = 0.316$; $P \mu 0.05$) bush in the diet was observed. A significant negative correlation ($r = 0.398$; $P \mu 0.05$) existed between stocking rate and the amount of "opslag" in the diet, while stocking rate was negatively (although not significantly) correlated with the amount of grass and palatable bush in the diet. In an attempt to determine which factors (alone or in combination) related best to the selected diet as reflected in the diet score, no strong relationship could be detected between diet score and the separate independent variables. When a stepwise multiple regression procedure was used, interactions between the different variables were detected. Stocking rate, individual camps, as well as canopy spread and veld condition score at the end of the grazing period, were identified as the most important contributors to diet score.

Stocking rate, the amount of available forage and the botanical composition of the veld in the camp being grazed, were the most important determining factors of the botanical composition of the diet of Afrino sheep on Arid Karoo veld. Because of the interdependent nature of these factors, a change in one or more is associated with a change in diet selection.

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ACACIA SEEDLING SURVIVORSHIP FOLLOWING DEFOLIATION

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Acacias form an important component of savanna communities in southern Africa, and are usually the first species to appear in the process of bush encroachment. Management of Acacias at the seedling stage is therefore crucial in determining the composition and structure of future communities. The level and timing of defoliation of seedlings by fire or herbivory will determine survivorship of different species, and therfore influence community composition. In this study I apply defoliation treatments to the seedlings of several Acacia species (A nilotica, A tortilis, A sieberana, A erioloba, A robusta, A karroo, A borleae, A grandicornuta, A gerrardii, A nigrescens and A luederitzii). Defoliation of seedlings is applied at the cotyledon stage and thereafter at weekly intervals for four weeks. Comparisons are made of survivorship between seedlings and this is assessed in terms of the successional status of each species.

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THE INFLUENCE OF INTENSITY OF TREE THINNING ON THE VEGETATIVE GROWTH AND REPRODUCTION OF THE REMAINING COLOPHOSPERMUM MOPANE TREES

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The investigation was conducted on a densely wooded area north of the Soutpansberg. In addition to an uncleared control plot (65 x 180 m), six other plots were subjected to different intensities of tree thinning, ranging from a totally cleared plot (0 %) to plots thinned to the equivalent of 10 %, 20 %, 35 %, 50 % and 75 % of the leaf biomass of the control plot (100 %). Leaf biomass of the control plot was estimated at 5 910 Evapotranspiration Tree Equivalents ha-1 (1 ETTE = mean leaf volume of a 1.5 m tree = 500 cm3 leaf volume). Results of three seasons after thinning is presented. Rainfall over this period ranged from 169 mm (1989/90), 440 mm (1990/91) and 214 mm (1991/92) (mean 380 mm). Surveys of all rooted live C mopane trees encountered in fixed transects included (i) measurement of their spatial canopy (at the end of the growing seasons), (ii) observations on flowering and seed production (monthly). Twelve marked trees from each plot were also observed monthly for estimates of leaf carriage. Estimates of leaf DM were calculated from the spatial canopy measurements using a regression equation $\ln y = -4.165 + 0.711x$, where y = leaf mass (g) and x = spatial canopy volume (cm3). Thinning of C mopane reduced inter-tree competition which resulted in marked increases in the vegetative growth, flowering and seed bearing of the remaining trees. The mean seasonal leaf DM increases per tree ranged from 12.6 % to 27.8 % in the 10 % plot opposed to increases of 8.9 % to 17.9 % of trees in the control (100 %) plot. Between 0.4 % and 11.5 % of the trees in the 100 % plot flowered and produced seeds, opposed to 17.8 % to 62.9 % of the trees in the 10 % plot. The larger number of trees in the high tree density plots ensured that the total seasonal leaf dry mass increase and number of trees that flowered and produced seeds were of the same order or exceeded that of the low tree density plots. On a structural basis, the trees showed increases in canopy cover rather than increases in tree height. Trees from the low tree density plots displayed a better distribution of browse, having leaves in comparatively younger phenological states over an extended period. This has important consequences to browsers and it can thus be concluded that high densities of C mopane trees are also detrimental to browsers, and not only grazers. The months September to December were established as the critical months as far as vegetative growth is concerned.

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DIE INVLOED VAN DICHROSTACHYS CINEREA OP GRONDFAKTORE EN FLORISTIESE SAMESTELLING VAN DIE GRASLAAG IN DIE SUURAGTIGE GEMENGDE BOSVELD

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Dichrostachys cinerea is die mees prominente houtagtige verdigter in die Suuragtige gemengde bosveld. Tydens hierdie studie is die ekologiese invloed van dié plant op die grond en floristiese samestelling gekwantifiseer. Die navorsing was daarop gemik om basiese inligting omtrent die plant te bekom, vir die formulering van moontlike beheer- en bestuursmaatreëls. Die ondersoek is op die Towoomba Landbou-ontwikkelingsentrum uitgevoer. Ses persele met twee boomdigthede (enkel boom en drie bome) en van verskillende groottes (groot, medium en klein) is gebruik. Die stam van die D cinerea bome het as verwysingspunt gedien, van waar alle opnames in konsentriese sirkels, plaasgevind het. Twee subhabitatte nl. onder die boomkroon en buite die kroon, is geïdentifiseer. Panicum maximum het slegs onder die groot bome en tot 'n mindere mate onder die medium bome voorgekom. Hierdie studie het bewys dat daar 'n sterk assosiasie tussen die grootte van die boom, die afstand van die stam, die reënval en die voorkoms van P maximum is. Alhoewel die grond onder die groter bome verryking ondergaan het, het dit uit hierdie studie geblyk dat stikstof nie noodwendig 'n bepalende faktor is vir die voorkoms van P maximum nie. Gedurende die 1989/90 seisoen, was daar 'n hoër bogrondse fitomassaproduksie van die graslaag onder die boomkrone as in die buiteveld terwyl die teendeel waar was gedurende die ondergemiddelde reënseisoen van 1990/91. Die gemiddelde toename in die totale blaarproduksie vanaf die 1989/90 tot die 1990/91 seisoen het voorgekom. Die klein D cinerea bome het 'n hoër beskikbare water in die grond verteenwoordig as die van die groot- en medium bome terwyl daar minder beskikbare water in die drieboompersele as die enkelboompersele, gemeet is. Ook het die grond in die bedekte subhabitat minder beskikbare water verteenwoordig as die in die buiteveld. Uit hierdie studie was dit duidelik dat die laagste Et per dag onder die groot bome (2,05mm) en die hoogste in die buiteveld (2,89mm) voorgekom het. Ook blyk dit dat die enkelboompersele 'n hoër WVD het as

die drieboompersele en dat sonder uitsondering 'n hoër WVD gedurende die onder gemiddelde reënseisoen, in al ses die verskillende plantgemeenskappe, voorgekom het. Uit 'n boerdery-oogpunt, kan die D cinerea bome nie op grond van voerproduksie vergoed vir die onderdrukking daarvan op grasproduksie nie. Indien bome deur drastiese beheermaatreëls verwyder moet word, ongeag of die boerderyvertakking gras- of blaarbenutters behels, sal volgens resultate uit die studie verkry nie aanbeveel word dat groot D cinerea bome verwyder word nie.

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EFFECT OF FIRE INTENSITY ON THE MORTALITY AND TOPKILL OF BUSH IN THE KRUGER NATIONAL PARK IN SOUTH AFRICA

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Fire intensity is one of the most important components of the fire regime to consider when using controlled burning to combat bush encroachment. Consequently it was decided to determine the effect of the intensity on the mortality and topkill of stems and branches of trees and shrubs of different heights in the Kruger National Park where the vegetation is representative of much of the woody component of the northern savannahs of South Africa. The research comprised monitoring the response of 7401 trees and shrubs to 43 fires which ranged in intensity from 110 kJ/s.m. to 6704 kJ/s.m. The results showed that the mortality of bush was very low irrespective of fire intensity and the mean total kill for 14 of the most common bush species was only 1.3 percent. Conversely it was found that increasing fire intensities caused a significantly greater topkill of stems and branches of the trees and shrubs, the majority of which coppiced from the collar region of the stem. However, this effect declined with an increase in the height of the bush. There were no clear cut differences in the response of the most abundant bush species in the Kruger National Park to different fire intensities. The general conclusion was drawn that in the northern savannahs of South Africa bush is susceptible to a topkill of stems and branches to a height of approximately 3.5 metres and a minimum fire intensity of 3000 kJ/s.m is necessary to cause a significant topkill of bush to this height.

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THE INFLUENCE OF RAINFALL AND GRAZING ON THE SPECIES COMPOSITION OF CERTAIN HABITATS IN THE SOUR AND MIXED BUSHVELD

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With the exclusion of fire as an important management tool in many of the farming areas of the Thabazimbi, Ellisras and Waterberg magisterial districts, rainfall and grazing became the most important factors influencing the dynamics of the vegetation. The aim of this study will be to quantify these changes for each of the most important habitats in this area. A detail study of the relationships between vegetation and habitat was made and broad ecological divisions were identified. Grazing intensity gradients on five of these habitat groups were sampled by 140 plots in 1991 by using watering points and fence-line effects. A Two Hundred Point Nearest Plant Sampling procedure was used and each sampling plot was subjectively classified into one of four veld condition classes. TWINSPAN and DECORANA algorithms were used to verify the subjective vegetation-habitat and veld condition classifications. The individual species of each vegetation-habitat type were classified into functional groups (Decreasers and Increasers) by using Box-and-Whisker plots. In the following three years, till 1994, the vegetation-habitat types were re-sampled. During this time major differences in the amount and distribution of the rainfall have occurred. The data were again subjected to multivariate analysis techniques. The results showed that the species composition alone clearly reflects the grazing intensity gradients. In the case of rainfall differences, major changes have taken place over four years in the species composition of a habitat. The distribution of the rainfall has also a profound impact on the annual species. The habitat played an important role in the classification of species into functional groups. For instance a species that is a Decreaser in one habitat may be classified as an Increaser in another habitat. It was shown that there is a significant decline in basal cover with a deterioration in veld condition. These results were used to classify a SPOT satellite image into veld condition classes and the percentage degradation of each habitat was determined. This together with veld production and utilisation data will be used to develop a dynamic geo-spatial grazing capacity model.

OPTIMUM NITROGEN STRATEGIES FOR CENCHRUS CILIARIS USING PUTU 13 AND STEER (ASSESSING BIOLOGICAL AND ECONOMICAL OPTIMUM AT DIFFERENT STOCKING RATES)

MD HOWARD, JM DE JAGER, LG DU PISSANI & C BOOYENS

A nitrogen balance model taken from PUTU 14, was included and tested in PUTU 13 for C Ciliaris. Overall model performance yielded an r^2 and an index of agreement of 0.97 and 0.98 respectively. Simulations (64 seasons) at differing soil-nitrogen levels suggested that N-applications of 40 kg ha^{-1} were adequate.

A parameter for estimating the chance of an improved yield resulting from an incremented nitrogen application was defined (P). The highest P occurred when N-application was increased from 0-20 kg ha^{-1} (P = 0.94). An increase of 20 - 40 and 40 - 60 kg N ha^{-1}, yielded a P of 0.5 and 0.19 respectively.

PUTU 13 simulated growth of C Ciliaris at 5 climatic scenarios (bad, poor, moderate, good and wet) and 3 levels of N-applications (20, 40 & 60 kg N ha^{-1}). STEER simulated growth of 2 year old steers (ox) at these scenarios. Animal performance was modelled at 8 different stocking rates (0.3, 0.6, 0.9, 1.2, 1.5, 1.8, 2.1 & 2.4 Oxen ha^{-1}). Optimum animal production (kg ha^{-1}) was found to be 230, 280 & 340 at stocking rates of 2.1, 1.8 & 1.5 for a poor, moderate and good year respectively.

Optimum gross margin was reached at stocking rates of 1.8 oxen ha^{-1}, where a N-application of 40 kg N ha^{-1} yielded the highest gross margin (R 430 ha^{-1}). Stocking rates between 1 - 1.5; 1.1 - 1.5 & 1.2 - 1.5 are recommended for N-applications of 20, 40 & 60 kg ha^{1} respectively.

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ENVIRONMENTAL CONSIDERATIONS IN THE FUTURE USE OF NITROGEN FERTILIZER ON INTENSIVE ANNUAL PASTURES

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The 1980's and 1990's have brought with them a challenge to consider the long-term sustainability and environmental impact of agricultural systems. With the re-entry of South African produce into international markets, serious review will be required of input costs. Two input costs requiring review are also under the environmental spotlight, namely the use nitrogen (N) fertilizer and the extensive re-establishment of annual pastures.

The problems associated with excessive use of N fertilizers have been extensively researched worldwide. One of the main pathways of N loss from intensive pasture is via the leaching of nitrates. Evidence is presented from streams passing through intensive pasture systems indicating as much as a 5 fold increase in nitrate. Perhaps a combination of political isolation and the geographical separation of pasture lands has shielded local farmers from the pressures of environmental lobbyists. Another side-effect, associated with excessive N fertilizer use, is the increased incidence of ammonia bloat and toxicity reported from intensive Midmar ryegrass pastures.

The ever-increasing cost of N-fertilizer inputs will require review as local prices are forced into line with international markets. It was this precise scenario that forced most first-world economies to opt for legume-based pastures almost 20 years ago. It was in this same era that South African scientists presented the need for a switch to legume-based pastures, with many "land-mark" symposia and papers being presented. However, due to artificial market protection, ample available land and price-fixing, farmers were not forced into this option. Sadly enough, many of these symposia could now be presented again, with data unchanged, 20 years later.

The depletion of soil organic matter (OM) reserves has received much attention from scientists concerned with maize production. However, little attention has been paid to the depletion of these reserves under intensive annual pasture systems. These OM reserves play a vital role in moisture and N retention in the root profile, as well as reducing the impact of hoof action on soil compaction. Local evidence is presented indicating a progressive decline in total soil N, OM and pasture yields with long-term annual soil cultivation.

An increased emphasis on perennial pastures may be one of the few practical means of promoting long-term sustainability. Research efforts on annual pastures should concentrate on minimum tillage re-seeding techniques and techniques for maximizing the re-incorporation of unitilized forage into the soil.

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EFFECTSOF IRRIGATION TIMING AND APPLICATION METHOD OF UAN ON KIKUYU YIELDS, AND ECONOMIC COMPARISONS BETWEEN IT AND THAT OF LAN

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Earlier work showed UAN dilution had detrimental effects on kikuyu yields, i.e. irrigated pastures may not have been realising their full yield potential. To confirm this, 138kg N ha^{-1} $dressing^{-1}$ of UAN and LAN were applied separately to 13 plots. Water was applied immediately before, after and at two intervals after fertilisation. Water equivalent to one week's irrigation was applied to plots. Yields were measured and degree of scorch visually appraised. No significant yield differences occurred between treatments, regardless of watering procedure used. Scorch occurred only on UAN fertilised plots and severity corresponded to length of time elapsed before water was applied to the sward. Scorch did not play a significant role in yield reduction, even when pastures were irrigated six days after fertilisation (i.e. no significant yield differences existed between treatments). This indicated that farmers could irrigate up to six days after fertilisation without yield depression. Various applicators have been manufactured to apply liquid UAN. Stream nozzles which release thin jets of fertiliser onto the pasture, thereby minimising scorch and wind losses, have been preferred. However, efficiency of other nozzles like cones, fan or special applicators are untested. Four nozzle types were used to apply 138kg N ha^{-1} $dressing^{-1}$ of UAN to plots (i.e. chafer streamjet; cone; fan; disc). Scorch appeared one day after fertilisation and persisted for about two weeks, regardless of applicator used. Use of fan nozzles resulted in 80-90% of the sward being scorched. With the other three, scorching was localised. Even though fan nozzle fertilisation gave the lowest yields (2.2t ha^{-1}), and stream nozzle the highest (2.5t ha^{-1}), no one applicator was superior to another as yields showed no marked differences between nozzle types. UAN usage is normally determined by price, and application costs. If money is saved, because of lower input demands, then it should be used more than others. To establish whether this is so, costings using solid LAN and liquid UAN were performed. Labour, tractor, implement and fertiliser costs were included and assumptions for a kikuyu pasture, to allow for comparisons of known yields between LAN and UAN, determined. To obtain 5, 10 and 15t ha^{-1} DM it was more economical to use UAN than LAN.

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CONGRESS 30 POSTER ABSTRACTS

RANGE MONITORING: A DYNAMIC PROCESS

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The word "sustainable" is becoming very popular amongst politicians and rangeland scientists. This word implies that there is some knowledge of the temporal impact of a specific rangeland use on the various resources, such as soil, vegetation, capital etc. To quantify temporal changes, various forms of monitoring at various levels must be done. While monitoring, the scientist and land user are influenced by various factors which include, available technology, present knowledge of rangeland dynamics and perceived urgency of society to monitor which are also, all time dependent. Rangeland monitoring programs must therefore, be designed to change with changing circumstances but must also have enough continuity to be relevant in the long term. This paper investigates the various objectives and problems of range monitoring by using various examples where the authors have been or are presently involved. These include the range monitoring programs in the Kruger National Park, Western Australia and the Eastern Cape. Although these programs are located in areas with different land use patterns the monitoring programs have common ground. All the programs demonstrate that the interaction between the "data collectors" and those who analyse and interpret is the key for an adaptive monitoring approach. There are two aspects of this interaction which need emphasis. Firstly, range monitoring programs must have an end product that is applicable to all potential end users and the end users should have input into the program. This is an iterative process where the various people involved are on a learning spiral. Secondly, range monitoring must concentrate on gaining temporal knowledge because it is the time series components that are the most valuable.

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SATELLITE IMAGES: ALTERNATIVE PERSPECTIVES TO KAROO ECOSYSTEM FUNCTION

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"Science is a dialogue between Observable Phenomena and Conceptual Constructs." (Pickett, SAAB 1994) leading to our understanding and explanations. Before predictions or decisions can be made, the overall patterns in a system must be observed and all the information possible considered.

One way of expanding the observable phenomena is to extend our view beyond the visible spectrum using radiometry. Spectral information is then increased from just the visible wavelengths (0.4-0.7um) into the near and far infra red (and even into thermal infa red) wavelenghts) (0.4-12.5Um). This provides greater information about vegetation properties: photosynthetic activity, leaf water content, atress senescence, green biomass; and also about the baxkground: soil moisture, erosion, patchiness.

We compare an aerial photograph to a SPOT HRV satellite image of a portion of the Karoo National Park. Both contain valuable information, but the image provides us with enhanced data about the vegetation as well as the texture of the landscape. One pertinent example of this, is the identification of patches in the landscape which to the visible eye in the field appear denuded and degraded with a very low plant cover; and on the aerial photograph appear as a patch with low cover, similar to other patches on the photograph. On the satellite image these patches show up as being areas of high photosynthetic activity. Investigation in the field shows these as areas where there is greater herbivory, new plantgrowth (less moribund material) and where higher photosynthesis occurs in some species. This phenomena would not have been observed without the satellite information and hence could not have been investigated or incorporated into any management planning.

Another aspect we explore is that of diversity. Radiometric diversity within an image provides us with information about landscape patterns and patchiness of the area, which can be linked to habitat diversity.

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DIE LANGTERMYNEFFEK VAN 3 VERSKILLENDE VEELADINGS OP VELDTOESTAND IN DIE WATERBERGSE SUURBOSVELD

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Doel: 1. Om te bepaal wat die langtermyn effek van ligte, matige en oorbelading van 3 kampe in die groeiseisoen op:
a) Gras-spesiesamesteling,
b) Grasproduksie,
c) Tempo van bosverdigting op Eragrostis pallens / Burkea africana veld in die suurbosveld het.
2. Om bg. kampe as verwysingspunte en as demonstrasie-eenhede in weidingsvoorligting aan te wend.

Behandeling: Die volgende persentasies van die beskikbare droë grasmateriaal word gedurende 2-3 beweidingsperiodes in die groeiseisoen benut:
Kamp 1 - 25% (verteenwoordig ligte beweiding),
Kamp 2 - 50% (verteenwoordig matige beweiding),
Kamp 3 - 75% (verteenwoordig swaar beweiding).

Elke kamp word gedurende die dormante seisoen tot dieselfde mate afgevreet.

Die beskikbare materiaal word as volg bereken: Honderd en vyftig (150) 1m2 kwandrante word ewekansig verspreid oor elke kamp uitgegooi. Opbrengs grasmateriaal word met gereelde kontrolering binne elke kwadrant geskat. Vyftig persent word tussen bome en 50% onder bome gedoen. Kruinbedekking van elke kamp is vooraf bepaal om sodoende die werklike beskikbare materiaal per kamp te bereken. Natmateriaal opbrengs word op sekere aannames na droemateriaal opbrengs bereken.

Grootvee-eenheid weidae word vanuit bg. gegewens bereken: Aantal dae wat kudde in elke kamp moet wees om beplande persentasie hoeveelhede te benut, word bepaal volgens b.g. GVE-weidae en kuddegrootte.

Monitering van veranderde veldtoestand: Grasspesiesamestelling word m.b.v. 'n 300 wielpunt opname in elke kamp vasgestel. Dit sal elke 2e jaar herhaal word. Die vergelyking van grasproduksie tussen die 3 kampe word bereken deur die oorblywende hoeveelheid materiaal net na beweiding elke keer af te trek van die beskikbaar hoeveelheid materiaal net voor die volgende beweiding. Tempo van bosverdigting word vasgestel m.b.v. 3 transekte van 90 meter elk in elke kamp. Tempo van vermeerdering of vermindering van houtagtige komponent word elke 2e jaar bepaal. Reenval word maandeliks in elke kamp gemeet.

Resultate: Monitering het eers met die aanvang van die 1993/94 seisoen begin. Daar bestaan op hierdie stadium nog nie genoegsame data om die effek wat die 3 beladings op die 3 kampe het, te vergelyk nie. Bestaande data sal egter in plakaat weergegee word.

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DIE INVLOED VAN HULPBRONGEKOPPELDE FAKTORE OP VELDTOESTAND EN WEIDINGSKAPASITEIT

W van der BOTHA H R BECKER & J VILJOEN
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Weidingskapasiteit, in die ekstensiewe veeweistreke van die Karoo is met die oog op volhoubare produksie, die mees kritiese komponent in veldbestuur. ie beraming van weikapasiteit is dus 'n belangrike komponent. Veldtoestand is op sy beurt weer 'n bepalende faktor in die beraming van weikapasiteit. Die bepaling van veldtoestand en beraamde weikapasiteit is dus van kardinale belang vir die produsent. Hy moet egter ook besef dat verskeie hulpbrongekoppelde faktore 'n beliste bydrae tot veldtoestand en dus weidingskapasiteit maak.

Doel: Die doel van die studie is om in samewerking met boeremedewerkers en die monetering van veldtoestand die verband tussen reënval, veldtoestand en toegepaste veelading oor tyd te bepaal.

Resultate: Uit die verwerking van 80 medewerkers se data oor 'n periode van agt jaar is die volgende resultate gevind:

* Daar is 'n sterk verband tussen langtermyn re%nval en toegepaste veelading of weikapasiteit.
* Daar is 'n sterk verband tussen veldtoestand (oor die algemeen) en reënval.
* Daar is 'n sterkverband tussen veldtoestand en veelading gevind.

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THE DEVELOPMENT OF AN ADAPTIVE STRATEGY FOR ESTABLISHMENT OF PERMANENT VEGETATION ON NON-LEACHED GOLD MINE TAILINGS: A PRELIMINARY ANALYSIS

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Effective mine closure plans must provide for the rehabilitation of disused workings, waste rock dumps and tailings impoundments. The establishment of vegetation, particularly grassland, is an important long-term objective for erosion control on such sites, particularly as this gives additional landscaping benefits compared to physical techniques such as rock cladding. Gold tailings represent a pyritic waste with particularly extreme conditions of acidity and high aluminium. Traditionally surface leaching using overhead sprinkler systems have been needed for the control of acidity in surface layers of gold mine tailings before an attempt is made to establish vegetation. This technique is expensive in equipment and labour. This paper presents preliminary results concerning the selection of grass populations which may be suitable for an alternative approach to the stabilisation of gold tailings dam slopes. This adaptive approach seeks to produce suitable species or ecotypes from promising natural or artificially selected plant material. An evaluation of methods for screening suitable plants has been conducted, with particular regard to assessing different tolerance to substrate acidity and high soil aluminium, the relative merits of the various methods will be discussed. Preliminary results will be presented of screening experiments of a small number of commercial grass varieties, and comparisons with populations of the same species established from individual plants naturally occurring on gold tailings dams.

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MINE WASTE REVEGETATION MONITORING

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Legislation stipulates that all mines are required to submit an Environmental Management Programme, which, once approved by all the relevant regulatory authorities, defines the criteria for the approval of a Closure Certificate.

The standard set in Palabora Mining Company's Environmental Monitoring Programme, stipulates that all revegetated areas must be dominated by perennial species and further, 80 percent of any randomly placed points must be within 50 cm of the nearest live grass tuft.

A monitoring programme was thus developed to determine whether these criteria were being met, and to identify remedial management requirements.

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DIE INVLOED VAN GLIFOSAAT OP DIE PRODUKSIE EN KWALITEIT VAN DIGITARIA ERIANTHA

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Glifosaatbespuiting of "pasture topping" is 'n benadering wat gebruik word on saadsetting van ongewensde grasse te verhoed of om die kwaliteit van 'n grasweiding te verbeter. Bespuitings met chemiese middels soos Roundup, met glifosaat (N-[phosphanemthyl] glycine) as aktiewe bestanddeel, teen lae dosisse, beperk die fisiologiese ontwikkeling van die plant. Hierdie proses inhibeer die vorming van lignosellulose en dus die proses van lignifikasie wat hoofsaaklik verantwoordelik is vir laer kwaliteit van die plant in die volwasse stadium. Hoewel veral die verteerbaarheid van die gras na so 'n bespuiting verhoog en in sommige gevalle ook die ruproteïeninhoud, neem die droëmateriaalopbrengs van sulke weidings normaalweg af.

Vier (4) herhalings van die behandelingkombinasies nl. behandeling 1 (Bemes, nie gespuit), behandeling 2 (nie bemes, nie gespuit), behandeling 3 (bemes, gespuit) en behandeling 4 (nie bemes, gespuit) is op 'n totale oppervlakte van 46 ha toegepas. Dertig kilogram stikstof (N) en drie kilogram fosfor (P) is gedurende Oktober 1993 op die bemeste persele toegedien, terwyl 125g glifosaat aktief (Roundup 360 g. l^{-1}) per hektaar op die sagtedeeg stadium op die bespuite persele toegedien is. Simmentaler koeie met kalwers het die staande hooi gedurende die 1994 winter benut. Die kwaliteit van die weidings is met behulp van slukdermfistelmonsters bepaal.

Anders as verwag was daar geen betekenisvolle verskil (P μ 0.05) tussen die droëmateriaalproduksie van die behandelings nie. Die behandeling wat bemes en gespuit is (beh. 3) het die hoogste % RP (6.1%) en TVV (50.7%) teenoor die kontrole (beh. 2) met 5.2% RP en 47.5% TVV, gehad. Behandeling 3 het ook die meeste GVE-WD/ha (grootvee-eenheid weidae) opgelewer.

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DEVELOPMENT OF ADVENTITIOUS ROOTS OF SMUTS FINGERGRASS TREATED WITH 2,4-D

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A previous study on the feasibility of chemical weed control in Smuts fingergrass (Digitaria eriantha: eriantha Steud) indicated that 2,4-D might have a adverse effect on the adventitious roots of the pasture. In that study, fingergrass tufts were easily dislodged during irrigation or moving. It was assumed that 2,4-D might have an adverse effect on the adventitious roots of fingergrass. The possible effect of 2,4-D on the number and length of adventitious roots of this pasture was examined in a glasshouse. The dimethylamine salt of 2,4-D was applied at the two tiller stage of the pasture at the following rates: 0.96, 1.92 and 3.84kg/ha. Observations were made 10. 20 and 30 days after herbicide application. In due course 2,4-D had increased the number of adventitious roots, but most of these roots were malformed. Root length was also adversely affected by 2,4-D. Although the pasture recovered from the effect of 0.96 kg 2,4-D/ha, the effect of higher rates lasted for the duration of the experiment (10 weeks). Malformed and shortened roots may cause water stress and unsatisfactory anchoring of the grass.

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THE NITROGEN MANAGEMENT OF PERENNIAL RYEGRASS AND TALL FESCUE PASTURES WITH AND WITHOUT CLOVER

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As a more perennial alternative to annually re-established Midmar ryegrass pastures, perennial ryegrass and tall fescue pastures, with or without clovers, are increasing in popularity in the higher potential areas of southern Africa.

The N fertilizer management of these grazed perennial pastures, with and without clover, was investigated with the objective of providing detailed N management guidelines. Varying rates of N fertilizer (LAN) were applied to both pure grass pastures (150, 450 & 600 kg N $ha^{-1}yr^{-1}$) and mixed grass/clover pastures (0, 105, 315 & 420 kg N $ha^{-1}yr^{-1}$). In order to optimise the N contribution of the clover, grass/clover treatments received no N fertilizer during the clover-active months (November to March). Data were analysed by analysis of variance, based on the randomised blocks field design, with regression analysis being used in the interpretation of yield responses.

Both perennial ryegrass and tall fescue pastures responded linearly ($P > 0.05$) to increasing rates of N fertilizer up to 600 kg N $ha^{-1}yr^{-1}$. The DM yield of the grass/clover pastures was consistently greater than that of the pure grass pasture at equivalent N fertilization rates. The yield responses were graphed for the clover-dormant (April to October) and clover-active months, indicating a clear yield benefit of including clover in the sward. Only when the N fertilization rate was increased to 180 kg N ha^{-1}, between November to March (60 kg N ha^{-1}application^{-1}), was there a significant ($P > 0.05$) yield benefit over the grass/clover plots. The overall yield contribution of clover was emphasised, in addition to a potential savings on N fertilizer during these summer months.

The number of clover stolons m^{-2} were measured in order to investigate the effect of N fertilizer treatment on clover growth. A significant ($P > 0.05$) decline in clover content was noticed with increasing N fertilization rate. This decline in clover content was less severe in the tall fescue pasture, relative to the perennial ryegrass pasture, indicating a greater

compatibility of tall fescue with clover, particularly in the presence N fertilizer. The clover content of both pastures declined into the second season, to the extent that reintroduction would be necessary every three years. Given the additional yield, N-fixation contribution and superior nutritional quality associated with clover, the inclusion or re-introduction of clover into these pastures is highly recommended. The data are reviewed in terms of yield and theoretical economic benefit between the varying N fertilizer treatments.

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AANGEPLANTE WEIDING: INVLOED VAN GROND pH, KLEIPERSENTASIE EN BEMESTING OP KWALITEIT EN PRODUKSIE VAN DIGITARIA ERIANTHA

IF RECKLING
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Wat is die minimum fosfaat status [Bray 2] wat benodig word deur Digitaria eriantha vir ekonomiese sowel as biologiese verantwoordbaarheid? Hoe beïnvloed varieërende pH, fosfaat vaslegging? Watter rol speel kleipersentasie in hierdie proses?

Peile toegedien:	N_0	=	0 kg N/ha	Bron (Ureum 46%)
	N_1	=	40 kg N/ha	
	N_2	=	80 kg N/ha	
	N_3	=	120 kg N/ha	
	P_0	=	0 kg P/ha	Bron (K H_2 PO_4)
	P_1	=	15 kg P/ha	
	P_2	=	30 kg P/ha	
	P_3	=	45 kg P/ha	

Groeimedium gebruik:	Sand	pH (H_2O) 4.72
	Sandleem	pH (H_2O) 4.94
	Sandklei	pH (H_2O) 7.30

Dit blyk dat 10dpm [Bray 2] fosfaat voldoen aan die biologiese vereiste van Digitaria eriantha op alle groeimediums. Dit verskil van die huidige aanbeveling van 15dpm [Bray 2], en sal 'n besparing van 25kg P/ha beteken, met 'n beraamde koste van R160.85 (pryse soos op 1994-06-28 Sentraalwes, Potchefstroom). Die rol van pH vereis verdere navorsing maar uit die resultate van die 1992/93 groeiseisoen (glashuis) is geen statistiese betekenisvolheid tussen hoë en lae fosfaat peile by 'n suur sowel as by die neutrale grond verkry nie. Die invloed van klei het egter 'n merkwaardige invloed op produksie, asook vogstremming. Dit blyk asof grond met 'n hoë klei-inhoud hoër produseer maar meer vogstremming ondergaan. Gronde met 'n lae klei-inhoud het swak lug tot water verhoudings, produseer laer en is geneig om te versuip. Weens interaksie tussen grond en residuele stikstof kon geen statistiese ontledings tussen gronde gedoen word nie.

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AANGEPLANTE WEIDING: DIE PRODUKSIE VAN DIGITARIA ERIANTHA STEUD. (SMUTS-VINGER) BY VIER BEWERKINGSDIEPTES MET 'N FREKWENSIE VAN BEWERKINGSTYE

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Die produksie van Smutsvingergras neem drasties af na vier tot vyf jaar na vestiging. 'n Ondersoek na die probleem het daarop gedui dat die verdigting van grond die moontlike rede hiervoor is. Drie duidelike verdigtingslae op 7 cm, 18 cm, en 25 cm diep is met behulp van penetrasiemetings geïdentifiseer. Hierdie verdigting is waarskynlik deur onderskeidelik die hoefaksie van diere, 'n ploegsool op 18 cm, en verdigting deur meganisasie aksies wat op die land plaasvind op 25 cm veroorsaak.

Waterinfiltrasiemetings is op losmaakdieptes van 0 cm, 15 cm, 20 cm en 30 cm gedoen. Die infiltrasie-

diepte het betekenisvol vanaf die kontrole 114 mm diep, na 173 mm diep toegeneem op die 15 cm bewerking. Daar was klein verskille tussen die 15 cm bewerking en die dieper bewerkings.

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INFLUENCE OF PLANT DENSITY ON THE PRODUCTION OF 10 SALTBUSH SPECIES AT WORCESTER VELD RESERVE IN THE LITTLE KAROO

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Saltbush species (Atriplex spp) are important pasture crops in the winter rainfall area of South Africa. This can be attributed to their extreme drought tolerance and ability to produce green feed in winter, as well as during the dry summer period. As these shrubs are traditionally planted as single plants and plant density would possibly exercise an important influence on production, this aspect was investigated with 10 saltbush species over four seasons (1989/90 to 1992/93) at Worcester Veld Reserve. Seedlings of A cana (sin halimus), A nummularia, A undulata, A paludosa, A repanda, A canescens, A cinerea, A lentiformus, A semi-baccata and A lentiformus ssp breweri were established during 1989 on a Valsrivier soil. Four rows of each species were planted in a fan-shaped formation in triangular plots, with the plants at the narrowest end nearest and at the widest end furthest apart. Four spacings were used, ie 2mx2m (2 500 plants/ha), 2mx1.5m (3 333 plants/ha), 1.5mx1.5m (4 444 plants/ha) and 1.5mx1m (6 666 plants/ha). Yield (g plant-1) was determined by cutting the two middle rows of each plot to a height of 400mm at three-monthly intervals and weighing the cut herbage after drying at 60oC. The two side rows were used as borders only. The annual rainfall at the trial site was below 250mm per annum and lowest in the third (1991/92) season, but during the other three seasons the rainfall was very similar, viz between 275 and 300mm per annum. A undulata was significantly ($P < 0.05$) the highest producer. A breweri yielded (g plant-1) the second most dry matter, but not significantly so. A paludosa, A canescens and A cinerea were lower producing, but their yields tended to be higher than those of A nummularia and A cana, the two shrubs used most often in practice. The yield (g plant-1) of all the species was significantly ($P < 0.05$) higher during the first two than the last two seasons. The yield of A repanda and A semi-baccata, however, declined most and the two species were clearly not persistent. The yield (g plant-1) of all the species decreased significantly ($P < 0.05$) with increased plant population, but the response of the different species varied. The yield (g plant-1) of A undulata and A nummularia declined most with increased plant density. Although the mean decline of all species was greatest between the two lowest densities, the yield of some of the species tended to decline most at the higher densities. Plant density had a much smaller influence on the yield per hectare (kg ha-1), but yield increased significantly ($P < 0.05$) with increased plant density. However, it was clear that the decrease in yield per plant, owing to higher plant densities, was largely neutralised by the higher plant population over the range of densities used, which were rather high compared to those used in practice.

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PRODUKSIE VAN MENGSELS EN SUIWER STANDE VAN LUSERN, WITKLAWER EN VYF GRASSE ONDER BESPROEIING IN DIE KLEIN KAROO

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Vyf meerjarige grasse (Phalaris aquatica cv Sirolan, Dactylis glomerata cv Currie, Lolium perenne cv Nui, Festuca arundinacea cv Demeter en kikoejoe, Pennisetum clandestinum) en twee peulgewasse, lusern (Medicago sativa cv SA standaard) en witklawer (Trifolium repens cv Haifa) is in suiwer stande en in peulgewas-grasmengsels oor 'n periode van drie jaar onder vloedbesproeiing op Rhoodeheuwelproefplaas, Oudtshoorn, (Oakleaf grond) geëvalueer. Die proef is in Mei 1987 gevestig. In die mengsels is die peulgewas- en die graskomponente in alternatiewe rye gevestig. Die persele is vyfweekliks met 'n snymasjien tot op 'n hoogte van ongeveer 50mm afgesny. Na elke sny is aan die suiwer graspersele en die mengsels 'n kopbemesting van 60kg stikstof per hektaar toegedien. In die vestigingsjaar (1987/88) was onderlinge produksieverskille tussen die

gewasse en mengsels klein. Die peulgewas-grasmengsels met lusern (cv SA Standaard) as 'n komponent het egter effe hoër opbrengste gelewer as dié met witklawer (cv Haifa) as komponent. Hierdie tendens het progressief oor die jare toegeneem en in die derde seisoen (1989/90) het die suiwer lusern stand en die mengsels met lusern as 'n komponent statisties betekenisvol ($P < 0.05$) hoër opbrengste gelewer as die witklawer-grasmengsels en die suiwer gras en witklawer. Alhoewel, nie betekenisvol hoër nie, was die produksie van die langswenkgras (cv Demeter) en lusern (cv SA Standaard) mengsel elke seisoen die hoogste. Die mengsels se produksie was deurgaans hoër as die gemiddeld van die twee komponente. Dit kan moontlik toegeskryf word aan die feit dat stikstof aan die mengsels toegedien is terwyl die peulgewaskomponent ook stikstof verskaf het. Die insluiting van 'n peulgewas in 'n mengsel hou nie net 'n produksie voordeel in nie, maar verhoog ook die kwaliteit van die weiding, wat tot beter diereprestasie lei.

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DROëMATERIAALOPBRENGS EN ASSIMILAATVERDELING VAN KUILVOERSOJABONE EN - MIELIES BY VIER BESPROEIINGSPEILE

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Met die nywerheidskompetisie om beskikbare besproeiingswater, word dit al hoe belangriker om per eenheidwater meer en/of beter kwaliteit opbrengste te lewer.

'n Proef om vas te stel wat die invloed van verskillende besproeiingspeile op sojaboon- en mieliekuilvoer-produksie is, is op die Hatfield Proefplaas te Pretoria uitgevoer. Klein persele onder 'n outomatiese reënskerm is gebruik en besproeiing is weekliks met behulp van 'n neutronvogmeter geskeduleer.

Die vier besproeiingspeile wat toegepas is, het gevarieer van 'n kontrole (W1) tot 'n straf gestremde behandeling (W4).

Beide gewasse is op die hardedeegstadium geoes. By mielies was daar 'n styging in opbrengs vanaf die W1- tot W3-peile gevolg deur 'n skerp daling in opbrengs vir die W4-behandeling. Elke perseel het 'n standaard bemesting ontvang, maar differensiëleloging van nutriënte kon aanleiding gegee het tot waargenome mielieopbrengste en sal verder ondersoek moet word. By sojabone was die teenoorgestelde tendens waarneembaar, nl. 'n afname in opbrengs met afname in watertoediening.

As daar na die assimilaatverdeling gekyk word, het beide gewasse meer fotosintaat verdeel na die reproduktiewe- as die vegetatiewe dele. By die W4-peil het die koppe 65% en die peule 32% van die totale droëmateriaal uitgemaak teenoor die W1-peil se 58% en 29% vir onderskeidelik mielies en sojabone.

Vir beide die gewasse het stremming min verskil in stingelmassas veroorsaak. Die blare en reproduktiewe-dele was duidelik meer gevoelig vir waterstremming met assimilaatverdeling as gevoeligheidskriterium.

Dit is belangrik om daarop te let dat alhoewel lae besproeiingspeile (W4) tot lae droëmateriaalproduksie lei, word relatief meer fotosintaat na die peule en koppe gealokeer wat lei tot groter hoeveelheide energie (mielies) en proteïene (sojabone). Dit kan dus tot 'n beter kwaliteit kuilvoer lei wat kompenseer vir die afname in droëmateriaalopbrengs.

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THE VELD AND PASTURE SCENE OF THE KROONSTAD SUBREGION

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The Kroonstad sub-region lies in the central and north western parts of the Orange Free State and covers an area of 2.9 million ha. Cash cropping is very important, especially maize farming, but besides that 42% of the area is veld. The veld consists of *Cymbopogon-Themeda* variations and is sweet, with conditions varying from good to poor. 90 700 ha are established under pastures - 60% perennial grasses, 9% Lucerne and 31% annual pastures such as small grain and forage sorghums. The soil conservation scheme has had a great impact in this area and 12% percent of the pastures established under this scheme, in the RSA, have been established in this sub-region in spite of the fact that it only covers 3.4% of South Africa.

EFFECT OF GRASS FLAMMABILITY ON FIRE INTENSITY

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During burning trials conducted since 1972 in the savannah areas of South Africa on the use of fire in the control of bush encroachment it has become very apparent that certain grass species are more flammable than others, resulting in significantly different fire intensities. This phenomenon was very well illustrated in a recent fire applied to East Camp 2 on the Napier Section of the Fort Hare Research Farm (17/8/94) where as a result of the non-flammability of Panicum maximum growing under the trees the fire had minimal detrimental effects on the bush. This result was also exacerbated by the air temperature being 21° Celsious instead of at least 25° Celsius and the relative humidity being 41% instead of less than 30% all resulting in a cool fire. In an effort to explain this result an investigation was initiated to ascertain the reasons for the grasses having different flammabilities. The following hypotheses were tested.

Panicum maximum has an inherently higher overall residual moisture content during the dormant period; than the grass species that grow in the area between the trees and bush clumps resulting in a lower flammability;

The culms of Panicum maximum have in particular a higher residual moisture content than the culms of the grass species that grow in the area between the trees and bush clumps resulting in a lower flammability;

The moisture content of Panicum maximum is generally lower at the upper levels of the grass canopy but increases at the lower basal levels resulting in the grass tuft igniting more readily at the top than at the bottom which leads to the development of a slow burning "back fire" down the grass plant significantly reducing its flammability.

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THE DETERMINATION OF THE OPTIMAL COMBINATION OF UNHARVESTED MAIZE AND JAPANESE RADISH AS WINTER FEED FOR SHEEP ON THE EASTERN HIGHVELD

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Unharvested maize has high potential for the fattening of lambs on the Eastern Highveld from about April to July. The carrying capacity is high and the animal performance satisfactory. There are two factors limiting animal production on unharvested maize, namely a protein deficiency and acidosis, as a result of high energy intake. Previous work done at Nooitgedacht A.D.C. showed that these problems could be overcome by utilizing green feed in combination with unharvested maize. It was also shown that Japanese Radish cv. Nooitgedacht has very high potential because of the high carrying capacity and animal performance. It also carries a lower risk than most other green feeds because of its early planting time. It is thus less reliant on late season rainfall. The optimal combination of unharvested maize and Japanese Radish, in terms of animal production and combatting acidosis, is unknown. A trial was done with four combinations of unharvested maize and Japanese Radish with 0%, 33%, 66% and 100% radish. Young Merino ewes were used to determine animal performance, and quality and yield were also determined for each combination. It is expected that these results will make a contribution to more effective application of green feed/unharvested maize combinations in fodder flow programs. (At present the trial is being done and results will be available after August 1994.)

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DIE EVALUERING VAN VIER BESPROEIDE WEIDINGS MET LAMMEROOIE TE ERMELO

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Die hoë koste verbonde aan besproeide weidings plaas groot druk op die winsgewende gebruik van sulke weidings. Benewens effektiewe bestuur van 'n spesifieke weiding, het die keuse van weidingstipe 'n bepalende invloed op die winsgewende benutting van besproeiingsgrond. Belangrike oorwegings sluit in meerjarigheid, drakrag, diereprestasie en bemestingsbehoeftes van alternatiewe weidings. Op Nooitgedacht LOS is alternatiewe besproeide weidings wat insluit eenjarige raaigras, assegaaiklawer, mengsels van eenjarige raaigras/assegaaiklawer, mengsels van eenjarige raaigras/assegaaiklawer/SSR 729 en 'n meerjarige langswenkgras/witklawer mengsel oor drie jaar getoets. Belangrike norme in terme van drakrag en diereprestasie vir onderskeidelik die Herfs/Winter- en Lente/Somer seisoen is verkry. Betekenisvolle verskille in diereprestasie en weidingskoste is verkry. Die insluiting van rog in 'n eenjarige raaigras/assegaaiklawer mengsel lewer die hoogste drakrag sowel as diereprestasie. Daarteenoor is die koste van die meerjarige langswenkgras/witklawer weiding die laagste. Winsgewendsberekenings is gemaak en beter gemotiveerde aanbevelings vir die effektiewe gebruik van besproeiingsgrond is hieruit moontlik.

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THE EVALUATION OF FIVE MAIZE CULTIVARS AS WINTER FEED FOR SHEEP ON THE EASTERN HIGHVELD

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An important factor limiting sheep production on the Eastern Highveld, is the shortage of fodder during the winter months. Maize crop residues form an integral part of economic fodder flow programs for woolled sheep in this region. However, there is often a critical period before the maize is dry enough to harvest, when there are no crop residues available for grazing. During this period, unharvested maize can be utilized. At Nooitgedacht A.D.C., consistently good results are obtained from sheep grazing unharvested maize. The aim of this study was to evaluate five maize cultivars, established early and late respectively, in terms of drying off, yield, quality and animal performance. The trial consisted of 20 plots and was stocked with six sheep per plot, each plot containing three Merino wethers and three Döhne-Merino lambs for a period of at least 56 days. It is expected that these results will make a definite contribution to more effective application of maize in fodder flow programs. (At present the trial is being done and results will be available after August 1994.)

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THE WINTERING OF YOUNG BEEF CATTLE ON BANA PASTURES WITH AND WITHOUT A GROWTH PROMOTER

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Little information on the value of Bana grass (Pennisetum purpureum X P americanum) exists. 100 Hereford X Bonsmara weaners (50 steers and 50 heifers) were used to determine the wintering potential of Bana pastures stocked at aproximately 1.6 ha / LU from May to November in the Hoopstad district. Animals were randomly divided within sex in a treatment group which received subcutaneous implant at the start of the trial period and a control group.

Animals had free access to a commercial winter supplement. Cut samples of the pasture were analysed at the beginning and end of the trial. In vitro crude protein and dry matter digestibility were 4.18% and 56.71% at the beginning, and 17.98% and 56.70% at the end of the trial. Implanted calves of both sexes grew

significantly ($P < 0.05$) faster (566.46 and 577.65 vs. 469.59 and 504.68 g/day for steers and heifers respectively) and attained a heavier final mass (326 and 320 vs. 310 and 309 kg for steers and heifers respectively) compared to controls.

The results indicate that Bana grass can be utilised for wintering cattle. However, the favourable analysis of the spring sample suggests that the real value of Bana grass lies in the utilisation thereof as a spring and summer pasture, possibly for the finishing of young beef animals.

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THE PRODUCTION OF THREE SALTBUSH SPECIES, ATRIPLEX NUMMULARIA, A CANA AND A CANESCENS, IN THE LITTLE KAROO AND STRANDVELD AREAS OF THE WINTER RAINFALL REGION

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Saltbushes (Atriplex spp) are important pasture species in the drier areas (<300 mm annum^{-1}) of the Little Karoo and Strandveld regions of the winter rainfall region of South Africa. The most important factor limiting animal production in these areas is the lack of high quality green feed during the dry summer period. Saltbushes are evergreen and therefore able to supply the need for green grazing. Very little information is available on the dry matter production of saltbush in the main production areas. Production of three species, Old Man (A nummularia), Jewish (A cana) and Four Winged (A canescens) saltbush were therefore determined over four seasons (1989/92) at Nortier Experiment Station (Fernwood soil) at Lamberts Bay in the Strandveld and at Worcester Veld Reserve (Valsrivier soil) and Oudtshoorn Experiment Station (Oakleaf soil), both in the Little Karoo. At all three sites cutting treatments were randomly applied to five replicates of single plants randomly selected in established stands. At Nortier Old Man saltbush plants were cut monthly, three-monthly or annually at 200mm, 400mm or 600mm. At Worcester Veld Reserve the same nine treatments were applied to stands of Old Man, Jewish and Four Winged saltbush. At Oudtshoorn Experiment Station the three species were cut three-monthly at 200mm and 600mm. The three sites did not differ much in annual rainfall, but the precipitation varied between 200 and 300mm annum^{-1} from year to year. The yield (g plant^{-1} annum^{-1}) of Old Man saltbush tended to be higher than that of Jewish saltbush at Nortier and Worcester, but at Oudtshoorn their yields did not differ. Four Winged saltbush was lower producing than the other two species at Oudtshoorn, but at Worcester its yields were similar to those of Jewish saltbush. Yields tended to decline over the four seasons. At Oudtshoorn no significant influence of cutting height was evident. Cutting intensity and frequency interacted significantly ($P<0.05$) at Nortier and Worcester and both treatments had a significant ($P<0.05$) effect on the yield of all three species. At Nortier Old Man saltbush had the highest yield ($P<0.05$) when cut three-monthly to 200mm and at Worcester when cut three-monthly or annually to 200mm or 400mm. At Worcester Jewish saltbush yielded most ($P<0.05$) when cut three-monthly to 400mm and Four Winged saltbush ($P<0.05$) when cut monthly or three-monthly to 200mm. All three species are therefore very resistant to defoliation and can be cut short and frequently.

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EFFECT OF CUTTING HEIGHT AND FREQUENCY ON LEUCAENA LEUCOCEPHALA

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Firewood is a scarce commodity with high commercial value in areas with high population densities. High quality forage supplements for livestock can also be a limiting factor for optimum growth in these areas with high competition for pasture. Leucaena leucocephala is a fast growing tree which can provide both these products on small plots of land. The objective of the trial was to determine the optimum height and frequency of cutting which allows for both wood and forage production. The trial was located in Maputo Province, Mozambique, on sandy, well drained soil. Rainfall during the three years of the trial was 881 mm for 1991, 327 mm for 1992 and 723 mm for 1993. The local variety of leucaena was planted in 14 m rows spaced 2 m

apart with 0.25 m between plants, 2 lines per treatment and 3 replications. The two factors were superimposed in a split-plot design with cutting heights at 0.30 m, 0.6 m and 1.0 m while frequency was every 3 months and every 6 months. Analysis of leaf 3 year averages showed that there was no interaction (P=0.36) between frequency and height and no difference between frequencies (P>0.50), 7.44 t ha^{-1} for 3 month and 7.08 t ha^{-1} for 6 month treatment. Height did have an effect (P=0.01) with 5.46 t ha^{-1} for the 0.3 m height, 7.62 t ha^{-1} for the 0.7 m height and 8.71 t ha^{-1} for the 1.0 m height. Average wood production results were similar with no interaction (P>0.50) between frequency and height while the averages for frequency (P=0.15) were 0.84 t ha^{-1} for the 3 month and 1.03 t ha^{-1} for the 6 month treatment. There was an effect of height (P=0.05) with 0.72 t ha^{-1} for the 0.3 m, 0.93 t ha^{-1} for the 0.7 m and 1.16 t ha^{-1} for the 1.0 m treatments. In conclusion it appears that leucaena can be cut at either frequency but there are advantages to having a taller trunk base.

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EFFEK VAN INSEKPREDASIE EN VOGSTREMMING OP DIE OORLEWING VAN BOOMSAAILINGE IN KLEIN PERSELE

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'n Voorlopige ondersoek is gedurende die 1993/94 seisoen in die Suuragtige Gemengde Bosveld van Noord-Transvaal uitgevoer. Sewe en twintig persele van 4m² elk is in 'n homogene veldeenheid afgemerk. Elke perseel is opgedeel in 16 subpersele van 0.5m² en die middelpunt daarvan afgemerk met 'n dun staalpen. Die 432 staalpenne (16 x 27 persele) dien as permanente merkers waar boomsaad ingeplant is. Vyf verskillende ontblaringsbehandelings is op die persele toegepas, wat gevarieër het van algehele rus tot aanhoudende strawwe ontblaring (9 ontblarings tot op grondvlak). Die saad van Leucaena leusosephala, Acacia tortilis en Dichrostachys cinerea is gebruik. Gesonde kiemkragtige saad is vooraf aan die teenoorgestelde kant van die hilum geskuur om hardskaligheid op te hef. Die saad is tydens drie afsonderlike plantdatums in die persele ingeplant nl: 29/10/93, 17/11/93 en 05/01/94. Die saad is in die onmiddellike omgewing van die permanente merkers, op 'n plantdiepte van 3 tot 5 mm ingeplant. 'n Totaal van 1 594 sade is ingeplant, met 'n verdeling op spesiebasis van: 50% D.cinerea, 25% L. leucocephela en 25% A. tortilis. Die gemiddelde ontkieming oor die drie plantdatums vir L.leucocephala, A.tortilis en D.cinerea was onderskeidelik 20%, 42% en 31%, met 'n gemiddeld van 31% oor al drie die spesies. Ontkieming na die eerste aanplanting was die hoogste (41%), gevolg deur die derde aanplanting (23%). Swak ontkieming na die tweede aanplanting (14%) kan toegeskryf word aan die ligte neerslae van 4.5mm en 3mm wat die ontkieming geïnisieer het. In teenstelling met die beduidende ontkiemingspersentasies, was saailingvestiging swak. Slegs 3% van alle saailinge het 'n drie-week ouderdom bereik waarvan die meerderheid D cinerea saailinge was (13 van die 15 saailinge). Oorlewing was die hoogste na die eerste aanplanting (13 saailinge), gevolg deur die derde (2 saailinge) en met geen oorlewing na die tweede aanplanting. Saailingafsterwe kan feitlik uitsluitlik aan twee faktore toegeskryf word nl: insekpredasie en vogstremming, waar eersgenoemde vir 88% en laasgenoemde vir 12% verantwoordelik was. Geen noemenswaardige verskil in die verhouding tussen die twee faktore het tussen die drie boomspesies, drie plantdatums of vyf ontblaringsbehandelings voorgekom nie. Na die aanvanklike drie weke het relatief min addisionele afsterwing plaasgevind. Alhoewel slegs 15 saailinge (3%) die ouderdom bereik het wil dit voorkom of vatbaarheid vir insekpredasie en vogstremming afneem. Vyf van die 15 saailinge het die eerste seisoen (Mei'94) oorleef. Die effek van insekpredasie en vogstremming op die vroeë oorlewing van boomsaailinge, het die invloed van enige ontblaringsbehandeling oorheers.

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GROEIKROMMES VAN TAGASASTE EN LEUCAENA

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Gedurende die herfs- en wintermaande bestaan daar 'n ernstige proteïentekort in natuurlike weiding. Die gebruik van vreetbare bome en struike kan 'n belangrike bydrae lewer tot proteïenaanvulling. Die doel van hierdie studie is om die potensiaal van Tagasaste en Leucaena onder marginale toestande in die somerreënvalgebied te ondersoek.

Leucaena en Tagasaste is gedurende 1992 op die Hatfield proefplaas van die Universiteit van Pretoria aangeplant. Maandeliks is daar 10 plante van elke spesie ewekansig gekies en op 'n hoogte van 15 cm afgesny. Die plante is verdeel in blare, fyn stingels (dunner as 3 mm), growwe stingels (dikker as 3 mm), blomme en peule.

Daar is gevind dat die totale produksie (TP) van Tagasaste elke maand vanaf September (lente) tot en met Februarie verdubbel waarna die TP meer geleidelik toeneem. Gedurende September bestaan die TP uit 76% blare terwyl die blaarmateriaal gedurende Junie (winter) slegs 25% van die TP beslaan. Die houtagtige komponent (growwe stingels) beslaan 75%.

Die TP van Leucaena verdubbel ook elke maand tot Februarie. Gedurende Oktober beslaan blare reeds 80% en growwe stingels slegs 19% van die TP. TP neem sigmoïdaal toe totdat 'n maksimum produksie gedurende Mei bereik word. 'n Maksimum produksie van 3,46 kg/ boom is verkry (vanaf slegs 8 maande se groei). As gevolg van die feit dat Leucaena ryp sensitief is en groot hoeveelhede blare en peule verloor, het die TP gedurende Mei begin afneem . Gedurende Junie beslaan die blare slegs 5% van die TP, terwyl die houtagtige komponent 68% van die TP verteenwoordig. Peule het eers vanaf Januarie begin vorm en het eers 3 maande later 'n betekenisvolle bydrae tot benutbare materiaal gemaak.

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DIE EVALUERING VAN VERSKEIE VOERRADYS KULTIVARS OP DIE OOSTELIKE HOËVELD

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Droëland groenvoere is baie nuttig om die mid-winter krisistydperk in die voervloei op die Oostelike Hoëveld te help oorbrug. In 'n proef te Nooitgedacht LOS is hawer, rog en Japanese radyse vergelyk ten opsigte van droë materiaal opbrengs sowel as diereprestasie. Die Japanese radyse het die beste resultate gelewer. Met verloop van tyd het talle vrae ontstaan omtrent die langlewendhied en produksie vermoë van kommersieel beskikbare voer radyse. Die degradering van 'n bekende kultivar wat geteel is om laat in die seisoen tot blomvorming oor te gaan met die gepaardgaande opheffing van die langlewenhied van die materiaal het 'n ondersoek genooe Nooitgedacht LOS is hawer, rog en Japanese radyse vergelyk ten opsigte van droë materiaal opbrengs sowel as diereprestasie. Die Japanese radyse het die beste resultate gelewer. Met verloop van tyd het talle vrae ontstaan omtrent die langlewendhied en produksie vermoë van kommersieel beskikbare voer radyse. Die degradering van 'n bekende kultivar wat geteel is om laat in die seisoen tot blomvorming oor te gaan met die gepaardgaande opheffing van die langlewenhied van die materiaal het 'n ondersoek genoovelings gemaak word ten opsigte van watter kultivar op die Oostelike Hoëveld geplant behoort te word, sowel as die beste tyd vir benutting uitgewys word.

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DIE EVALUASIE VAN LUSERNKULTIVARS IN DIE KAROO

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Suid Afrikaans lusernprodusente lei jaarliks groot verliese as gevolg van gesnyde lusern wat natreën en dan verrot. Die ideaal is dus om 'n kultivar te plant waarvan die hoofproduksie seisoen buite die reënseisoen val. Totale produksie moet egter steeds vergelykbaar wees met die van ander beskikbare kultivars.

Twintig lusern kultivars wat in the handel beskikbaar is, is in die Nationale Lusern evaluasieproewe by twee lokaliiteite in die Karoo Vergelyk. Die volgende veranderlikes is onder besproeiingstoestande vergelyk: eerstens jaarlikse droëmateriaalproduksie en tweedens die seisoenale verpreiding van produksie. Die kultivars is ook in hulle verskillende domansieklasse ten opsigte van bogenoemde twee veranderlikes vergelyk. Seisoenale produksie is in verband gebring met die langtermyn gemiddelde reënvalverspreiding.

Op albei lokaliteite was die totale produksie van al die kultivars van dieselfde orde. Die reënseisoen was ook in albei die gevalle die seisoen waarin die meeste materiaal geproduseer is. Vir Cradock is dit in die voorsomer terwyl dit vir Grootfontein in die nasomer is. Geen betekenisvolle verskille (p μ 0.05) is tussen kultivars gevind nie. Dormansieklasse het wel 'n betekenisvolle (p μ 0.05) invloed op totale produksie, dit is egter slegs die semi-winterdormante groep wat van die ander verskil. Hierdie verskil is waarskynlik tewyte daaraan dat lae potensiaal kultivars uit hierdie groep geëvalueer is.

In die Karoo moet die keuse van 'n kultivar dus op ander gronde as totale produksie, seisoen van produksie en dormansieklas geskied. Faktore wat eerder in aanmerking geneem moet word is siekte bestandheid, beskikbaarheid en koste van saad, produktiewe lewensduur en metode van benutting (sny of wei).

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PERSISTENCE OF LUCERNE (MEDICAGO SATIVA) CULTIVARS UNDER CONTINUOUS GRAZING IN THE RÛENS AREA OF THE SOUTHERN CAPE

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Lucerne (Medicago sativa) is the most important pasture legume in the winter rainfall region of South Africa. The importance of allowing lucerne a rest period after each period of grazing has always been emphasised. However, on account of low capital outlay for fencing, watering-points and labour with continuous grazing, this system is still used by the majority of producers in the Rûens area of the southern Cape. In the past SA Standard was the only available cultivar and it did fairly well under continuous grazing. It is, however, unknown whether the new cultivars presently available will persist under continuous grazing. The persistence of six lucerne cultivars selected from four dormancy classes (semi-winter dormant, cv Meteor, intermediate to mildly winter dormant, cv Diamond, non-winter dormant, cv's WL515 and WL516 and highly non-winter dormant, cv's Cuf101 and WL605) and a control cultivar, SA Standard, were evaluated over a three year period under dry land conditions at Tygerhoek Research Station (Riviersonderend district: Glenrosa soil form, long term annual rainfall 430.7mm annum-1). The cultivars were broadcasted into strips measuring 3m x 50m, each with six replicates in the same palasses (semi-winter dormant, cv Meteor, intermediate to mildly winter dormant, cv Diamond, non-winter dormant, cv's WL515 and WL516 and highly non-winter dormant, cv's Cuf101 and WL605) and a control cultivar, SA Standard, were evaluated over a three year period under dry land conditions at Tygerhoek Research Station (Riviersonderend district: Glenrosa soil form, long term annual rainfall 430.7mm annum-1). The cultivars were broadcasted into strips measuring 3m x 50m, each with six replicates in the same paCuf101 and Wl605) persisting was significantly ($P<0.05$) lower (<40% plant persistence) than the other cultivars after one year of continuous grazing. Less than 20% of the original plants of the winter active cultivars survived a two year spell of continuous grazing. The more winter dormant types, however, persisted better under continuous grazing and Meteor and SA Standard had a significantly ($P<0.05$) higher percentage of plants (>85%) persisting after one year. After 24 months of continuous grazing the percentage of plants of cv Meteor (>80%) persisting was still significantly ($P<0.05$) higher than the other cultivars. The number of SA Standard plants was, however, dramatically reduced in the subsequent year and there was very little difference between the persistence of the non-winter dormant cultivars (WL515 and

WL516) and the intermediate to mildly winter dormant cultivars (SA Standard and Diamond). The more winter dormant lucerne cultivars are therefore recommended for a continuous grazing system.

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ONDERSOEK NA DIE KLIMATOLOGIESE AANPASBAARHEID VAN FESCUE ARUNDINACEA CULTIVARS IN TERME VAN DIE BOGRONDSE FITOMASSAPRODUKSIE

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Hierdie proef word as deel van die Roodeplaat Weidinginstituut -Cedara se Nasionale Fescue Evaluasie Projek (NFEP) onder sprinkelbesproeiing geëvalueer. Vyftien cultivars is op 4 Maart 1992 gevestig. Die produksie resultate van die 1993/1994 seisoen word bespreek.

Die proef is in 'n 4x4 drievoudige rooster, met drie herhalings, uitgelê. Klimato-logiese data, bogrondse fitomassa produksie, hittebestandheid, kouebestandheid en roesgevoeligheid. Die statistiese ontleding van die data is gedoen deur Cedara.

Die bogrondse fitomassaproduksie word geëvalueer in terme van totale- en seisoenale produksie. Betekenisvolle verskille kom voor tussen cultivars op grond van die totale bogrondse fitomassaproduksie sowel as op die droëmateriaal geproduseer in die winter- en somer produksiemaande.

Gesien in die lig van die groot aantal cultivars wat tans in die handel beskikbaar is, asook die wat tans op registrasie wag, is waardevolle inligting ingesamel. Die inligting wat ingesamel is stel verder kundiges in die gebied instaat om sinvolle voervloeibeplannings daar te stel aangesien die aanpasbaarheid en produksiepatroon van die gewas nou bekend is.

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A STUDY ON THE INDUCTION OF LOLIUM MULTIFLORUM

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The aim of this study was to determine the vernalization requirements of seed and plants of some of the Italian and Westerwolds type plants of L multiflorum Lam. for the production of certified seed of L multiflorum. It is essential that the genetic integrity of cultivars be maintained. The possible translocation of the vernalization stimulus was also investigated. To achieve this aim, different vernalization techniques were introduced on imbibed seeds, container grown plants, and meristems grown in vitro. The use of electrophoresis to determine whether plants have been vernalized or not, was also investigated. It was evident from this study that the cultivar Tetrone, and probably other Italian type plants, have a juvenile phase of about six weeks (a chi-squared test carried out on the raw data showed a significant difference at a test level of 5%). Vernalization can therefore only take place in Italian type plants after the age of six weeks. It was thus concluded that seed production units containing Italian type plants should always be planted in autumn. Translocation of the vernalization stimulus from vernalized tillers to tillers formed after the inductive period, under non-inducive conditions, did not occur in this study. It is recommended that the close down date for seed production units should not be legislated, but be based on specific guidelines which would be related to climatic conditions pertaining to the specific area where seed is produced.

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USING 15N NATURAL ABUNDANCE TO EVALUATE NITROGEN FIXATION BY ACACIA SPP. IN BUSHVELD

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Soil nutrient concentrations under savanna trees are usually higher than in the open. One source of increased nutrient input may be from symbiotic biological nitrogen fixation associated with Acacias, however, the amount of nitrogen entering the system from this source is seldom measured. Nitrogen (N) fixation can be estimated by comparing the ratio of N isotopes in leaves of putative fixing species to that in non-fixing species: the 15N isotope will be more abundant in those species not fixing atmospheric nitrogen. The N isotope values of bushveld Acacias representing early and mid successional stages are compared with those of non-fixing woody plants. gical nitrogen fixation associated with Acacias, however, the amount of nitrogen entering the system from this source is seldom measured. Nitrogen (N) fixation can be estimated by comparing the ratio of N isotopes in leaves of putative fixing species to that in non-fixing species: the 15N isotope will be more abundant in those species not fixing atmospheric nitrogen. The N isotope values of bushveld Acacias representing early and mid successional stages are compared with those of non-fixing woody plants. To test if N fixation is restricted to young plants, 15N natural abundance of different aged plants will also be investigated. The results of this study will indicate the potential for using this method to evaluate the effects of bush enchroachment and bush clearing on the nitrogen cycle of savanna ecosystems.

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CONCEPTUAL MODEL TO PREDICT SHEEP OR CATTLE DIET SELECTION ON SOURVELD

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Simulation of grass species intake of sheep and cattle grazing on veld is important. The information can be used for predicting animal performance and for predicting the effects of grazing on the vigour of the idividual grass species. The PUTU 11 veld growth simulation model is currently being adapted to predict veld production on a species basis on the Eastern Transvaal Highveld. Factors are included to take the effect of the previous season's treatment into account, as well as the effect of grazing during the current season.

A frame based model has been develop to simulate animal intake on a species basis. The model uses the PUTU 11 simulation on a species basis as input, and classifies species production in terms of palability classes on a daily time step. Animal intake is calculated also on a daily time step.

Three frames occur in the model. The first frame comprises a situation where animal intake is lower than the production of the palatable species. The model remains in this frame for as long as those conditions are satisfied. The second frame comprises the situation where animal intake is higher than production of the palatable species, but lower than the production of the palatable and intermediate species combined. The third frame comprises a situation where animal intake is higher than the production of the combined paratable and unpalatable species, but lower than the production of all classes, namely palatable, intermediate and unpalatable combined.

The model switches between frames depending on the growth of the species in the three classes, and the animal intake for the corresponding period. The output of the model consists of the number of time steps that the model remains in each frame during the season, and the pattern of change between frames over time. This will enhance predictions regarding the residual effects of grazing in individual grass species vigour, as well as total veld vigour. This will in turn enhance the accuracy of the PUTU 11 model to take into account the effect of previous season's treatment on production. Also the output forms input for animal production models such as STEER, to predict animal performance.

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THE USE OF LEAF EXTENSION MEASUREMENTS IN GRAZING RESEARCH

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Rates of leaf growth or extension have been shown to be a very reliable index of plant vigour. Unfortunately the collection of suitable data to use this parameter is intensive but there are no alternatives giving reliable, species specific, data on plant performance. One of the major drawbacks of using leaf extension measurements is the large volume of data that are generated from field measurements of individual leaves. This has deterred researchers from using the method in field studies. Under grazing systems destruction of marked individuals complicates the analyses of the data because the number of usable tillers changes continuously.

A series of computer modules have been developed to handle data generated from leaf extension measurements under grazing. This data reduction facility should improve the usefulness of leaf extension measurements in research designed to improve our understanding of processes driving the plant/animal dynamics of grazing systems.

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VOORGESTELDE PROJEK: SIMULASIE VAN VELDPRODUKSIE IN DIE OOSTELIKE HOËVELD

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Die behoefte het ontstaan om veldproduksie in die Oostelike Hoëveld te simuleer om produksie van veld vir verskillende klimaatstoestande en onder verskillende bestuurspraktyke te beraam. Korttermyn voorspellings van die verwagte produksie is noodsaaklik om bestuursbesluite binne sekere betroubaarheidsgrense te kan neem. Hierdie voorspellings van produksie moet toepaslik wees vir veld van verskillende veldtoestande in enige van die veldtipes in hierdie gebied. Modellering van die produksie van veld kan as hulpmiddel dien, om relatiewe produksieverskille van veld in verskillende gebiede op grond van intrinsieke en eksterne faktore te simuleer. Daar bestaan tans verskillende benaderings om veldproduksie te simuleer; van eenvoudige produksiemodelle, wat totale produksie skat, tot die meer komplekse simulering van produksie deur die groeiseisoen. Hierdie simulering geskied op 'n dag tot dag basis, gebaseer op sogenaamde groeimodelle. Hierdie groeimodelle integreer wiskundige vergelykings en algoritmes wat die interaksies van die biotiese en abiotiese komponente van die weiveldekosisteem beskryf. Die kompleksiteit van die model is afhanklik van die huidige beskikbare kennis; beskikbare data om die model te ontwikkel en die graad van akkuraatheid van die resultate wat verlang word. Bestaande simulasiemodelle neem interaksies tussen klimaats-, hidrologiese-, grondfaktore en plantfisiologiese veranderings in ag, tydens die berekening van gesimuleerde produksie. Belangrike faktore, byvoorbeeld die effek van behandelingspraktyke soos beweiding en brand, en veldsamestelling op produksie, word nie binne die modelle wat reeds ge-evalueer is, gekwantifiseer nie. Om veldproduksie met behulp van modelle te simuleer, bring kwelvrae na vore. Die vlak van kompleksiteit wat gevolg moet word om die behoefte aan te spreek, moet bepaal word. 'n Keuse moet gemaak word om of 'n eenvoudige model te ontwikkel, of om bestaande modelle aan te pas en verder te ontwikkel, met die insluiting van addisionele subroetines. Indien bestaande modelle gebruik word, moet hierdie veranderings maklik geakkomodeer kan word.

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THE DRY-WEIGHT-RANK METHOD OF BOTANICAL ANALYSIS: A VALUABLE TOOL INEXPLICABLY LARGELY IGNORED

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In grassland research it is often desirable to determine pasture yield. With veld, comprising a mixture of species, a measure of the yield of each of the component species provides valuable additional information. It is relatively easy, but destructive and labour intensive, to accurately determine the total yield of veld by harvesting representative samples. Non-destructive estimation techniques such as double sampling are suitable for rapid, accurate estimation of total yield of veld. It is difficult, labour intensive, time consuming and destructive to harvest individual species on a large scale to determine the contribution of individual species to the total yield. The dry-weight-rank technique of botanical analysis is an efficient and accurate method of determining proportional species contribution by mass. Combining double sampling and dry-weight-rank techniques, it is possible with adequate training and practice to estimate the yield of a quadrat using the double sampling technique, and then estimate the proportional composition of individual species within the quadrat. A resultant species yield per quadrat is obtained. With enough estimates per unit land area, an estimate of the proportional composition by mass of each species is obtained for the survey area for the time of sampling. This measure is important in a variety of situations common to grassland research. For example, sequential determinations allow for the estimation of preference indices during a season. At the end of a season or grazing period, differences in grazing patterns between treatments or animal types may be quantified. Patterns of growth for the full range of species during, for example, a rest period may be determined. This has potential for accurately determining the effects of defoliation treatments on grass vigour by measuring regrowth during the period of absence or the season following treatment. In this case, obviously, comparisons have to made either between treatments or with an undefoliated control. The dry-weight-rank technique has been used successfully in combination with the double sampling technique for the above mentioned purposes locally. With the double sampling technique, R^2 values of between 0.87 and 0.93 are consistently obtained, indicating high levels of accuracy in the estimation of total yield. The accuracy of the two techniques in combination has been shown by consistent results obtained between operators and consistent patterns over time.

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ESTIMATION OF THE GRAZING CAPACITY OF THE FALSE THORNVELD OF THE EASTERN CAPE ON THE FORT HARE RESEARCH FARM

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Stocking rate refers to the area of land in the system of management which the operator has allocated to each animal unit in the system. In order to avoid over utilisation and the consequent deterioration in the condition of the vegetation the stocking rate of the domestic animals should ideally be based on the carrying capacity of the veld which is in turn influenced by the current condition of the grass sward and the bush. Danckwerts (1981) found that the grazing capacity of sweetveld in the Eastern Cape is primarily a function of veld condition as reflected by the botanical composition and secondly the previous twelve months rainfall. Data collected on the Research Farm of the University of Fort Hare showed that the grazing capacity of sweet thornveld in optimum condition varied from 0.5 ha/AU to 12.5 ha/AU and that the mean for the period (1972 to 1993) was 4 ha/AU with a coefficient of variation of 74%. These data were collected in an area receiving a mean rainfall of 539mm with a coefficient of variation of 25.6%. Because of this variation a useful tool would be the estimation of the number of grazing days from a standing crop of grass. In this regard the relationship was determined between the standing crop of grass and the number of grazing days with positive animal performance using the Disc Pasture Meter to survey the plots until the point of restricted intake had been passed for approximately three days.

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VEGETATION CLASSIFICATION USING GIS AND REMOTE SENSING AS ADJUNCTS TO CONVENTIONAL ORDINATION TECHNIQUES

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The complex driving forces giving rise to and determining the potential of African savannas can be studied in the parks and nature reserves in the Transvaal Lowveld. In order to understand the variety of natural and man-induced effects on the natural resources, a basic vegetation map which will allow for comparison of similar areas under different management regimes is being constructed.

The study area currently covers some 400 000ha. There are broad vegetation maps for some parts of the area, but no such map exists for the region as a whole. Landsat TM imagery is georeferenced using 1:50 000 map sheets. These georeferenced images are then subjected to an unsupervised classification using IDRISI to obtain a classified image. As part of a monitoring programme, herbaceous and woody vegetation has been sampled at 745 sites in the area. From the latter, a supervised classification is conducted using the vegetation data which has been analysed using classical ordination techniques.

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DIE DROë - MASSA - RANGORDE METODE VAN BOTANIESE ONTLEDING IN DIE MOPANIE-VELD NOORD VAN DIE SOUTPANSBERG, SUID AFRIKA

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'n Geskikte kwadraatgrootte en getal kwadrate vir gebruik in die droë-massa-rangorde metode in die studiegebied is bereken. Die persentasie verspreiding van die aantal spesies per kwadraat van 200, 0.09m², 0.25m² en 0.49m² kwadrate is met mekaar vergelyk. Die kwadraat van 0.49m² blyk die mees geskikste te wees vir gebruik in die studiegebied. Die werklike spesiesamestelling van die graslaag, op 'n droëmassa basis, is bepaal deur die knip, skei, droog en weeg van 181 kwadrate. Die standaardafwyking van die verskil tussen die werklike persentasie spesiesamestelling en voorspelde persentasie spesiesamestelling volgens die droë-massa-rangorde metode (r^2 = 84%), is geplot teenoor die getal kwadrate. Vir 'n kwadraatgrootte van 0.49m² is afgelei dat minstens 100 kwadrate nodig is vir 'n beraming van die botaniese samestelling van die graslaag. Die droë-massa-rangorde metode van botaniese ontleding is getoets en is bevind 'n doeltreffende en akkurate metode om die botaniese samestelling van die graslaag in die studiegebied te bepaal.

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THE EFFECT OF STOCKING RATE ON THE BROWSING BEHAVIOUR AND SPECIES SELECTION BY GOATS

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Goats are important livestock in the Eastern Cape because of their income potential and their impact on the environment. A trial was carried out in the False Thornveld of the Eastern Cape to investigate the effect of stocking rate on the diet selection and browsing behaviour of goats. Both animal and plant based studies were done. This study reports on the results of the plant based studies. The stocking rates applied were 8 and 24 goats per hectare for 3 weeks. Data on browsing and method of browsing was collected for eight abundant species. Results indicate that stocking rate has a marked impact on browsing and species selected. The low stocking rate was associated with a lower browsing heigtigate the effect of stocking rate on the diet selection and browsing behaviour of goats. Both animal and plant based studies were done. This study reports on the results of the plant based studies. The stocking rates applied were 8 and 24 goats per hectare for 3 weeks. Data on browsing and method of browsing was collected for eight abundant species. Results indicate that

stocking rate has a marked impact on browsing and species selected. The low stocking rate was associated with a lower browsing height and a greater selection pattern i.e. more variation between species, compared with the high stocking rate at the end of the trial. But selection and height were similar at the beginning of the trial where the browsing height was low and variation beteen species was high. Stocking rate is therefore important if the impact of goats on the vegetation is to be quantified.

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'n LAERKOSTE ELEKTRIESE HEINING AS HULPMIDDEL TOT VELDBESTUUR

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'n Laerkoste elektriese heining is met die volgende doel voor oë ontwikkel, naamlik: om 'n lae koste veewerende elektriese heining te ontwerp om binne ekstensiewe omstandighede die uitbreiding van 'n meerkampstelsel op veld moontlik te maak.

Sou 'n veldkamp met behulp van 'n elektriese heining verdeel word, en daar word van byvoorbeld 'n vierkampstelsel vir benuttig gebruik gemaak dan word die vier kampe, vyf kampe. Deurdat u meer weidae in die verdeelde kamp kry beteken dit dat die ander drie kampe 'n langer rustydperiode vir hergroei ondergaan. Die hele aksie kan 'n verlengde somersweiperiode tot gevolg hê, wat die druk op die wintersvoervloei kan verlig.

Die volgende tipe span tegnieke is gebruik: Slegs "Y" tipe ysterpale en gegalfaniseerde gladde draad word as omheiningsmateriaal gebruik. 'n Implus skokapparaat, swaardiens batterye en isoleringsmateriaal word vir elektriesifering aangewend. Vier gladde drade word gespasieerd op elke 20 meter aan ysterpale geheg waarvan 2 drade geïsoleer en geëlktrifiseer word.

Die volgende resultate is behaal: Die elektriese heining is 58% goedkoper (R1010.00/km) as konvensionele 6 dubbeldoringdraad heinings (R2400.00/km). Bogenoemde kostes sluit die elektriese apparaat in en is oor 5 km bereken. Die stelsel is in gebruik oor 'n afstand van 1.4 km waar 3 groot veldkampe verdeel is om 6 kampe te vorm.

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VEGETATION DYNAMIC CHANGES DURING THE PROCESSES OF DEGRADATION AND RECOVERY IN PARTS OF THE GRASSLAND BIOME OF SOUTHERN AFRICA

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The over-exploitation and poor management practices together with the unpredictable climatic conditions, especially the rainfall pattern, has led to the degradation of the natural rangeland in the climatic climax grassveld of southern Africa. During the process of degradation, changes in the composition and basal cover of the species are used for the condition assessment of the veld by degradation gradient models. Species were classified in ecological status groups (Increaser- and Decreaser type of species) and it is therefore known, that a certain vegetational composition represents a particular conditional state of the rangeland. The successional changes that take place by the species from one condition to another, is however unknown. The aim of this study was therefore to study the dynamic changes taking place in the vegetation during the processes of degradation and recovery.

A number of paddocks, grazed by different utilization levels in two rainfall areas were selected. Exclosures in the paddocks, served as the recovery sites(macroplots), while outside the exclosure, the different utilization levels were still applied and served as the degradation macroplots. Within each macroplot, 1x1m permanent microplots, each comprising of a certain vegetation composition and representing a particular conditional state, were selected. Succesional changes in the vegetation were monitored by a photographic and point-quadrate technique, for a period of three years (1990-1992 - 2 seasons). By determining the changes in the frequency, basal cover, density and the spatial pattern of the species, transition matrix tables were constructed. Markov

progression matrix models were used to estimate the stability of a certain conditional state and to predict the vegetation change over time.

No clear pattern of interspecific changes whereby one species is replaced by another species could be identified in such a short time. Most spatial changes took place whereby bare patches were occupied by the same or a new species or by the reduction of an already existing species to a bare patch. Species indicating the stability of a certain type of vegetation composition (conditional state) over time could however be determined. In the most degraded macroplots (heavily utilized and unutilized), successional changes indicating the degradation and recover processes were mostly driven by changing rainfall events, whereas in the other two macroplots, the successional changes were caused by a combination of rainfall and grazing patterns.

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THE FREQUENCY AND INTENSITY OF GRAZING OF THEMEDA TRIANDRA IN PATCHES AND NON-SELECTED VELD IN THE SOUTHERN TALL GRASSVELD

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Seasonal patterns in patch-selective grazing by cattle were investigated at Ukulinga Research Station in the Southern Tall Grassveld. Grazing commenced two (1), four (2) and eight (3) weeks after spring burning, to create different sward heights. In each camp, 10 Themeda triandra tufts were randomly-selected and marked in each of five randomly-selected patches and adjacent non-selected veld. Grazing frequency and grazing intensity (height removed) were measured daily over a five day period of stay. The difference in initial heights of the patches and non-selected veld were not significantly different ($P > 0.05$) in treatment 1, but patches were significantly shorter than the non-selected veld in treatments 2 and 3 ($P < 0.01$). This indicates less selective grazing when early grazing after a burn is applied. The differences in initial height between patches and non-selected veld steadily increased through the season, but only during winter were the tuft heights in patches significantly lower ($P < 0.01$, 1992; $P < 0.05$, 1993) than the non-selected veld. Patches were more frequently grazed than the non-selected veld in all treatments ($P < 0.05$). The frequency of grazing of both patches and non-selected veld increased from spring through to February/March and then declined, with the frequency of grazing during July 1992 being higher in the non-selected veld. The greatest degree of patch selection occurred during spring and summer. The seasonal trend in the intensity of grazing was similar to that of the frequency of grazing. It appeared that cattle graze patches during spring and summer when plant quality is higher in the patches than the non-selected veld. As sward quality declines and forage in the patches becomes limiting during autumn and winter the animals are forced to forage in the previously ungrazed veld. Patches may therefore play an important role in providing animals with a high quality diet during the summer period.

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EFFECT OF DEFOLIATION ON PRODUCTION OF THEMEDA TRIANDRA

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Veld management recommendations should be based on a thorough understanding of certain physiological processes within the grass plant. Possibly the most important of these processes is the effect of defoliation on the production and vigour of a grass plant. This is important in terms of production within the season when defoliation takes place, and the residual effects on the grass production in following seasons is particularly important. Current knowledge regarding the effects of defoliation on local veld grasses is incomplete. A cutting trial was initiated to determine the effects of varying defoliation treatments on the production of Themeda triandra. Treatments included cutting three and five times during the 1987/88 season at heights of 20 mm and 40 mm respectively, as well as an undefoliated control. The production within the season of treatment was measured by sequentially harvesting 40 Themeda triandra tufts per treatment at two weekly intervals. Gompertz growth curves were fitted to determine cumulative production. The undefoliated control

produced 584 g dry matter (100 % index), 3 cuts at 20 mm produced 441 g (76 %), 5 cuts at 20 mm produced 534 g (91 %), 3 cuts at 40 mm produced 570 g (98 %) and 5 cuts at 40 mm produced 643 g (110 %). The production in the season following the defoliation treatments was measured by harvesting 80 Themeda triandra tufts per treatment in December 1988 as a measure of treatment effect on vigour. The undefoliated control produced 2.56 g dry matter per tuft (100 % index), followed by 3 cuts at 40 mm with 2.08 g (81 %), 3 cuts at 20 mm with 1.99 g (78 %), 5 cuts at 40 mm with 1.59 g (62 %) and 5 cuts at 20 mm with 1.51 g (59 %). Defoliation had a significant depressive effect on production of Themeda triandra in the season following defoliation. Frequency of defoliation had a greater negative effect on vigour than intensity. These results are in agreement with previously published results. Understanding the effects of defoliation on grass vigour as expressed by measuring production in the season following treatment, is particularly important in terms of the formulation of grazing management recommendations.

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SUBJEKTIEWE BEOORDELING VAN DIE SPESIEVOORKEURE VAN BEESTE IN DIE POTCHEFSTROOM-OMGEWING

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Dit is 'n bekende feit dat diere nie alle grasse wat in die veld voorkom, vreet nie. Moniteringsopnames wat in die beesstelselproef te Potcefstroom gedoen is, het dit ook moontlik gemaak om afleidings ten opsigte van spesiesvoorkeure in die somer en winter deur beeste te maak. Spesiesamestellingopnames is direk na beweiding in die proefkampe gedoen. Die naaste-planttegniek is gebruik en by elke punt is die plantnaam genoteer asook 'n subjektiewe skatting ten opsigte van die benutting. 'n Vyfpunt skaal is gebruik, naamlik 1 = 100% benut; 2 = 75% benut; 3 = 50% benut; 4 = 25% benut en 5 = 0% benut. Uit die resultate het dit geblyk dat spesies soos Eustachys paspaloides, Digitaria tricholaenoides en Sporobolus fimbriatus beide in die somer en winter goed benut word. Spesies soos Schizachyrium sanguineum, Brachiaria eruciformis, Diheteropogon amplectens en Elionurus muticus slegs in die somer en ook slegs vroeg in die groeiseisoen benut word. Digitaria eriantha, Eragrostis lehmanniana, Heteropogon contortus en Digitaria argyrograpta word weer meer in die winter benut as in die somer. Die benuttingsvoorkeure ten opsigte van spesies soos Themeda triandra, Cympopogon plurinodis en E. chloromellas verskil nie baie vir die somer en winter nie. Dit het verder geblyk dat spesies soos Chloris virgata, Trachypogon spicatus, Triraphis andropogonoides, Cymbopogon excavatus en Cynodon dactylon selde deur beeste benut word. Hoewel die inligting op 'n subjektiewe wyse ingesamel is, blyk dit tog van waarde te wees deurdat duidelike tendense ten opsigte van spesievoorkeure tussen somer en winter voorgekom het.

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PATCH DEVELOPMENT IN MIXED-SPECIES GRAZING OF HIGHLAND SOURVELD

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Patch grazing is a widely recognized phenomenon in most grazing systems. It is an inevitable consequence of the selective grazing habit of large herbivores. The extent and severity of patch grazing is influenced by the species of herbivore and differences in the nutrient content, morphology and physical strength and structure of grass species on offer to grazing animals. Factors such as time in the growing season when the sward is first grazed and stocking rate also play a role in the extent and intensity of patch grazing. Continued grazing of patches within the sward, combined with trampling and changing micro-environmental conditions, could result in a loss in plant vigour, soil compaction and associated changes in plant species composition. Various grazing management strategies have been proposed which aim to minimize the detrimental effects of patch grazing. One such proposal is to graze cattle together with sheep at a narrow cattle to sheep ratio. However, few studies have attempted to quantitatively describe the effects of grazing management on the development of patch grazed areas within a livestock production system.

The objective of the present study was to test the recommendation that cattle should graze together with sheep in order to limit the extent and severity of patch grazing. This objective was aimed at answering questions relating to what effects cattle to sheep ratio and stocking rate would have on the development of patch-grazed areas in the sward rather than answering questions relating to why patch-grazed areas developed.

Data were obtained from a grazing trial comprising 3 stocking rates for each of 5 cattle to sheep ratio treatments. Line intercept and quadrat sampling procedures were used to determine the extent and severity of patch grazing in each treatment.

Results indicated that patch size and the extent of patch grazing were primarily functions of stocking rate (expressed in terms of AUE ha^{-1}), despite the differences in animal species. However, the severity of grazing within patches was a function of both stocking rate and stocking ratio.

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DEVELOPMENT OF RANGE MANAGEMENT IN WESTERN PROVINCE, ZAMBIA

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Cattle production forms the backbone of the economy of Western Province. Animals are almost entirely reliant upon the natural vegetation for their survival and production. Throughout the province, communal grazing of natural pasture is the major system of raising cattle. The Kalahari-Namib soils in the province are generally of low fertility and have both low moisture and nutrient holding capacity. This, combined with climatic uncertainty, results in large areas of the province being marginal for arable agriculture. Great importance is therefore attached to cattle production and hence to the sustainable use of grazing resources. However, the introduction of an effective management system for the communal natural resources is a complex task. Consequently the Rangeland Management Team (RMT) of the Livestock Development Project (LDP) is endeavouring to develop a Range Management Model for use in the field.

This poster describes the model and the process by which it was developed. Work was initiated with a *resource inventory* of the rangelands of Western Province, using a number of methods including a vegetation survey resulting in a detailed landscape and grasslands map and carrying capacity estimations; vegetation condition monitoring, the formation of the regional herbarium with more than 800 species, a compilation of vernacular names, and phenological studies.

Subsequently, *land and resource use studies* were carried out including traditional grazing management studies, regrowth after burning studies, and grazing behaviour studies. All these studies were aimed at providing information on what is utilized by the animal.

More recently, RMT has started developing "Technical" packages based on particular problems raised by farmers. An extension leaflet on the use of forage legumes has been developed based on the results of a forage legume screening programme, burning policy workshops at district level and in selected areas at village level have been held, and government field staff have been trained in range management.

The next step will be the concentration of activities and efforts into a small number of *pilot areas*. This will enable RMT to test farmer's perception of the acquired knowledge, to discuss range management practices with the farmers, and thus to facilitate the development of efficient and sustainable rangeland management practices by the communities themselves. Institutions dealing with natural resource mangement, such as government departments, projects and the traditional leadership (Royal Esdtablishment) will be involved in the process through progress monitoring and discussions. The experiences gained will result in a model that can be followed by others to facilitate the development of rangeland management in other areas of the province.

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BENUTTING VAN SKYNKAROOVELD MET WILD

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'n Deel van die Ovistonreservaat van die Kaaplandse Natuurbewaring is vir die navorsing aangebied. Dit is ongeveer 1 800 ha groot en grens aan die Verwoerddam suid van Bethulie in die Venterstaddistrik. Die plaas is in twee dele verdeel: een helfte wei die wild in een kamp, terwyl die ander helfte van dieselfde grootte in drie kampe verdeel is. Wisselweiding met swartwildebeeste, springbokke en gemsbokke word toegepas, deur 'n kamp ses maande te bewei en twaalf maande te laat rus. Die wild is vir 15 keer suksesvol van een kamp na die volgende verskuif. Eenvormige benutting van die kamp is verkry en die rusperiode van twaalf maande gee voldoende herstel. Die aanhoudende beweide kamp het dele van oor- en onderbenutting gehad. Wildboere kan dus veldbestuur toepas.

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THE INFLUENCE OF FIRE, BOER GOATS AND CATTLE ON THE WOODY COMPONENT OF THE SOURISH MIXED BUSHVELD

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The use of boer goats as browsers has been documented by several researchers. Since it was proved that bush encroachment was one of the major factors that influenced carrying capacity of South African Bushveld, the searchlight has again fallen on the use of goats as bush utilizers and controllers. The disuse of fire is also questioned, as the absence thereof is considered as one of the major reasons for the occurrence of bush encroachment. The disadvantages of both boer goats and fire have however been well accepted by farmers in the Transvaal Bushveld. The trial was conducted on Towoomba Agricultural Development Centre. Three camps were burned during September 1988. They were again burnt during September 1990. A goat proof enclosure was erected in each of the camps. Five other camps were left unburnt. The eight camps were subjected to the following grazing treatments, using boer goats and cattle during the 1990, 1991 and 1992 seasons: burnt plus continuous browsing, burnt plus rotational browsing and rotational grazing, burnt plus no browsing or grazing (enclosures), unburnt plus continuous browsing, unburnt plus rotational browsing and grazing, unburnt plus no browsing or grazing, unburnt plus rotational grazing and unburnt plus rotational browsing. The woody component alone was monitored. Decreases in evapotranspiration tree units, tree volume, leaf volume, leaf production and available browse were encountered in all camps where goats were involved. The effect was greater where fire was used in combination with browsers, continuous browsing causing the most damage to the woody component. In camps that involved only grazing, increases in all tree characteristics that were monitored were observed, the reaction being more severe where fire was used in combination with grazing. Bush density increased in all camps, but to a greater extent where veld was burned. In the short term, bush could not be eradicated by fire or browsers alone. Browsers can be used in combination with fire in the long term to give the desired level of bush control. The importance of a well-planned after-care programme following burning is however emphasized. As boer goats have a major role to play as bush controllers or utilizers in the Transvaal Bushveld, it is believed that the potential of browsers in these areas is totally underestimated.

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BEHEER EN BENUTTING VAN BOS MET BRAND EN BOKKE IN MESIESE SAVANNE

CH DE RIDDER, DA DEKKER, HO OOSTHUIZEN & FO HOBSON
Döhne Landbou-ontwikkelingsinstituut, Privaatsak X15, Stutterheim 4930

Bosindringing word beskou as 'n blywende probleem vir bees en skaap produksie in die mesiese savanne gebied van die Oos Kaap, waar bokke as 'n sekondêre en ongewilde vertakking beskou word. Die beheer van bosindringing met meganiese en chemiese prosedures is duur en moeilik ekonomies haalbaar. Die inskakeling van bokke as struikvreters en die oordeelkundige gebruik van brand is as alternatiewe maniere van bosbeheer geëvalueer. Die volgende behandelings is vergelyk; beeste alleen (kontrole), beeste saam met brand, beeste saam met bokke en beeste saam met brand en bokke. Behandelings is in 0.75 ha kampe (1 kamp per behandeling) vanaf Oktober 1987 toegepas. Plantegroei is tweejaarliks gemeet. Struike is in permanent gemerkte transekte gemeet. Die relatiewe spesiesamestelling van die graskomponent is ook gemeet. Vee is gereeld geweeg en veeweidae is aangeteken.

Alhoewel struikdigtheid nie in die kontrole verander het nie, is daar 'n stadige toename in boomekwivalente gemeet. Brand het struikdigtheid en boomekwivalente verlaag. Waar bokke saam met brand gebruik is, is daar 'n groter verlaging in boomekwivalente gemeet. Die grootste verlaging in boomekwivalente is egter verkry waar swaar beweiding met bokke toegepas is. Tot 1989 het veldtoestand in alle behandelings toegeneem, waarna dit, met uitsondering van die kontrole behandeling, tot 'n geringe mate gedaal het . Met die inskakeling van bokke het die beskikbare struikweiding gedaal terwyl die beskikbare grasweiding ooreenstemmend toegeneem het.

In mesiese savanne kan brand effektief gebruik word as 'n metode van bosbeheer, indien veldtoestande dit toelaat. Met die inskakeling van bokke verbeter veldweiding vir beeste, word onbenutte bronne (struike) benut, en sodoende word inkomste verhoog.

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VACANCIES

DIRECTOR: GOLDEN VALLEY AGRICULTURAL RESEARCH TRUST IN ZAMBIA

ZAMBIA AGRICULTURAL RESEARCH AND EXTENSION PROJECT (ZAREP)
The Government of the Republic of Zambia has received loans in various currencies from the International Development Association of the World Bank to implement ZAREP. Part of these proceeds will be used to hire staff for the Golden Valley Agricultural Research Trust (GART).

GART is an autonomous agricultural research organisation set up in 1994 by the Ministry of Agriculture, Food and Fisheries of the Republic of Zambia as part of its policy to make the agricultural research sustainable.

The Trust is looking for suitably qualified and self motivated persons to fill the following position.

DIRECTOR
The Director will report to the Board of Trustees and will be the Chief Executive Officer. The person appointed will have overall responsibility for the planning, development and implementation of GART's operations and activities to meet its goals and objectives within the policies laid down by the Board of Trustees.

Qualifications
A PhD in any field of agriculture with at least 10 years productive experience in a challenging management position in agriculture or a related field. Good interpersonal and communication skills are essential as is the ability to initiate, develop and successfully implement project proposals.

Conditions
3 year contract. Remuneration will be at international rates and will be negotiable.

Applications with copies of certificates and curriculum vitae, giving the names of at least three referees who have known the applicant for not less than three years, should be sent to the Secretary of GART at the following address:

The Secretary
Board of Trustees GART
P.B. RW 250x
Ridgeway
Lusaka
ZAMBIA

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REPÚBLICA DE MOÇAMBIQUE
MINISTÉRIO DA AGRICULTURA
INSTITUTO DE PRODUÇÃO ANIMAL
Caixa Postal, 25 - MATOLA - Telef. 450395/6
Caixa Postal, 1410 - MAPUTO - Telex: 6-209 SOGMA MO

TITLE: RUMINANT NUTRITIONIST

LOCATION: MAPUTO, MOZAMBIQUE, INSTITUTE FOR ANIMAL PRODUCTION, MINISTRY OF AGRICULTURE

SALARY: US $30 000/YEAR (tax-free)

BENEFITS: Housing, health cost coverage within Mozambique, round-trip airfare from country of residence.

MINIMUM QUALIFICATION: M.Sc. in animal nutrition, forage quality or related field. Ph.D. preferred.

DURATION OF CONTRACT: 2 years with possible extension to 5 years.

LANGUAGE: Fluent in English. Willing to learn Portuguese.

DUTIES & RESPONSIBILITIES:
The researcher will be responsible for the forage quality laboratory including IVD, CP, and NDF/ADF. In addition, the researcher will be required to instruct Mozambican faculty (B.V.Sc.) as well as carry out independent research in the following specific areas on cattle (dairy, beef and dual purpose):

1. Grazing selectivity, including such techniques as oesophageal sampling, direct observation, remote control as well as new developments in the field.
2. Rumen fermentation manipulation by means of feeding trilas, concentrates, cultivated forages, bypass proteins, degradibility etc.
3. In vivo and in saco digestibility.

The research program will encompass all aspects of feed intake and digestibility that might increase bovine productivity. The candidate should have a solid notion of ruminant physiology, ruminant nutrition and forage quality. In addition, she/he should be comfortable with computer software including spreadsheets, statistical packages, graphics and Wordperfect.

Interested candidates should send a letter and C.V. to CPIHIO, MAPUTO c/o Mrs Olga Faftine or Dr Jim Muir, or call 258-1-450 395/6, or Mrs Faftine at 258-1-732 217, or Dr Muir at 258-1-416 738.

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DIARY

CONGRESSES, SYMPOSIA & COURSES

Global Environmental Change: implications for southern Africa
24-26 April 1995
An overview of southern Africa's scientific input to global environmental change. CSIR Conference Centre, Pretoria, South Africa. Contact: The SA IGBP Secretariat, Foundation for Research and Development, PO Box 2600, Pretoria 0001, South Africa. Tel (012) 841-4429 Fax (012) 841-3791. E-mail: louise@frd.ac.za

Southern African Paleo-and Neoclimates
27-30 April 1995
Cape Town, South Africa
Contact: Mr J Boelhouwers, Department of Earth Sciences, University of the Western Cape, private Bag X17, Bellville 7535, South Africa. Tel (021) 959-2135 Fax (021) 959-2266.

River Management
May 14-19 1995
The IAWQ conference on river basin management will be held in the Kruger National Park. Enquiries: Dr Ben van Vliet, Watertech,CSIR. Tel (012) 841-2237 Fax (012) 841-4785.

Design and Analysis of Distance Sampling Data
26-30 June 1995
An international workshop will be held at the University of Natal, Pietermaritzburg, South Africa.
Registration fee is R325-00 (South African currency). Enquiries (registration): Professor GPY Clarke or Mrs EH Hayes, Department of Statitistics and Biometry, Univeristy of Natal, Private Bag X01, Scottsville 3209, South Africa. Tel (0331) 2605609. E-mail: clarkep-@stat.unp.ac.za or Hayes@stat.unp.ac.za

1995 World Conference on Natural Resource Modelling
5-10 July 1995
Models for managing natural resources. Pietermaritzburg, South Africa. Contact: Professor John Hearne, Department of Mathematics and Applied Mathematics, University of Natal, Private BAg X01, Scottsville 3209, South Africa. Tel 0331 260-5599 Fax 0331 260-5626

First South African International Geography Conference
10-14 July 1995
Geography in a changing society: Critical choices for change in southern Africa. University of Durban-Westville, Durban, South Africa. Contact: The Conference '95 Secretariat, Department of Geography, University of Durban-Westville, Private Bag X54001, Durban 4000, South Africa. Fax (031) 820-2934 or (031) 820-2780.

All Africa Conference on Animal Agriculture
1-4 April 1996
The conference has been planned to provide perspective and insight into African animal production industries and systems. It will also consider useful strategies for sustainable animal production, ensuring optimal landuse and adequate food supplies to growing populations. The theme is: Food security in Africa: Challenges, opportunities and targets for animal production. Pretoria, South Africa. Approximately US $450 registration fees. Enquiries: Ms Una Wium, c/o University of Pretoria, Department of Animal and Wildlfe Sciences, Pretoria 0002, South Africa. Tel/fax (012) 342-1627.

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