The potential of *Digitaria eriantha* Steud. as summer pasture crop for growing sheep

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The aim of this study was to determine the potential of Smuts finger grass as summer grazing for sheep on two soil types at different stocking rates and fertilisation levels. The four seasons during which the trial was executed, were relatively dry and were also characterised by a poor distribution of rainfall during the summer months. These aspects resulted in very disappointing mass gains by the sheep, owing to insufficient available dry matter. In most cases the animals could only stay on the pastures for limited periods. The fact that continuous grazing was applied, may also have influenced the results. If the mass gain/ha, as well as the length of the grazing period are considered, it appears as if a stocking rate of 8 sheep/ha gave the best animal performance. Mass gain on Valsrivier soil was ($p < 0.01$) higher than on low potential Avalon. Fertilisation level (120 kg N + 20 kg P/ha/yr vs 60 kg N + 10 kg P/ha/yr) on either soil had little effect on animal performance. The poor animal performance recorded during the trial leads to the conclusion that Smuts finger grass, during relatively dry seasons, has limited potential as summer grazing for sheep. This might possibly change during a season with a higher rainfall and the use of a rotational grazing system.

Die potensiaal van *Digitaria eriantha* Steud. as somerweigewas vir groeiende skape. Die doel van hierdie ondersoek was om die potensiaal van Smutsvingergras as somerweidings-gewas vir wolskape te ondersoek op twee grondvorms teen verskillende veeladings en verskillende bemestingspeile. Die vier seisoene waartydens die ondersoek uitgevoer is, was relatief droog en is ook gekenmerk deur 'n swak verspreiding van reënval gedurende die somermaande. Hierdie twee aspekte het gelei tot baie swak diereprestasie as gevolg van die feit dat daar nie voldoende materiaal vir beweiding beskikbaar was nie. Die skape kon in die meeste gevalle ook slegs vir beperkte periodes op die weiding bly. Die feit dat aanhoudende beweiding toegepas is, kon moontlik ook 'n nadelige invloed gehad het. Indien die massatoename/ha, sowel as die periode van beweiding, in ag geneem word, wil dit uit hierdie ondersoek voorkom asof 'n veelading van 8 skape/ha die beste diereprestasie gelewer het. Massatoename op die Valsriviergrondvorm, was hoër ($p<0.01$) as dié op die lae potensiaal Avalon. Bemestingspeil (120 kg N + 20 kg P/ha/jr *vs* 60 kg N + 10 kg P/ha/jr) het nie op een van die grondvorms 'n noemenswaardige invloed gehad nie. Uit die resultate wat met hierdie ondersoek behaal is, wil dit voorkom asof Smutsvingergras gedurende relatief droë seisoene, met 'n praktyk van aanhoudende beweiding beperkte potensiaal as somerweidingsgewas vir skape het. Die situasie kan egter moontlik verander gedurende 'n seisoen met hoër reënval en die toepassing van 'n wisselweidingstelsel.

Keywords: Smuts finger grass, stocking rate, summer grazing, woolled sheep

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Introduction

The continuous decrease in area available for agricultural purposes, in conjunction with the ever increasing need for higher production, necessitates definite efforts to realise more efficient production per unit area of available land. This applies especially for marginal soils withdrawn from maize production in favour of cultivated pastures and other forage crops (Booysen, 1970; Luitingh, 1978). This practice will also lead to more stability in the total farming enterprise, as well as a decrease in risk (Grunow, 1974; Van Wyk, 1980).

Luitingh (1978) alleges that in South Africa approximately 12 million ha are both ecologically and economically suitable for veld improvement or substitution of veld by high producing pasture species. One of the most important goals of the latter option is to alleviate the pressure on the veld, specifically during certain critical periods. Laas *et al.* (1978) state that an additional advantage in the utilisation of cultivated pastures is the expansion of the national sheep flock.

Regarding the utilisation of Smuts finger grass, Liebenberg (1956) claims it to be good summer grazing with high palatability and an average nutritional value. Ludlow *et al.* (1982), as cited by Dannhauser (1985), point to the fact that the height of the grazing crops did not have any effect on beef production. Its effect on small-stock production, however, was not discussed.

The object of this study was to determine the potential of *Digitaria eriantha* (Smuts finger grass) as a summer grazing crop for woolled sheep on two soil types at different stocking rates and fertilisation levels. Dannhauser (1985) dealt with the pasture aspects of this study.

Procedure

The trial was carried out under dry land conditions on Valsrivier (2112) and low potential Avalon (3100) soil types (Soil Classification Working Group, 1991) on the Noyjons experimental farm of the North West Agricultural Development Institute, Potchefstroom. The long-term average (lta) rainfall for this region is approximately 640 mm/year (Institute for

Soil, Climate and Water, 1989). Eighty year-old Döhne merino ewes (~40 kg), allocated according to initial mass, were divided into 16 groups (5 animals/treatment). The total trial area (10 ha) was divided into 16 camps. Camp sizes differed to obtain the required stocking rate.

- Two different fertilisation levels were applied on each of the soil types:

  Fertilisation level 1 — 60 kg N + 10 kg P/ha

  Fertilisation level 2 — 120 kg N + 20 kg P/ha

Fertiliser was applied annually (during September/October). The fertilisers used were limestone ammonium nitrate (LAN) (28% N) and superphosphate (11,3% P).

- Four stocking rates were also applied during the trial:

  Stocking rate 1: 4 sheep/ha/180 days

  Stocking rate 2: 8 sheep/ha/180 days

  Stocking rate 3: 12 sheep/ha/180 days

  Stocking rate 4: 16 sheep/ha/180 days

These particular stocking rates were chosen specifically to include a very low stocking rate (4 sheep/ha), as well as a relatively high stocking rate (16 sheep/ha). The trial was repeated for four consecutive summer seasons (81/82, 82/83, 83/84, 84/85) and was originally planned as continuous grazing for approximately 180 days (beginning of December till the end of May). At the end of each trial season (during the winter period) the camps were cleared of excess dry matter (DM). The DM-production for each season is presented by Dannhauser (1985). A salt-phosphate lick (50% salt, 47% dicalciumphosphate and 3% flowers of sulphur) was supplied to the trial animals. The animals were weighed every fortnight. During the periods of low rainfall (accompanied by a lack of available grazing), with live mass gain as criteria (as will be discussed later), the following rumen stimulating lick (42% crude protein) was supplied to the animals:

Groundnut oilcake meal	40 %
Salt	30 %
Dicalcium phosphate	15 %
Urea	10 %
Molasses	5 %

Lick intake was monitored throughout the trial.

During Year 1 the rumen-stimulating lick was supplied to the trial animals as from the end of April, whereas during Year 2, it had to be supplied from the first week of February. A rumen-stimulating lick was made available to the animals for approximately three weeks during the third season (1984/03/08–1984/03/27) whereafter, owing to rainfall and the regrowth of the pasture, a salt phosphate lick was again made available to those animals still on the pasture (lowest stocking rate).

The trial was originally planned as a factorial design with stocking rate, soil type and fertilisation level as the main factors. The different levels of fertilisation, however, showed no significant effect on the gain/ha of the animals (37.6 and 39.6 kg/ha for Fertilisation levels 1 and 2 respectively) and therefore this treatment was not taken into consideration with the statistical analysis of the data. Consequently the SAS program (Statistical Analysis Systems, 1985) was used to analyse the data of the different seasons as a 4 × 2 factorial with four stocking rates and two soil types. The four seasons were also jointly analysed as a 4 × 4 × 2 factorial design with four seasons, four stocking rates and two soil types.

Results and Discussion

Rainfall

The average monthly rainfall for the different seasons (December–April) and the preceding summer months (October & November), as well as the long-term average per month (lta) for 71 years, are shown in Table 1. The first part of the summer of Year 1 (November/December/January) had a relatively high rainfall, while the period February/March was exceptionally dry (Table 1).

The high rainfall during October '82 (Year 2), had the effect that the grass sprouted early and was ready to be grazed by mid-November. The rest of this season, with the exception of February, was extremely dry and very hot resulting in a high evaporation rate which further reduced the available soil moisture. A large part of February's rainfall was one downpour and the effectiveness of this was not as high as would normally be expected.

Although the rainfall figures for October and November of the third season ('83/84) were much higher than the long-term average (Table 1), the grass did not, at any stage, show vigorous growth (possible reasons will be discussed later). However, owing to the intensity and distribution of the rainfall, the monthly rainfall figure can often be misleading. The rainfall figures for the rest of the third season, with the exception of March, were much lower than the lta.

Owing to the fact that the dry matter (DM) production of the grazing was very poor during Year 4, the trial could only start during December. This was possibly due to the culmination of the effect of the possible factors which inhibited growth (as discussed under period of grazing). The rainfall figures for the first few months (December–February) of this season were appreciably lower than the lta, while the rainfall during March was approximately the same as the lta (Table 1).

Animal performance

Period of grazing

Owing to the drought (below average rainfall, as well as the poor distribution) and consequent lack of available grazing during the various seasons, all the groups could not stay on the pasture for the total period (summer) and had to be removed at the stage that the grazing became insufficient, based on mass loss. The fourth season was the exception

Table 1 Average monthly rainfall (mm) for the four trial seasons, as well as the long-term average (1913–1984)

	Year				
Month	1 (81/82)	2 (82/83)	3 (83/84)	4 (84/85)	Long-term average
October	29.4	109.7	95.0	70.5	47.9
November	119.3	18.8	106.5	104.2	80.0
December	111.9	69.4	70.0	54.4	100.7
January	102.9	69.8	71.5	91.8	111.3
February	39.1	130.7	7.9	73.4	93.5
March	48.6	14.2	93.2	86.4	82.9
April	77.7	18.6	14.6	4.4	47.3
Total	528.9	431.2	458.7	458.1	563.6

because the animals in some of the treatments started losing mass within the first two weeks of the season. The number of days that the animals of the different treatments stayed on the pasture for the summer period of the various seasons are shown in Table 2.

As can be seen in Table 2, the pasture could not accommodate the animals of the two heaviest stocking rates (12 and 16 sheep/ha) for the whole of the summer period during any of the trial seasons. This was only achieved during the first season on Stocking rates 1 and 2.

During Year 1 problems were experienced with the fact that the trial had to start at a set date. The pasture became too high and also got too mature for efficient utilisation by the sheep.

Consequently it was decided, for the remaining seasons, to start the trial at the stage that the grass was sufficient for grazing (which was determined by sample plots as described by Dannhauser, 1985), rather than at a predetermined date. Although it was decided to use sweepers if the five trial animals could not utilise the pasture sufficiently this was, owing to the low rainfall, not necessary during any of the following trial seasons.

Weed infestation, accompanied by a poor basal covering of Smuts finger grass resulted in a deficiency in available grazing material during the fourth season (Dannhauser, 1985). Therefore, the animals of the three lowest stocking rates on the Avalon soil type had to be removed from the trial during January 1985 (56 days), while the animals of the Valsrivier soil type still grazed on the pasture till the last week of March (98 days).

Possible reasons for the poor growth of the pasture during certain seasons, could be one or more of the following:

- The consecutive dry seasons caused the grass to 'die' and thus the basal covering of the camps deteriorated. Continuous grazing could possibly also contribute to this. Dannhauser (1985) referred to the percentage foreign matter in the pasture that occurred at the different stocking rates.
- Weed encroachment occurred and the 'suffocation effect' of these weeds further contributed to the elimination of the Smuts finger grass.
- Late frost during Year 3, which occurred when the grass was already sprouting, had a retarding effect on the DM-production of the pasture.
- High temperatures during the trial period enhanced evaporation, and this had a negative effect on the already limited available soil moisture.

Table 2 Number of days that the animals could stay on the grazing during the various seasons

Year	Soil type	Stocking density (S) (sheep/ha) 1 (4)	2 (8)	3 (12)	4 (16)
1 (1981/82)	Valsrivier	186	186	82	75
	Avalon	186	186	82	75
2 (1982/83)	Valsrivier	140	98	56	42
	Avalon	140	98	56	42
3 (1983/84)	Valsrivier	141	84	37	37
	Avalon	141	84	37	37
4 (1984/85)	Valsrivier	98	98	98	28
	Avalon	56	56	56	28

The short grazing periods on the different camps during the various seasons, caused large variations in mass gain between the different treatments during the various seasons. Owing to the great variation in the number of grazing days between the different treatments (Table 2), the animals' gains during the different seasons were not compared statistically. The mass gain per unit area, however, (which took into consideration the number of grazing days) made comparison between the different treatments possible and they were consequently compared statistically.

Mass gain per hectare

As mentioned previously the mass gains obtained on the two different fertilisation levels were not statistically different and were thus not considered as a main effect.

Despite this, interactions (in terms of mass gain/ha) still existed between the different seasons and stocking rates ($p < 0.01$), as well as between the different soil types and stocking rates ($p < 0.05$). These interactions were possibly due to the fact that the animals at the higher stocking rates, during the years that it seemed as if there was ample grazing available, had the best results, while these animals had the poorest results (in terms of gain/ha) during drought years (accompanied by a lack of available grazing).

The total live mass gains (kg/ha) of the animals on the different treatments were, therefore, only compared statistically on each soil type for the various seasons and are presented in Table 3.

Although the animals at the lowest stocking rate (4 sheep/ha) on the Valsrivier soil type during the first season (81/82)

Table 3 Total live mass gain (kg/ha) of the animals during the three different seasons

Soil type (S)	Stocking rate (R) (sheep/ha) 1 (4)	2 (8)	3 (12)	4 (16)	Avg. (S)	CV (%)[1]
Year 1 (81/82 season)						
Valsrivier	35.9^{a}_{w}	77.0^{b}_{xy}	57.4^{c}_{wx}	82.9^{b}_{y}	61.26	10.24
Avalon	32.5^{ab}	49.2^{ab}	27.9^{a}	61.8^{b}	43.07	21.03
Avg. (R)	34.19	63.06	43.42	70.49	51.92	
Year 2 (82/83 season)						
Valsrivier	51.6^{a}	51.8^{a}	54.1^{a}	51.5^{a}	52.26	17.34
Avalon	36.6^{a}_{w}	44.2^{ab}_{wx}	70.0^{b}_{x}	54.3^{ab}_{wx}	50.96	15.43
Avg. (R)	44.08	48.20	61.65	52.92	51.63	
Year 3 (83/84 season)						
Valsrivier	44.8^{a}	48.3^{a}	56.4^{a}	33.8^{a}	45.82	15.57
Avalon	37.8^{a}	54.3^{a}	51.1^{a}	57.7^{a}	50.21	13.87
Avg. (R)	41.27	51.29	53.75	45.75	48.02	
Year 4 (84/85 season)						
Valsrivier	17.8^{a}_{w}	18.8^{a}_{w}	23.1^{a}_{w}	-22.2^{b}_{x}	10.18	25.44
Avalon	-2.3^{a}	-15.5^{ab}	-34.8^{b}	-13.8^{ab}	-13.88	26.87
Avg. (R)	7.79	3.52	3.83	-18.24	-0.47	

[1] Coefficient of variation

$^{a-d}$ Values in the same row with different superscripts differ significantly ($p < 0.05$)

$_{w-z}$ Values in the same row with different subscripts differ highly significantly ($p < 0.01$)

stayed in their camps for the whole of the summer period, the mass gain/ha of these animals was lower than the gain/ha of the animals at Stocking rate 3 ($p < 0.05$) and Stocking rates 2 and 4 ($p < 0.01$). The gain/ha at Stocking rate 4 (16 sheep/ha) was also higher ($p < 0.01$) than that of Stocking rate 3 (12 sheep/ha) during this season. The only significant difference that occurred on the Avalon soil type was that Stocking rate 4 had a higher ($p < 0.05$) mass gain/ha than Stocking rate 3. The relatively high coefficient of variation (*CV*) possibly contributed to this. The fact that the highest stocking rate on both soil types (Table 3) had the highest mass gain/ha during this season (Table 3), possibly points to the fact that the rainfall during this summer period (93% of the lta) was sufficient for this particular stocking rate

Despite conflicting results during the four trial seasons (Table 3) the animals grazing on the Valsrivier soil type performed better ($p < 0.01$) than the animals grazing on the low potential Avalon.

The different number of days that the animals stayed on the pasture (Table 2), as well as the relatively high *CV* was possibly responsible for the fact that the mass gain/ha of the different treatments were quite similar during Years 2 (82/83) and 3 (83/84). The only significant difference that occurred during these two seasons was the higher ($p < 0.01$) gain/ha of Stocking rate 3 in relation to Stocking rate 1 on the Avalon soil type during Year 2.

Although the rainfall during Year 4 was approximately the same as during the third season (± 81% of the lta) and even higher than that of the second season (Table 1), the accumulating effect of the reasons mentioned earlier possibly contributed to the fact that the quality of the grazing deteriorated to such an extent that the animals' performance was much poorer both in terms of the number of grazing days, as well as the gain/ha (Table 3). During this season the three lowest stocking rates on the Valsrivier soil type had better ($p < 0.01$) gain/ha than those at the heaviest stocking rate. During Year 4, in contrast with Year 2, the lowest stocking rate on the Avalon soil type had a better gain/ha ($p < 0.05$) than Stocking rate 3.

Stocking rate

The total gain/ha over the four trial seasons for Stocking rates 1 to 4 were 127.3, 165.1, 172.4 and 139.2 kg/ha respectively. From these results it is evident that Stocking rates 2 and 3 (8 sheep/ha and 12 sheep/ha) had comparable mass gains/ha during these seasons. However, when the number of grazing days (Table 2) is brought into consideration, the best results are obtained with 8 sheep/ha. From these results it can also be concluded that even during relatively dry seasons Stocking rate 1 (4 sheep/ha) was too low for optimum animal production. There was an overabundance of grazing material and consequently the grass became too mature for efficient use by the sheep. This, together with the fact that the sheep did not prefer to graze long grass, was possibly responsible for low intakes with accompanying disappointing animal performance. Stocking rate 4 (16 sheep/ha) was possibly too high and the available grazing was utilised in too short a period, which also resulted in disappointing animal performance.

The mass gains realised in this investigation, especially when the limited periods of grazing are taken into consideration, were very disappointing. Cilliers (1984), in a trial with beef cattle weaners on veld fertilised at 100 kg N + 10 kg P/ha, recorded summer mass gains that varied between 117 and 176 kg/ha. The relatively dry years, in conjunction with continuous grazing, possibly contributed to the disappointing animal performance. Dannhauser (1985) alleges that the decision whether to apply continuous grazing or a multiple camp system, is a difficult one and quotes Brown (1977) who postulates that there is little difference between continuous and rotational grazing in terms of animal production. Contrary to this, Liebenberg (1956) states that Smuts finger grass can endure severe grazing if rotational grazing is applied. Dannhauser (1985) comes to the conclusion that a small-camp system, utilised as rotational grazing, would have been more efficient for sheep.

Lick intake

The sheep consumed very little lick (± 7.1 g/sheep/day) of the salt-phosphate lick (expected intake ± 28 g/day). The intake of the rumen-stimulating lick (± 42.0 g/sheep/day) was also much lower than expected (± 70 g/day). It must be remembered, however, that this lick is normally given to animals utilising winter veld. The crude protein supplied to the animals varied between 10.8 and 23.9 g crude protein/animal/day.

Conclusions

A number of dry seasons prevailed during this trial (Table 1). The results of this study must thus be seen against this background. Owing to the lack of available grazing, the average daily gain (ADG) of the trial animals was very disappointing. The animals at the highest stocking rate could not, during any of the years, stay on the pasture for the duration of the summer season. The sheep of the other treatments also had to be removed from the pastures occasionally owing to lack of sufficient grazing material. From this investigation Stocking rate 2 (8 sheep/ha) showed the best results. This stocking rate recorded the best mass gain per hectare, accompanied by the longest grazing period.

Regarding soil type, the gain of the animals on the Valsrivier was better ($p < 0.01$) than that of the animals on the low potential Avalon. It further appears that the higher fertilisation level held no additional advantage in terms of mass gain/ha. This situation could change drastically during years with higher rainfall when the reaction of the pasture to fertilisation could be vastly different.

The successive dry seasons resulted in a low soil moisture level, to such an extent that the basal covering of Smuts finger grass deteriorated and this enhanced weed infestation (Dannhauser 1985). From this it appears as if Smuts finger grass is not very drought resistant. Grobler (1956) recommends a minimum rainfall of 600 mm/year for optimal animal production on Smuts finger grass. Continuous grazing, however, could have a detrimental effect in this regard.

The results of this investigation show that Smuts finger grass, when continuous grazing is applied, has limited potential as summer grazing for sheep. This situation can possibly change during years with a 'normal' rainfall and the application of a rotational grazing system.

References

BOOYSEN, P. de V., 1970. Populations and pastures in perspective. *Proc. Grassld Soc. Sth Afr.* 5, 14.

BROWN, T.H., 1977. A comparison of continuous grazing and deferred autumn grazing of Merino ewes and lambs at 13 stocking rates. *Aust. J. Agric. Res.* 28, 947.

CILLIERS, J.W., 1984. Vleisproduksie vanaf onbemeste en bemeste *Cymbopogon-Themeda* somerveld. Ph.D.-tesis UOVS.

DANNHAUSER, C.S., 1985. 'n Beskouing van *Digitaria eriantha* Steud. subsp. *eriantha* as aangeplante weiding. Ph.D.-tesis UOVS.

GROBLER, L.J., 1956. Veelsydige grassoort:- *Digitaria smutsii* (Northam tipe). *Boerd. S. Afr.* 32, 44.

GRUNOW, J.O., 1974. The pasture explosion. *Proc. Grassld Soc. Sth Afr.* 9, 19.

INSTITUTE FOR SOIL, CLMATE AND WATER, 1989. Long term rainfall data: Summary for 74 years till end 1987. *Agromet, Potchefstroom.*

LAAS, T.M., NEL, J.W. & GRUNOW, J.O., 1981. Die benutting van *Cynodon aethiopicus* Clayton et Harlan (stergras) en *Pennisetum clandestinum* Hochst ex Chiov (kikuyu) as hooigewas vir skape. *S. Afr. Tydskr. Veek.* 11, 211.

LIEBENBERG, L.C.C., 1956. Weiding en voergewasse vir die Transvaal-streek. *Boerd. S. Afr.* 32, 197.

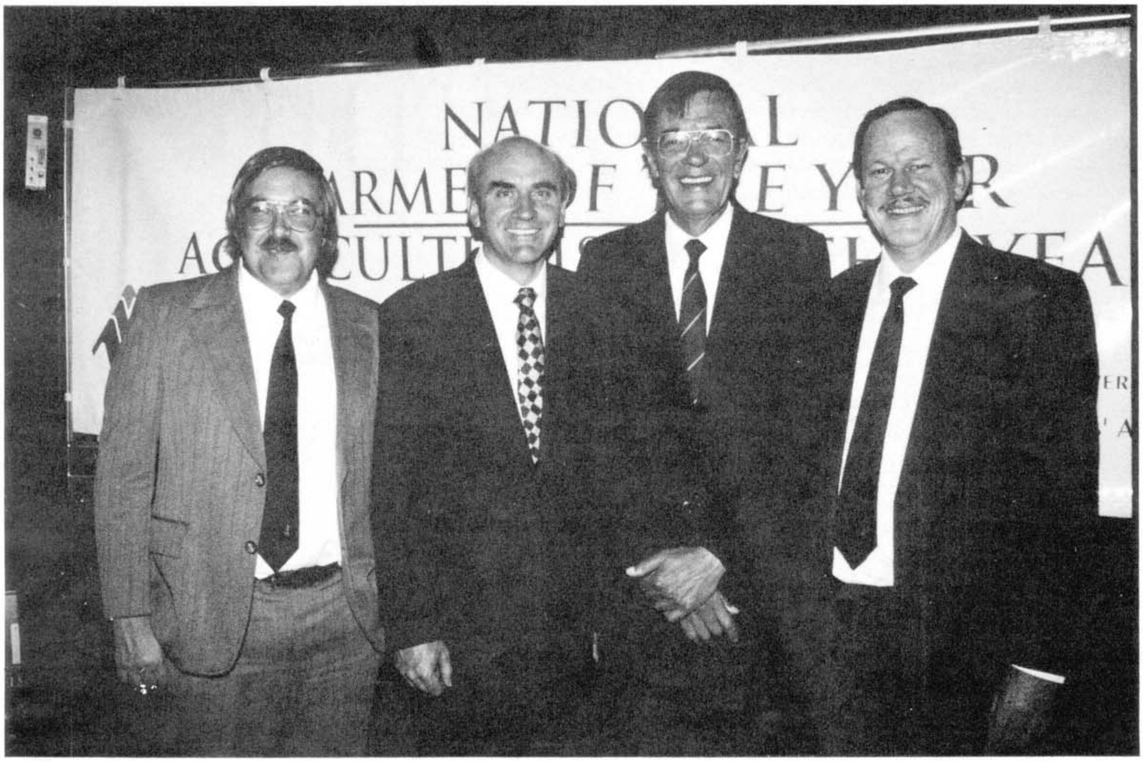
LUDLOW, M.M., STOBBS, T.H., DAVIS, R. & CHARLES-EDWARDS, D.A.,1982. Effect of sward structure of two tropical grasses with contrasting canopies on light distribution, net photosynthesis and size of bite harvested by grazing cattle. *Aust. J. Agric. Res.* 33, 187.

LUITINGH, H.C., 1978. 'n Diereproduksiestrategie vir Suid Afrika. *S. Afr. Tydskr. Veek.* 8, 43.

SAS, 1985. Statistical Analysis System User's Guide (5th edn.). Institute Inc. Raleigh, North Carolina.

SOIL CLASSIFICATION WORKING GROUP, 1991. Soil classification — A taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

VAN WYK, S.P., 1980. A marketing and promotion strategy for wool. *S. Afr. J. Anim. Sci.* 10, 251.



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Op die foto tydens die toekenningsplegtigheid in Pretoria, wat deur Sasol Kunsmis en Sanachem geborg is, is van links: Charl van Rooyen (Landbouweekblad), nasionale voorsitter van die Landbouskrywersvereniging van S.A.; Adam Mostert, bestuurder, bemarking en logistiek, Sasol Kunsmis; prof. Erasmus en dr Abraham Brink, assistent-hoofbestuurder van Sentrachem.