Editor's Note

The year 2015 will be an eventful year for the GSSA. In July this year, the GSSA Congress will celebrate its 50th anniversary. The first Congress was held in 1966 at the then University of Natal, Pietermaritzburg. The Society will be returning to its roots in 2015, with the 50th Annual Congress hosted by the KwaZulu-Natal Province at the Royal Agricultural Showgrounds in Pietermaritzburg. You will find important dates and deadlines of the Congress at the back of this issue.

The mission of Grassroots is to keep Grassland Society of Southern Africa members and other interested parties informed of news, events, publications, reports and opportunities in their field of interest, and to provide a forum for debate and exchange of ideas in rangeland ecology and pasture management. Since it provides a platform to debate ideas, we publish letters to the editor, which you will also find in this issue. Furthermore, a number of snippets of relevant news are published along with a feature article by Dannhauser *et al.* on the importance *Cenchrus ciliaris* for beef production systems.

A helpful article on how to write a proper conclusion is published in this issue which is specifically aimed at young scientists. We encourage young scientists to use Grassroots as a platform to develop writing skills. Please send us your feature articles.

Enjoy reading this issue!

Pieter Swanepoel

Letters to the Editor

Aligning letters to the Editor

Holistic Management of Rangelands has been in the spotlight for quite a number of years. It is indeed a subject which unlocks lively debates between rangeland scientists and managers. In the previous issue of Grassroots (Volume 14, Nr 4), a feature article by George Monbiot, originally published in The Guardian, was reproduced ('Eat more meat and save the world: The latest implausible farming miracle'). This article raised a few bristles amongst GSSA members. Although Monbiot had some good points in his article, many of the statements or accusations made were on a personal level against Allan Savory and does not relate directly to improving our understanding of rangeland ecology or pasture management. The GSSA is a dynamic and inclusive forum for scientists and practitioners in rangeland ecology and pasture management, which champions the sustainable use of rangelands and pastures for the benefit of people and the environment, and does not pick sides, but does not limit freedom of expression either. To be fair, we therefore asked Allan Savory to respond to this article, and use Grassroots as a forum for debate. We hope that Grassroots could be used as a medium to trade ideas (without any more personal punches), and we trust that something positive comes from the response by Allan Savory.

Dr Pieter Swanepoel
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Dear Editor,

Thanks for your email offering me an opportunity of responding to George Monbiot's rather personal attack [feature article reproduced in Grassroots Vol 14 No 4]. There really is nothing in Monbiot's feature that I can respond to because it bears no relationship to my work. Perhaps this needs explanation.

Monbiot took information from a paper by David Briske et.al. summarizing years of range scientist's alleged criticisms of my work - a paper even refuted by one of its authors Dr Richard Teague. Monbiot, Briske and all the authors they cite studied several different rotational grazing systems. Not one of them made any effort to study holistic planned grazing. Like studying car wheels to experimentally prove if planes can fly - after all they do both have wheels. Monbiot, Briske and the many veld management trained people who have ridiculed and opposed for fifty years behaving as they do are not doing so for wrong reason, evil or motive. This is a paradigm paralysis problem. What we are seeing is the normal response to new counter-intuitive scientific advances by authority figures. Such behaviour has not changed since Galileo. In the famous case Ignaz Semmelweis, discovering the existence of bacteria before we knew such existed, he was so persecuted by his peers he died in a mental asylum. Thankfully I was already insane fifty years ago and that saved me when South African veld management experts first began opposing the development of Holistic Management!

My old university, University of Natal has, I think, completely disowned me but again that is normal when paradigms shift in science. I have been unable to find a single instance in history where any institution or organization has been able to accept new paradigm-shifting scientific insights ahead of public opinion. That is why my 20 minute TED talk on desertification viewed by now nearly 3 million people to whom it made sense and gave hope did more than fifty years of struggle to get institutional change. Now several universities, large NGO's etc. are actively collaboration with us around the world.

With regard to criticism of Holistic Management I welcome it as only through that can we keep advancing. When first asked to assist ranchers with their deteriorating land I agreed provided they understood I had no answers - but I would solve the apparently insoluble problem of land degradation leading to desertification if they stuck with me - the blind leading the blind as I said. From there it is history and you can glean much from the Ebook “The Grazing Revolution" including response to false critics. Everything developed was based on receiving criticism, doing more research, trying again and so on till we broke through in 1984. Since that time we have been able to achieve consistent results as long as people practice Holistic Management. That means ensuring all actions are in a holistic context and if livestock are involved the full holistic planned grazing process addresses that complexity of soil life, animal behaviour, plants and other land uses. Paradigm shifts are always hard on the experts in the old paradigm just as it was hard for the most expert candle makers when electric lights came along.

I absolutely wish we could have serious academic criticism of Holistic Management informing us where the process is flawed in any way logically or scientifically. Some 2,000 scientists coming through training in the 1980's were encouraged to find any flaw we could because we can no longer afford costly errors. They could not. I had them work with Holistic Planned Grazing in groups to see in anyone could theoretically cause failure - none could. So we seem to be on the right lines at last with this process. The day any person finds some logical or scientific flaw in the Holistic Management process I promise if still alive I will thank them and we will once more have to change what we are doing in response.

The most urgent need globally and not only in South Africa is to spread knowledge, understanding and experience with Holistic Management to address the desertification so rampant today. We are striving to provide a network of locally led and managed learning/training hubs affiliated through Savory Institute globally. Fortunately the first South African hub has formed in the Cape but more is needed. I hope thousands of South Africans will begin collaborating - farmers, ranchers, people on communal grazing lands, economists, researchers and government agencies as is now happening in other countries on over 20 million hectares on six continents.

A number of GSSA members have visited the Zimbabwean hub where I live and watch the management closely. There the improvement of the land continues to amaze all of us. We have gone through the last seven years with average to below average rain. Normally this would have been a problem but it is far from it. We are now trying to double up cattle numbers once again simply to keep pace with the production of the land. South African farmers can do the same just as fast as we can provide the knowledge and training locally. The productivity of South Africa's grasslands is frankly beyond anyone's current imagination just as soon as holistic planned grazing is fully understood and truly implemented.

Kind regards and appreciation for what Grassroots is doing,

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A Review of Beef Production on *Cenchrus ciliaris*, with Special Reference to the Limpopo Province, South Africa.

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A literature study was done on the utilization of *Cenchrus ciliaris* by beef cattle in the Limpopo and Free State Provinces. The following different systems were involved: cow/calf systems on veld; cow/calf systems on veld supplemented by *C. ciliaris*; cow/calf systems on *C. ciliaris* alone; weaner fattening on veld and weaner and yearling fattening on *C. ciliaris,* at different fertilization treatments. Three different cow/calf systems were compared at the Mara Agricultural Development Centre (Limpopo Province). Weaning masses were the lowest on veld and the highest on the veld + *C. ciliaris* combination during all three seasons. The live masses of weaners on the veld + *C. ciliaris* were on average 24.2 kg higher than on veld. Two cow/calf systems on *C. ciliaris* alone were studied, one on the Springbok Flats (Limpopo Province) and one at the Glen Research station (Free State Province). The weaning mass for the female calves, on the Springbok flats, was on average 189.7 kg for heifers and 198.7 kg for bull calves. The live mass gain of the calves per ha was on average 156.3 kg ha^{-1}. At the Towoomba Agricultural Development Centre, in the Limpopo Province, weaner calves were fattened on veld and on *C. ciliaris* up to an age ±18 months (hay production included). The live mass gain was 37.6 kg ha^{-1} on veld and 179.3 kg ha^{-1}. Yearlings gained 143.9 kg ha^{-1} and 214.3 kg ha^{-1} on non-fertilized and fertilized *C. ciliaris*, respectively.

Introduction

The importance of *Cenchrus ciliaris*, as a planted pasture in the drier savanna areas of southern Africa cannot be over emphasized (Du Pisani et al. 1987). It is a perennial, indigenous, tuft-forming grass with underground rhizomes, recommended by Klug and Arnott (2000) for summer rainfall areas with an average rainfall of between 400 and 750 mm per year. Bogdan (1977) indicated that *C. ciliaris* can survive dry seasons with an annual precipitation of 300 mm and grows well on almost every soil type, except sandy soils. It does well on the black clay soil of the Springbok flats in the Limpopo Province of South Africa (Dannhauser 1991). The optimum maximum temperature requirement of *C. ciliaris* is approximately 35^{0}C, with a minimum temperature requirement between 5^{0}C and 16^{0}C (Paul and Lee 1978, t'Mannetjie and Jones 1992). Growth is retarded by frost, but significant plant deaths have occurred only in areas of prolonged heavy frosting (Paul and Lee 1978).

Donaldson (1978) indicated that the devastating effects of the prolonged drought in the mid-sixties initiated research on the role of *C. ciliaris* as a forage crop. The same author concluded that rangelands should be supplemented with improved forage species to increase productivity, nutritive value and digestibility of the forage (Donaldson 2001). Research to evaluate the impact of planted pastures or alternative winter feed on animal performance were subsequently done by several researchers (Meaker and Lesch 1974, Meaker 1978, Van Niekerk and Louw 1990, Hardy 1991 and Lyle et al. 2003), who all concluded that alternative and or additional feed in winter increased production and reproduction of both beef cattle and sheep. Since Van Oudtshoorn (2004) described *C. ciliaris* as one of the most popular cultivated pastures, especially in the more arid parts of the world, the question of where and how *C. ciliaris* can contribute to higher animal production thus needs to be addressed.

Animal production on *Cenchrus ciliaris*

An extensive literature search was conducted to investigate available research on the role of *C. ciliaris* on animal production in Southern Africa. Six different experiments in which *C. ciliaris* was utilized by beef cattle in the Limpopo Province and the Free State were found. Different utilization systems were involved, which included: Cow/weaner systems on veld; cow/weaner systems on veld supplemented by *C. ciliaris*; cow/weaner systems on *C. ciliaris* alone; weaner and yearling fattening on veld, as well as weaner and yearling fattening on *C. ciliaris,* at different fertilization treatments. Treatments were not always available in the publications. Subsequently, the results are emphasized.

Cow/weaner systems on veld and veld supplemented by *C. ciliaris* at the Mara ADC, Limpopo Province

The Mara Agricultural Development Centre (ADC) is situated about 50 km south west of Louis Trichardt in the Limpopo Province, in the Arid Sweet Bushveld (Acocks 1988). The long-term average rainfall of the study area is 455 mm per annum and occurs mainly from November to February. The daily maximum temperatures vary between 12˚C and 25˚C (December) and the minimum between 21˚C and 3˚C (July) (Donaldson 1978). The experiment was done by Donaldson (1978) during the 1973/74, 1974/75 and 1975/1976 seasons and the rainfall during the experiment is shown in Table 1. The experiment was done on a red sandy/loam soil of the Hutton form. Three different cow and weaner calf systems were compared: System A included 164.4 ha veld (savanna); System B 164.4 ha veld cleared of trees and System C 137 ha veld combined with 27.4 ha *C. ciliaris* pastures (veld + *C. ciliaris*). Systems A and B were divided into

Table1: Grazing statistics on three different grazing systems at the Mara ADC (Donaldson 1978).

Parameter	Season 1 649.8 mm			Season 2 772.2 mm			Season 3 473.5 mm			Mean for 3 seasons		
	Systems											
	A	B	C	A	B	C	A	B	C	A	B	C
No of cows in system	15	20	25	15	20	25	15	20	25	15	20	25
Stocking rate on veld (ha LSU^{-1})	9.1	8.3	5.0	9.1	6.9	4.6	9.0	6.8	4.9	9.1	7.3	4.8
Grazing period on *C. ciliaris*	-	-	212	-	-	167	-	-	154	-	-	178
Stocking rate *C. ciliaris* (ha LSU^{-1})	-	-	0.9	-	-	0.8	-	-	0.8	-	-	0.8
Stocking rate on system (ha LSU^{-1})	9.1	8.3	5.5	9.1	6.9	5.1	9.0	6.8	5.4	9.1	8.1	5.3
Hay cut (t ha^{-1})	-	-	2.4	-	-	0	-	-	1.1	-	-	1.2
Fertilization (kg N ha^{-1})	-	-	80	-	-	60	-	-	60	-	-	67

multi-camp systems and rotational grazing was applied. The *C. cilaris* pasture (in system C) was divided into eight camps. A rotational grazing system was applied on the pasture during summer, while the veld was grazed during winter. Afrikaner/ Hereford crossbred cows were used and stocking rates applied as indicated in Table 1.The calves were removed from the experiment after weaning and weaning masses were used as the final production outcome and marketing stage of the calves. Grazing statistics, annual rainfall and hay production statistics are given in Table 1 and the annual production data of the calves in the different grazing systems in Table 2. According to Table 1, the number of cows per system remained the same in all treatments during the study. However, the grazing periods (period of stay) varied due to seasonal climate differences which, in turn, influenced stocking rates (Donaldson 1978).

The stocking rate (grazing capacity) on the veld for the three different seasons, remained relatively constant for System A, at 9.1 ha LSU^{-1}, 9.1 ha LSU^{-1} and 9.0 ha LSU^{-1} during the different seasons, respectively. For System B, where bush clearing was done, the stocking rate improved during the last two seasons of the study, changed from 8.3 ha LSU^{-1} to 6.9 ha LSU^{-1} and thereafter to 7.3 ha LSU^{-1}. The contribution of *C. ciliaris* in System C is clearly illustrated by a higher grazing capacity (between 5. 1 to 5.4 ha LSU^{-1}; on average of 5.3 ha LSU^{-1} for the three seasons) compared to the 9.1 and 8.1 ha LSU^{-1} of System A and B, respectively. It must also be noted that, besides better live mass production, *C. ciliaris* hay that served as a cash crop, was also produced in System C. According to the results in Table 2 (Donaldson 1978), the average weaning mass was the lowest (214.3 kg) on veld (System A) while it was 219.1 kg on the de-bushed veld (System B). Calves weaned at an average 223.8 kg on the veld + *C. ciliaris* (System C). The live mass production (kg/ha) of the weaners followed the same trend as the weaning masses. It was only 4.4 kg ha^{-1} higher in System B than in System A, thus questioning the economic viability of bush clearing under these circumstances. In System C, the average live weight gain was 26.3 kg ha^{-1}. It was 11.5 kg ha^{-1} higher than that on veld alone. Adding the average hay production of 1.2 t ha^{-1} (33.9 t on the 27.4 ha), including *C. ciliaris* in the system appeared to be a better economical proposition in terms of the year-round availability of fodder.

A cow/calf system on *C. ciliaris* at the Glen ADC, Free State

Du Pisani et al. (1987) evaluated a cow/calf system on 31.5 ha *C. ciliaris* on soil of the Kinross series (Shortland form), at the Glen ADC, near Bloemfontein, over a four year period. This included one season as a gestation period for the first calves and three seasons in which calf data were collected. Three stocking rates were applied under a system of continuous grazing, namely seven cows (and their offspring) per 14 ha; per 10.5 ha and per 7 ha. These treatments were classified as light (CL), medium (CM) and high (CS) stocking rates, respectively. Phosphate was applied "when necessary" and the average rate of application was 84.8 kg Super phosphate

Table 2: Mean annual weaning mass of calves (kg) and production (kg ha^{-1}) at the Mara ADC (Donaldson 1978)

System		Season 1	Season 2	Season 3	Average
A	Weaning mass (kg)	199.5	218.3	225.0	214.3
	Production (kg ha^{-1})	12.1	15.9	16.4	14.8
B	Weaning mass (kg)	205.5	215.5	236.4	219.1
	Production (kg ha^{-1})	13.7	20.9	23.0	19.2
C	Weaning mass (kg)	232.8	217.8	220.6	223.8
	Production (kg ha^{-1})	25.5	26.5	26.8	26.3

ha^{-1} (9 kg P ha^{1}). Nitrogen was applied at a rate of 90 kg N ha^{-1} $annum^{-1}$ in the form of limestone ammonium nitrate. Calves were removed from the systems at weaning age and then sold. It was planned that cows should graze permanently in all the treatments during the study, but on a few occasions they were removed from the CS and CM treatments due to a lack of available material.

This was not necessary in the CL treatment, and probably the reason why the authors considered this treatment as the best. Although the CS and CL treatments produced better (Table 3) in terms of average weaning mass over the 210 days, live mass production on the CS treatment was the highest (184.3 kg ha^{1}). Using this as a parameter, in retrospect, the CS treatment appeared to be best in terms of profit ha^{-1}.

A cow/calf system on *C. ciliaris* at the Towoomba ADC, Limpopo Province.

Robinson et al. (1979) researched a cow/calf system on 37 ha *C. ciliaris* at the Towoomba ADC, situated near Bela Bela in the Sourish Mixed Bushveld (Acocks 1988) of the Limpopo Province. The long-term annual rainfall for the experimental site is 630 mm per annum and occurs between October and March. The long- term daily average maximum and minimum temperatures vary between 30.2°C and 17.6°C for December and 21.0°C and 3.0°C for July respectively. The study was conducted on a Hutton soil over a four-year period. The pasture was fertilized, on average, with 60 kg N and 8.3 kg P ha^{-1} $annum^{-1}$. An average number of 10 cows and their offspring grazed on the 37 ha. The number of cows fluctuated as replacement heifers were introduced and non-productive or old cows removed, but the average stocking rate was 1.48 ha MLU^{-1}

Table 3: Production data in a weaner system on *C. ciliaris* at the Glen ADC (Du Pisani et al. 1987)

Stocking Rate	Carrying capacity (ha $MLU^{-1}a^{-1}$)	Weaning mass at 210 days (kg)	Average live mass production (kg ha^{-1})
CS	1.13	245.7	184.3
CM	1.49	275.9	156.2
CL	1.52	276.5	146.7

Afrikaner and Afrikaner / Simmentaler crossbreds were used. A lick consisting of 38 % salt, 25 % di-calcium phosphate, 20 % urea, 9 % maize, 4 % molasses and 4 % cowpea hay was fed throughout the year. Lick intake was 0.05 and 0.15 kg day^{-1} $animal^{-1}$ for summer and winter, respectively. Fertilization, management and animal production data are shown in Table 4. The average daily gain (ADG) and weaning mass were higher for steers than for heifers and averaged 1019 g day^{-1} over the 200 day study period. The average weaning mass was 245.2 kg, while the total live mass gain was 4609.8 kg on the 37 ha (124.6 kg ha^{-1}).

A cow/calf system on *C. ciliaris* on the Springbok flats, Limpopo Province

Penderis et al. (1977) reported on a cow/calf system, studied on 30 ha *C. ciliaris* on heavy clay soils (Arcadia) of the Springbok flats, Limpopo Province, over a three year period. The pasture was divided into a six camp system and was fertilized, on average, with 74kg N and 12kg P ha^{-1} $annum^{-1}$. It was grazed during summer with 30 lactating Afrikaner and Afrikaner/Hereford crossbred cows and their calves, until weaning, at which stage the calves were marketed. Cows were then fed hay while remaining in the camps. A lick block, consisting of 31% CP, 3.9% Ca, 1.8% P and Vitamin A was supplied. Lick intake was only measured during spring (September/October) and late summer (February/March), resulting in intakes of 53 g cow^{-1} day^{-1} and 135 g cow^{-1} day^{-1}, respectively. The rainfall, animal production and hay production are given in Table 5. The weaning mass for female calves was, on average, lower than that of and for bull calves (189.7 kg and 198.7 kg, respectively; Table 5). Besides the results in Table 5, additionally obtained data (Penderis et al. 1977) included an average calving percentage of 86 %. Total live mass gains of the calves were 4414 kg, 5040 kg and 4632 kg for the three seasons, respectively (average 4695.3 kg). The live mass gain of calves ha^{-1} was 147 kg, 168 kg and 154 kg for the three seasons, respectively (averaging 156.3 kg ha^{-1}).

Table 4: Management and production statistics of a cow/calf system (Robinson et al. 1979)

Management	Statistics	Production	Heifers	Bull	Average
F Fertilization (kg N ha^{-1})	60	No of calves on 37 ha	9.4	9.4	
Grazing period (days)	200	ADG (g day^{-1})	963	1075	1019
Season	Full	Weaning mass (kg)	232.2	258.2	245.2
Carrying capacity (ha MLU^{-1})	1.48	Live mass on 37 ha (kg)	2182.7	2427.1	-
Calving %	94.7	Tot. live mass on 37 ha (kg)	4609.8		
No. of calves on 37 ha	18.75	Tot. live mass (kg ha^{-1})	124.6		

Fattening weaners on *C. ciliaris* and veld: Towoomba ADC, Limpopo Province

Lademann (1995) compared two different weaner fattening systems on Towoomba ADC, in the Limpopo Province. The evaluation was done on black clay soil of the Arcadia series. Unfortunately, only one season's data are available. The total rainfall for the season was 548 mm. Two equivalent groups of crossbred weaner calves utilized veld between June and November, after which they were separated to be fattened on veld (96 ha) and on *C. ciliaris* (16 ha) until an age of ±18 months. The summer grazing period on the *C. ciliaris* lasted until March (280 days), and on veld until May (336 days). The veld group was rotated in a multi-camp system of 96 ha, while the pasture group grazed multi-camp system on 16 ha. The planted pasture received 56 kg N ha^{-1} a^{-1}. All fertilization, management and animal production statistics are given in Table 6. In terms of kg amimal^{-1}, veld produced better than *C. ciliaris*, but the opposite occurred in terms of live mass gains in terms of kg ha^{-1} (Table 7). Hay was produced from the *C. ciliaris* that could be used an extra source, but was used in this trial to feed the cows after weaning.

The animal production (37.6 kg ha^{-1}) on veld was higher than the 26.3 kg ha^{-1} measured in the cow/calf system on Mara Research Station, while the live mass gain on *C. ciliaris* was 179.3 kg ha^{-1}.

* Cow mass at weaning

Table 5: Production data of a weaner system, on *Cenchrus ciliaris,* on the Springbok Flats, Limpopo Province (Penderis et al. 1977).

Rainfall per annum (mm)	Carrying capacity (MLU ha^{-1}205 days^{-1})	ADG (g) of calves		Weaning mass (kg) at 205 days		Average cow mass* (kg)
		Female	Male	Female	Male	
651	1.4	780	830	189	200	465
595	1.3	780	850	196	208	470
534	1.0	750	760	184	188	490
Mean	1.2	770	813	189.7	198.7	475

Table 6: Grazing statistics, annual rainfall, animal and hay production statistics in two weaner fattening systems on the Towoomba ADC, Limpopo Province (Lademann 1995).

Parameter	Veld	*C. ciliaris*
Fertilization (kg N ha^{-1})	-	56
Grazing period (days)	336	280
Stocking rate (ha MLU^{-1})	6.7	1.1
MLU's ha^{-1}	0.15	0.91
*Weaners ha^{-1}	0.195	1.183
Starting mass (kg)	224	223
End mass (kg)	417	372
ADG (g day^{-1})	580	530
Total gain (kg $animal^{-1}$)	193	149
Total gain (kg ha^{-1})	37.6	179.3
Hay produced on system (t)	-	13.6
Hay produced (t ha^{-1})	-	1.7

Fattening yearlings on *C. ciliaris* at the Towoomba ADC, Limpopo Province

Dannhauser (1994) compared two different systems in which beef yearlings were fattened on non-fertilized and fertilized *C. ciliaris* (42 kg N ha^{-1}), during summer. The study was conducted at the Towoomba ADC, in the Limpopo Province and a continuous gazing system, on *C. ciliaris*, was done on the typical black clay soil of the area (Arcadia series). Yearlings were bought in and fattened for a period of ± 168 days until the age of ±18 months.

The difference between unfertilized and fertilized *C. ciliaris* in terms of individual animal production (Table 7), were low (approximately 2 kg $animal^{-1}$), but In terms of total animal gain, fertilized *C. ciliaris* produced 214.3 kg ha^{-1}, 70.4 kg ha^{-1} higher than the 143.9 kg ha^{-1} of unfertilized *C. ciliaris*. The best explanation for this is that specific groups of animals had shorter periods of stay on fertilized pastures (stocking rate statistics in the two treatments, Table 7), resulting in higher turnovers in terms of animal numbers that were marketed.

Table 7: Grazing statistics, annual rainfall and animal production statistics in a yearling fattening system at the Towoomba ADC, Limpopo Province (Dannhauser 1994)

Parameter	Season 1		Season 2		Average	
Fertilization (kg N ha^{-1})	0	42	0	42	0	42
Rainfall (mm)	491.4	491.4	511.5	511.5	-	-
Grazing period (days)	168	168	168	168	168	168
Stocking rate (yearling ha^{-1})	1.0	1.48	1.1	1.6	1.1	1.5
Stocking rate (LSU ha^{-1})	-	-	-	-	1.0	1.36
Starting mass (kg)	264.7	259.5	305.5	314.5	285.1	287.0
End mass (kg)	424.5	425.7	422.0	428.7	423.2	427.2
ADG (g)	963	1000	693	680	828	840
Total gain (kg $animal^{-1}$)	159.8	166.2	116.5	114.2	138.1	140.2
Total gain (kg ha^{-1})	159.8	246.0	128.1	182.7	143.9	214.3

Conclusions

A summary of relevant information, obtained from the discussed trials, is given in Table 8. Five different scenarios were investigated in which nine different treatments/systems were applied. These treatments/systems could be summarized as follows: Three systems that included veld – All these systems produced much lower than systems where *C. ciliaris* alone was used. The live weight gain in the two cow/calf systems (on veld and on veld + *C. ciliaris*) at the Mara ADC produced the lowest (14.8 kg ha^{-1} and 26.3 kg ha^{-1} respectively) illustrating the combined negative effect of low rainfall (the subsequent low availability of herbage; and the use of mature animals for meat production, even in an area dominated by a sweet veld type. Supplementing the veld with *C. ciliaris* resulted in an increase of 11.5 kg ha^{-1} plus 1.2 tons *C. ciliaris* hay ha $^{-1}$ (Donaldson 1978). Fattening weaners on veld alone, in a higher rainfall area, produced 37.6 kg ha^{-1}, which is also considered very low (Lademann 1995). Three cow/calf systems on *C. ciliaris* - The live weight gain on these three systems varied between 124.6 and 156.3 kg ha^{-1} (average 142.5 kg ha^{-1}), which is higher than that on veld alone. The results of two of these studies compared relatively well with results obtained with young animals alone on *C. ciliaris*.

Table 8: Summarized data obtained from the different studies

Location	Rainfall (mm)	System	Hay	Kg N ha^{-1}	Animal prod. (kg ha^{-1})
Mara	473 – 772	Cow/calf system on veld	No	-	14.8
Mara	473 – 772	Cow/calf on veld + C.ciliaris	Yes	67	26.3
Towoomba	548	Weaner fattening on veld	No	-	37.6
Towoomba	620	Cow/calf system on C. ciliaris	No	60	124.6
Glen	398 – 811	Cow/calf system on C. ciliaris	No	90	146.7
Springbok flats	534 - 651	Cow/calf system on C. ciliaris	Yes	74	156.3
Towoomba	491 – 511	Yearling fattening on C. ciliaris	No	0	143.9
Towoomba	548	Weaner fattening on C.ciliaris	Yes	56	179.3
Towoomba	491 – 511	Yearling fattening on C. ciliaris	No	42	214.3

on veld alone. The results of two of these studies compared relatively well with results obtained with young animals alone on *C. ciliaris*.

Fattening weaners and yearlings on *C. ciliaris* – The two systems where fertilized *C. ciliaris* was used as a fodder source produced the highest of all systems (179.3 and 214.3 kg ha^{-1} on average). Live weight gain of yearlings on unfertilized *C. ciliaris* declined over two seasons, despite a higher rainfall in the second season. This might be an indication of a non-sustainable practice and accentuates the importance of correct fertilization practices where planted pastures are implemented. Yearlings on relatively low fertilized *C. ciliaris* (42 kg ha^{-1}) gained, on average 214.3 kg ha^{-1}, but there was also a tendency of lower production in the second season that might be an indication that the fertilization was not high enough for sustainable animal production, especially in a relative good rainfall season. The results of this literature study, especially the weaner and yearling fattening studies at the Towoomba ADC, compares relatively well with results of Hyam and Penderis (1977), who reported live mass gains of as high as 342 kg ha^{-1} on *C. ciliaris*, Dickinson et al. (1990) mentioned that gains of approximately 200 kg ha^{-1} on the same grass could be taken as a general guideline. In comparison to other grasses that fall in the same drought resistant group as *C. ciliaris* - Dickinson et al. (1990) reported live mass gains of 277 kg ha^{-1} on *D. eriantha* (a comparative species) on an Avalon soil in the Northern Free State (600 mm plus rainfall), while Drewes (1982) reported live mass gains of 178 kg ha^{-1} on a marginal soil type in the Potchefstroom area (500 – 600 mm/annum). Dickinson *et al* (1990) reported live mass gains of 112 kg ha^{-1} in the Vaalwater district in the Limpopo Province on *Anthephora pubescens*.

Suggestions

The combined results of the studies clearly illustrate the benefits of *C. ciliaris* as a source of fodder, compared to veld alone. In all cases where *C. ciliaris* alone was used as a fodder source, irrespective of the production system, animal production was higher, while all combinations where veld was incorporated, either partially or as a whole, produced markedly lower. All indications point towards the fact that farmers with existing *C. ciliaris* pastures, especially on more fertile soils, can use it with success, especially in a weaner/yearling fattening system. However, risk factors relating to the economics, as well as the establishment and maintenance of *C. ciliaris* in the especially the lower rainfall areas (i.e. sweet and mixed bushveld) must be kept in mind, as concluded from the results of Donaldson (1978). Proper management of the sward (fertilization and a proper utilization strategy) is of critical importance, as indicated by the drop in gain of weaners and yearlings in one of the studies, due to the absence of proper fertilization practices and the subsequent utilization of low-quality herbage (Dannhauser 1994).

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Writing your Conclusion

UFS Postgraduate Newsletter
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One particular aspect of academic writing is how to write your conclusion section. We will discuss this issue and suggest some exercises which can help you with this process, based on a book called Becoming an Academic Writer by Patricia Goodson (Los Angeles: Sage Publications, 2013), which is a guide to all different stages of the academic writing process. While the section of Goodson's book about writing conclusions focuses on academic journal articles, much of the advice is also relevant to writing theses and dissertations. The first thing to note is that there is a slight difference between a 'conclusion' and a 'discussion'; in the context of journal articles, some journals request one or the other, or both. As they are similar, many writers see these terms as interchangeable, however it's worth looking at recent articles in the journal you are intending to publish in to check what the journal wants Your conclusion section is vital as, in the article context, many readers may only read the abstract and conclusion in full, and skim-read the rest. So it's important here to have a tightly written opening paragraph which contains your key idea in the opening sentence, to make sure the reader is aware of what your work is about straight away. While it's easy to assume that your findings speak for themselves, particularly if you have been assume that your findings speak for themselves, particularly if you have been immersed in your research for a long time, the reader will not necessarily see what you do in your findings/data. Thus you should spell out your findings and their implications as they will not necessarily be self evident to the reader. Furthermore, the applications that you perceive will not necessarily be those that the reader sees. We will now consider some exercises from Goodson's book which may help you with the process of writing your conclusion. The 'reader' of a journal article can be seen as analogous to the examiner of a thesis or dissertation.

Exercise 1: Brainstorming your key findings

You may find it useful here to set a timer for 10 minutes. List your thoughts about the main findings in your research in bullet point form. Then brainstorm any other questions that your research brings up (you can again use bullet points). Think like a reader would – what questions would they have if they are reading your study for the first time? Begin to answer these questions – in doing so you interpret your findings for the reader. You can also use this exercise to pose new questions of your own which appear.

Exercise 2: Link your findings to other research

It's a good idea to start your conclusion with a summary of your study's most important findings, using concise sound bites, which refresh the reader's memory. You can then link your findings to other studies in your field, and discuss how similar or different your results are to other authoritative research on the topic. This helps the reader to see the bigger picture, and joining the dots between your research and that of others starts a discussion/conversation about the topic. In this exercise, draw up a grid/matrix with nine columns (the last five columns will be used in the next exercises). In the first column, write down each of your most salient findings. In the second column, put down references which agree with your findings, and in the third column put down references which disagree. Then, in the fourth column, write down how these other references converge or diverge with your own.

Exercise 3: Relating your findings to theory

The conclusion/discussion section is where you go beyond description to interpret your findings. This involves telling the reader what your findings mean, explaining why you may have obtained these, rather than other, results, and clarifying what the results point to. Thus, you will explain why you obtained the results you did, and this will be how your study contributes to theoretical thinking in your field. In the fifth column of the matrix from the previous exercise, list the theoretical perspectives which may help your readers understand each particular finding In the sixth column write down how your findings relate to that theory – how they support or disprove it.

Exercise 4: the implications of your research

We now consider the implications of your research – now that you know your research findings, what can be done with this information? This can be summarised as the reader asking 'so what?' about your research. In columns seven, eight and nine, consider the question of 'So what?' applied to your main findings, in terms of 'So What... for practice?', 'So What... for Future Research?', 'So What... for Theory?'

Exercise 5: the limitations of your research

Most articles will include a paragraph or two discussing the limitations of the research; keep this fairly brief and only discuss the most important limitations. Many authors seem to rush through this section so it's worth giving it some more thought. Create a new grid with 4 columns. In the first column, write down any problems or difficulties you had during the project, and in the next column put down 'Yes' or 'No' as to whether each issue affected your results. Then in the third column write down the ways you dealt with each issue (you only need to do this for the 'Yes' issues), and in the last column write down a positive characteristic of your study which counterbalances the problem. While you should highlight the limitations of your study, you don't want your reader to only remember the negatives so you should also try to balance problems with the contributions your study makes. Help the reader to see the big picture about what your research brings to the topic as a whole, despite its problems.

Movers and Shakers

Prof Nick Kotzé
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Since 2014, he has been at the Department of Agronomy and really enjoys working with the future talent of his industry. "Developing the new talent and assisting them with bursaries and even work placements is very satisfying." says Dr Kotzé. He also focuses on bringing industry, research and academics together in projects to mutual benefit.

Dr Pieter Swanepoel
Lecturer/Researcher: Department Agronomy,
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Dr Pieter Swanepoel has moved from the Western Cape Department of Agriculture where he was employed as a Scientist on the Outeniqua Research Farm from 2011. Here, he undertook advanced research in the field of soil quality for pastures, aimed at improving farming efficiency and promoting sustainability. This research investigated soil quality of cultivated pastures in the southern Cape region of South Africa and he developed an index to monitor and manage soil quality. This technology is beneficial for the agricultural industry and is used by farmers, extension officers, environmentalists, ecologists and policy-makers to monitor sustainable pasture systems for milk production. In 2014, he gained his PhD on this topic. His new role as lecturer at the University of Stellenbosch will involve similar research, postgraduate training and supervision in agronomical crop and pasture production, as well as undergraduate teaching in agronomy, specifically with regard to cultivation of these and future crops and production physiology and technology for annual agronomical crops.

New and Resigned Members

New Members

Abraham Dabengwa - University of Cape Town
David Brown -University of Limpopo
Denisha Anand - ARC - University of the Western Cape
Jamie Paulse - ARC - University of the Western Cape
Megan Simons - ARC - University of the Western Cape
Visto Amputu - Polytechnic of Nambia
Dr Zivanai Tsvuura - University of KwaZulu Natal
Richard Findlay - No Till Club (re-instated)
Jaco Kellerman - Barenbrug SA Institute member
Elise Nghalipo - Polytechnich of Nambia

Resigned Members

Chantel Helm - moved overseas
Dr Johannes Chirima - ARC no longer in same field
Mark Surmon - Palabora Mining
Megan Ellis - envionmental services
Mzamose Hadebe - Vaal University of Technology
Dr Twahiri Saidi - SAEON