What's on the menu? Ryegrass (*Lolium multiflorum var. Westerwoldicum*) & Supplementation

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The utilization of irrigated pasture to finish off weaners is a practice explored especially during times of high maize prices. Limited data are available for the production potential of beef weaner calves that are finished off on irrigated annual winter crops with molasses based supplementation on the highveld of South Africa with an economic analysis. The aim of this study was to evaluate the effects of different supplementation, namely phosphate, protein and energy (all molasses based), on the economical production on weaner calves grazing irrigated annual *Lolium multiflorum var. westerwoldicum* and to develop strategies for best management practices for such a system. Key objectives were to determine the economic viability of finishing off calves on annual grazing and the advantages, if any, of using the supplementation in conjunction with winter grazing.

Action Plan

Locality

The trial was carried out at Potchefstroom Agricultural Development Centre in the central part of South Africa. The area is characterised by a level landscape mixed land use activities. It is a summer rainfall area, with cold winters. Irrigation is a common land use activity in the area.

Pastures

The trial was conducted on annual monoculture irrigated ryegrass. A tetraploid Westerwold cultivar was used (Energa). Standard irrigated pasture establishment, fertilisation and utilisation practices were applied during the trial. Pastures were utilised 24 hours of the day. Utilisation started at 9.7 oxen per hectare. Haybales were available for the oxen on the pastures as roughage.

Trial animals

Weaner cross oxen calves (Simmentaler + Afrikaner + Bonsmara) available locally from Potchefstroom LIC's extensive veld herd, born during spring 2010 were weaned in autumn 2011 (May), being about 7 months of age. The calves were also branded, castrated, dehorned, tattooed and dipped by the weaning date, 3 May 2011. The animals were slaughtered at the end of the trial for carcass evaluation.

Treatments

The animals were divided randomly into 3 groups of 12 animals each, marked with tags corresponding with different supplementation licks awarded to each group. The supplementations included:
A. Control (phosphate supplementation)
B. Energy – Protein supplementation
C. Pure Energy supplementation. (See Table 1 – Supplementation Scheduling)
Animals were managed in the groups according to the colour ear tag.

Data

All the animals were weighed once a month, beginning and end mass on an empty stomach. Notes on all supplementation intake per group were recorded on a weekly basis. Representative pasture samples were taken over the production period, to determine dry matter production. Records were kept on any abnormalities, (e.g. sick animals and their treatment.) At the end of the trial the animals were slaughtered and subjected to carcass grading.

Results

General

Autumn of 2011 was characterised by very wet conditions, influencing the establishment of the pastures, which only took place 2-3 weeks later than planned, on 25 March 2011. However, it was still estabished within the normal recommendation period. Initially, establishment was good and utilisation started on 25 May 2011. Over-utilising of the pastures occurred at a stocking rate of 9.7 calves per hectare and was adjusted to 8.1 calves per hectare, which was more sustainable. Because of the lower production of the ryegrass during the late winter, together with the extremely long cold periods which impaired production even more, the animals were taken off the pastures from 4 July 2011 up until 28 August 2011, when grazing continued on the pastures. Figure 1 is a diagramatic representation of the fodder flow. During the withdrawal period, the animals received Smuts finger hay in the kraal as feed. The total utilisation period, as from 25 May 2011, extended over 191 days, until 2 December 2011, including the hay period of 55 days. The hay supplemented to the animals on the pastures, was utilised initially, but as the pastures matured, the hay was left unutilised.

Growth data

Figures 2, 3 and 4 respectively indicate the average daily gain (ADG) in grams between the weighings, progressive ADG and mass between weighings, progressive ADG and mass changes of the herd over time. The initially high ADG which drastically decrease and then increase during May – June is a result of the first weighing on empty stomach, after which full stomach weighings took place. The actual adjustment was reflected during early June. During spring, Figure 2 shows ADG performance of 1 600 grams per day, but it was not sustainable over the entire period. The variation between weighings clearly indicates that the data should be viewed with caution over short periods of time.

Figure 1: Fodder flow

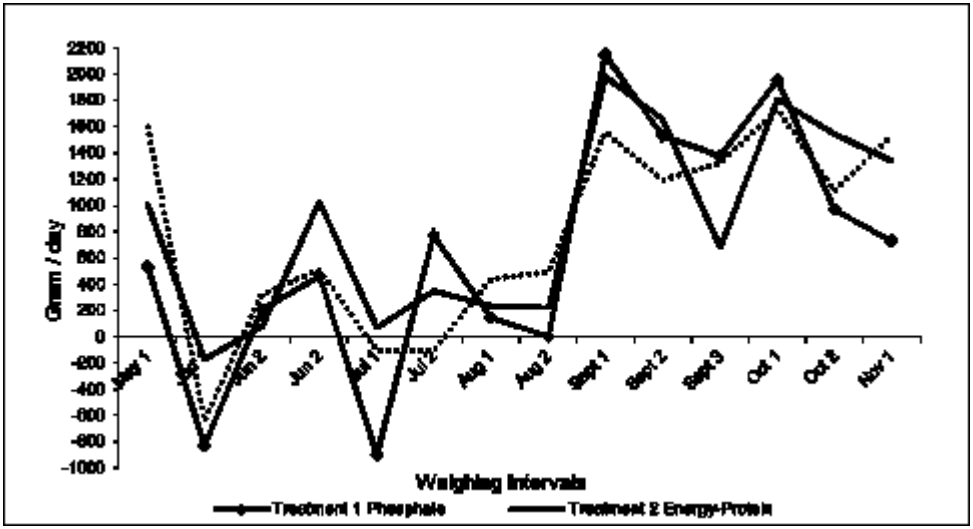

Figure 2: Average Daily Gain (ADG) of the oxen on irrigated ryegrass

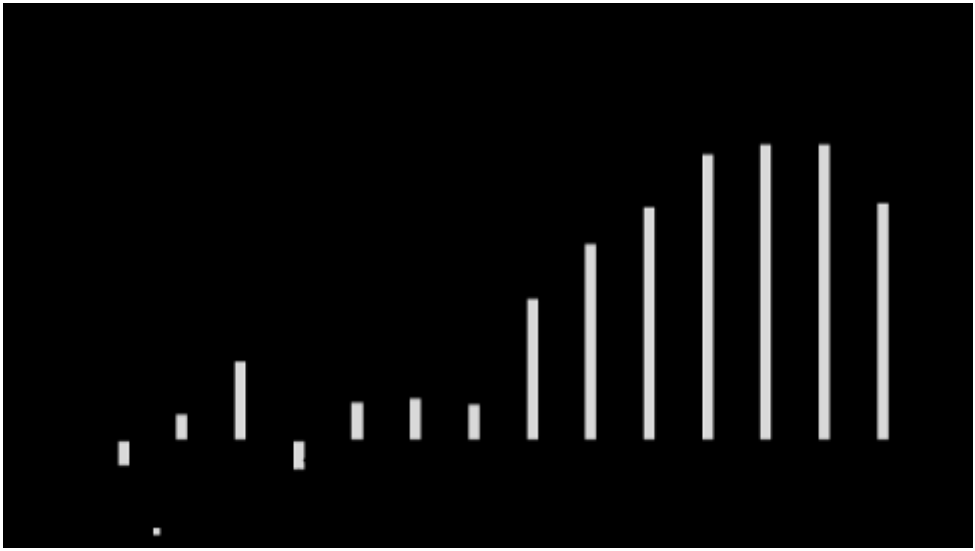

Figure 3: Progressive ADG of the oxen on irrigated Ryegrass pastures

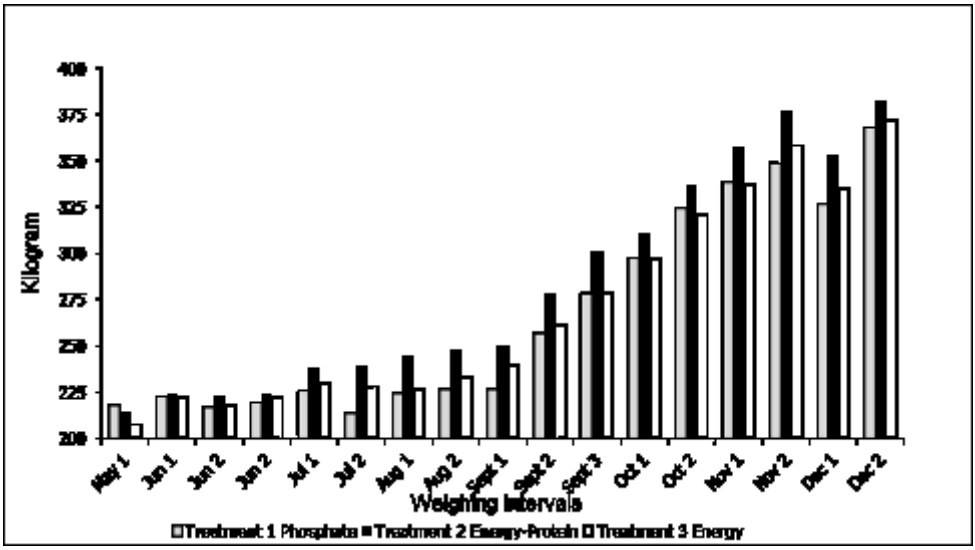

Figure 4: Weight changes of oxen on irrigated Ryegrass

The empty stomach data at the beginning of May, was left out in Figure 3, as ADG figures of higher than 1600g were noted, which formed a skew depiction of the data. The same reason is responsible for the fall in progressive ADG at the end of the period (Nov) which is the actual to progressive empty stomach ADG. Note the ADG of Treatment 1 versus 2 and 3 during May – June in Figure 3, indicating the positive impact energy supplementation has on adjustment. The respective progressive ADG figures from empty stomach to empty stomach are reflected in Table 2, during the hay, ryegrass and total phase. The restrictive effect of the ryegrass deficit (hay supplementation) resulted during July, can clearly be seen in the progressive ADG figures of 700g/day, compared with only the ADG on ryegrass, of over 900g. Figure 3 indicates a reliable picture of the performance of various treatments in general.

Figure 4 gives a good indication of the mass increases of the respective groups. The decrease in the mass towards the end of the period was a result of the effect between empty stomach and full stomach weighings. Table 3 shows the effect of empty and full stomach weights on data. The average for all the groups was 8%, that can influence data significantly, when empty stomach data is not used throughout. The difference is as high as 12% when animals reach maturity. Figure 5 shows the supplementation intake of the various treatments. After the adaption phase, a clear increase in supplementation intake was reflected, during June, when the pasture production decreased. A clear increase of supplementation intake was noticeable during this period when animals were fed on Smuts finger hay, with a 4.62% protein content. In September, the supplementation intake decreased, with the shift back to the ryegrass pastures. A gradual increase was shown as the pastures matured and resulted in weight gain of the animals. Treatment 1 (phosphate) intake, remained low, as expected, with Treatment 2 (energy-protein) and 3 (energy) clearly reflecting pasture quality. Table 4 is an explanatory summary of the supplementation intakes. Should Table 4 be interpreted with the growth data, it is evident that the energy-protein combination supplementation showed the best production results. Supplementation intake during the maximum intake only just exceeded 1 kg per day and was *ad lib* available.

The slaughtering data of the various treatments are shown in Figure 6. All the animals had a carcass grading of A2, without any carcass penalisation for abnormalities. Animals were finished off, despite the final average mass of 374 kg. All the organs were healthy with no injuries or parasite infestations. The official slaughtering percentage is cold carcass mass ÷ empty stomach live mass. The full stomach slaughtering percentage is included in order to demonstrate how misleading the results can be when incorrectly calculated. Table 5 is a summary of the production data with the economic performance achieved. Supplementation costs were calculated from the average supplementation prices for 2011, delivered at Potchefstroom. Purchase hoof price during May 2011 was R 17.17/kg and carcass selling price during December 2011 was R32.50/kg.

Table 1: Supplementation Scheduling of 2011

	Gram / day		
Treatment	Hay only	Rye grass only	Total phase
Treatment 1 Phosphate	7	799	571
Treatment 2 Energy - Protein	167	944	720
Treatment 3 Energy	62	907	664

Table 2: Progressive ADG of the respective treatments

	Trial start			
Treatment	Empty Stomach (kg)	Full Stomach (Kg)	Difference (kg)	%
Treatment 1 Phosphate	216	222	5	2.20%
Treatment 2 Energy-Protein	215	224	9	4.20%
Treatment 3 Energy	206	222	14	6.90%
	Trial ends			
Treatment	Empty Stomach (kg)	Full Stomach (Kg)	Difference (kg)	%
Treatment 1 Phosphate	327	368	41	12.70%
Treatment 2 Energy-Protein	352	383	30	8.60%
Treatment 3 Energy	335	372	37	11.10%

Table 3: Effect of empty and full stomach mass of cattle

Table 4: Explanatory summary of supplementation intakes

The figure of around 1000 kg live weight produced per hectare is slightly lower than figures of 1200 kg of meat, but the extremely cold winter, and the clay soil type on which the pastures were established, had an inhibitory effect on production. Given the circumstances, performance was satisfactory. It must be recognised that the pastures were fully utilised and not over utilised, reflecting the increase in supplementation and sometimes the increased production figures, which is not a genuine reflection of the grazing capacity.

The principle of the diminishing returns is observed in the production performance of Treatment 2 (1041 kg/ha) which is better than Treatment 3 (1000 kg/ha). The cost of the performance in Treatment 2 amounts to R 2369/ha lick costs, resulting in a nett income of R6464/ha. The supplementation costs of Treatment 3 totalled to R1531/ha, at the slightly lower performance of animals, with the nett income realising to R6833, which is better by R369 of 6%. Due to the many variables that play a role in animal performance, the difference is not very big, and the message should be that the energy supplementation, favours economic performance more than energy-protein in this study.

Conclusion

From the above mentioned data it is evident that the animals can be economically successfully finished off on irrigated annual ryegrass. The supplementation of energy both lead to increased animal performance, as well as economically viable performance.

Energy supplementations benefit growth rapidly, especially in the adaption phase. Energy-protein supplementation leads to increased animal performance, but not necessarily to higher economic performance. Supplementation intake levels in Treament 2 and 3 were lower than expected, but there is an interaction between the grazing pressure and intake level. Higher grazing pressure will lead to higher supplementation intake. The decrease in ryegrass production during the winter is clearly shown, resulting in a R2000/ha cost, due to hay that was supplemented. If the pastures should have been sufficient for the winter months, carcass mass could have been higher. Price trends during the year benefits the system and according to industry, must not be marketed before the first week in December. The system is extremely product price sensitive. A three percent shift in carcass price (R1/kg shift) leads to a 30% variation in nett income per hectare (R1600/ha shift). A 15% price shift in lick costs (± R330/ton) results in a 5% shift in net income (R350/ha).

Recommendations

- Provision should be made for the decline in dry matter production during the winter by attempting to establish the pastures before end February.
- Provision should be made for hay utilisation.
- Supplementation should mainly be energy supplementation, with a maximum protein value of 10%.

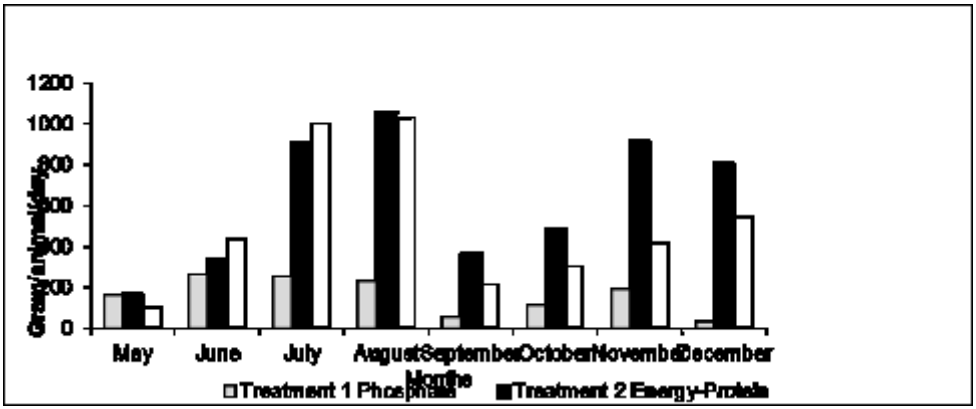

Figure 5: Supplementation intake by the respective treatment groups on irrigated ryegrass

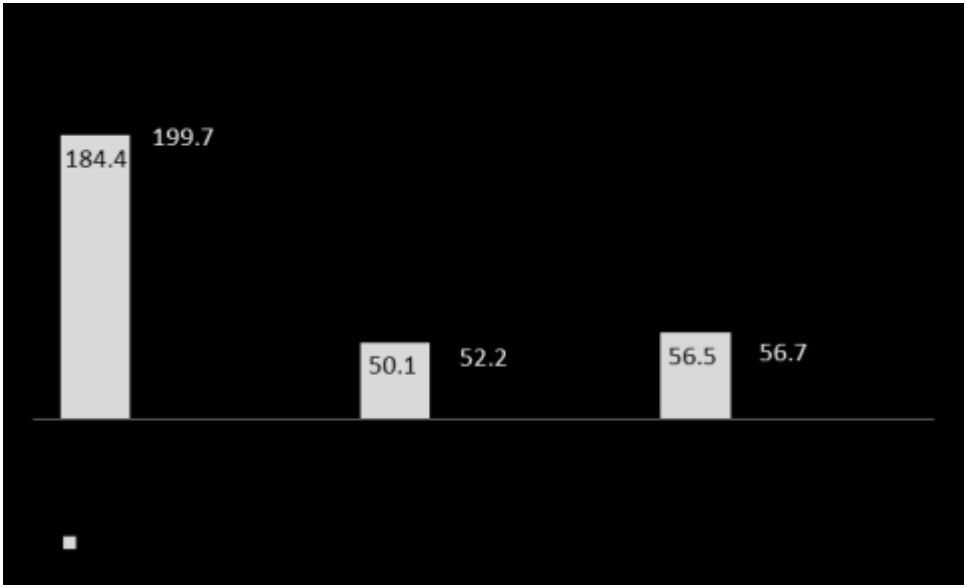

Figure 6: Summary of slaughtering data

Production data			
	Treatment 1: Phosphate	Treatment 2: Energy-Protein	Treatment 3: Energy
Average Purchase mass (Kg)	219	223	219
Mass increase/animal (kg)	109	138	127
Selling Carcass mass (kg)	184	200	195
Slaughtering %	56.50%	56.70%	58.30%
GDT (Gram/day)	571	720	664
Kg Living mass production/ha	881	1041	1000
Supplementation intake (Gram/dag)/ha	183	684	570
Rand/ha			
Total start livestock value (R17.7 hoof price May 2011)	R 31 543	R 32 119	R 31 471
Total supplementation costs (Suppl @ 2011 floor price Potchefstroom)	R 993	R 2 369	R 1 531
Total hay cost (R900/ton)	R 1 970	R 2 143	R 2 029
Process cost (@ R80/animal)	R650	R650	R650
Pasture cost (@R9027/ha)	R9027	R9027	R 9 027
Total expenses (Rand)	R 44 184	R 46 308	R 44 709
Carcass income (R 32.50 A2 carcass price Dec 2011)	**R 48 724**	**R 52 772**	**R 51 542**
Nett Income (Rand)	**R 4 540**	**R 6 464**	**R 6 833**
Interest on investment	**9.30%**	**12.20%**	**13.30%**

Table 5: A summary of production data with the economic performance achieved.

- Supplementation feeding is highly recommended, especially during the adjustment phase.

- Supplementation must be palatable and *ad lib* available.

- Depending on resource and management skills, the stocking rate of 8 – 9, 220 kg weaners during the autumn is a realistic figure.

- Price margin management of the animals is the single most important factor that needs to be managed.

Reference

Bartholomew, P.E. & Louw, B.P. 2005. Beef Production from Italian Rye http:agriculture.kzntl.-grass. za/ AgricPublications/Production GuidelinesPasturesinKwaZu luNa talBeefProductionfromItalian Ryegrass/tabid/319/ Default.aspx .