

THE UTILISATION OF *CENCHRUS* AND *PANICUM* PASTURES OR LUCERNE HAY FOR SLAUGHTER LAMB PRODUCTION – AN ECONOMIC SURVEY

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OPSOMMING: DIE BENUTTING VAN *CENCHRUS*- EN *PANICUM*- WEIDINGS VIR SLAGLAMPRODUKSIE – 'N EKONOMIESE ONDERSOEK

'n Ondersoek is op Vaalhartsnavorsingstasie uitgevoer waarin Dorperooie op óf 'n *Cenchrus ciliaris*-weiding óf 'n *Panicum maximum*-weiding aangehou is, of deurgaans droë lusernhooi gevoer is. Drie lammerooie is oor 'n 2 jaar periode verkry. Lammers is op 60 dae ouderdom gespeen en 'n vetmestingsrantsoen gevoer totdat slagmassa by ongeveer 35 kg lewende massa bereik is. 'n Veelading van 20,5 ooie/ha is toegepas en teen hierdie lading kon *Panicum* nie die diere vir die 2 jaar onderhou nie. Die *Cenchrus*-weiding, daarenteen, het wel genoeg ruvoer geproduseer om die diere te onderhou. Terwyl groen *Cenchrus*-weiding 'n goeie slaglam geproduseer het, was die kwaliteit van *Cenchrus*-hooi onvoldoende vir reprodukerende of lakterende ooie. 'n Ontleding van alle koste en inkomste is gemaak. 'n Negatiewe bruto marge is by beide die *Cenchrus*- sowel as die *Panicum*-weiding behaal. 'n Regressie vergelyking is bereken om aan te dui teen watter pryskoerse dit meer betalend sou wees om lusern as 'n kontantgewas of deur die dier te bemark.

SUMMARY:

A trial was carried out at the Vaalharts Agricultural Research Station in which Dorper ewes were run on either *Cenchrus ciliaris* or *Panicum maximum* pastures or fed lucerne hay. Three lamb crops were obtained over a 2-year period. Lambs were weaned 60 days after birth and fed a fattening ration until slaughter mass was attained at approximately 35 kg live mass. A stocking rate of 20.5 ewes/ha was applied on the pastures. At this rate the *Panicum* pasture failed to provide an adequate maintenance diet for the entire period of the trial, but the *Cenchrus* pasture produced sufficient roughage to maintain stock. Although green *Cenchrus* pasture was capable of producing an excellent fat lamb, the quality of *Cenchrus* hay was inadequate for reproducing or lactating animals. An analysis of all cost inputs and saleable produce was made. Both the *Cenchrus* as well as the *Panicum* pasture recorded a negative gross margin. A regression equation was developed to indicate at what price levels it would be more profitable to market lucerne as a cash crop or via the animal.

On the irrigation schemes in the Orange Free State Region, there are considerable areas of scheduled land which, because of physical factors such as poor drainage or a lack of effective depth, are not wholly suitable for cash cropping. However, hay crops or permanent pastures may be successfully grown on such lands, opening the way for a much needed introduction of the animal factor.

High mechanisation costs, together with escalating energy costs, threaten the economic viability of hay production. Consequently the direct utilisation of pasture or potential hay crops by grazing animals for red meat production,

warrants further investigation. Unfortunately, with the exception of lucerne, there is a dearth of information about suitable pasture species which might be used for meat production on irrigation schemes in the summer rainfall area. There is also a serious lack of economic data to evaluate alternative production systems.

A trial was carried out from 1976 to 1978 at the Vaalharts Agricultural Research Station to investigate the relative merits of *Cenchrus ciliaris* cv. Molopo and *Panicum maximum*, cv. Nanyuki, as compared to lucerne hay for intensive slaughter lamb production.

Procedure

The respective grass pastures were successfully established well prior to the commencement of the trial, on a soil of the Mangano series (Hutton form). Pastures were fertilised annually with 24 kg P/ha in the form of single supers and 160 kg N/ha in the form of LAN. The P was applied as a top dressing at the commencement of the growing season while the N was applied in 4 equal dressings during the growing season. Flood irrigation equivalent to approximately 75 mm water was supplied whenever the pastures appeared to be under moisture stress.

Each pasture block was 0,62 ha in extent and was divided into 10 equal paddocks. During the growing season sheep were grazed in rotation around paddocks, being moved at 3 to 4-day intervals depending on the availability of new growth. During the summer flush it was possible to skip certain paddocks in the rotation and surplus growth was hayed-off, hammermilled and fed back to the sheep during winter period. This hay was cut close to the ground and included previously ungrazed grass stubble which undoubtedly affected the quality of the hay adversely.

The annual above ground phytomass production of the *Cenchrus* and *Panicum* pastures was estimated by harvesting 5 protected quadrats, each 1,5 m² in extent in each pasture, at the flowering stage and again at the end of the growing season. After each harvest the enclosures were moved to new clean-clipped sites.

Dorper ewes were used in the trial. After a period of acclimatisation the trial commenced in February 1976 and extended until May 1978. During this period 3 mating seasons, each of 42 day duration, were applied. The different mating seasons commenced on 1976-02-16, 1976-11-05 and 1977-06-05, so that 3 lamb crops were obtained during the 2-year trial period.

Experiment groups consisted of 14 ewes. During mating 3 rams were used, individual rams being rotated at weekly intervals between the groups of ewes. Ewe mass was recorded at mating, at partus and at weaning. Lambs were weaned at 60 days of age and transferred to a feeding unit where they had free access to a ration consisting of 56 parts of milled lucerne, 37 parts of maize meal, 4,5 parts of feed lime and 2,5 parts of fishmeal. The feed intake of each group was recorded. Lambs were slaughtered on attaining a live mass of approximately 35 kg. Birth, weaning and slaughter mass of each lamb was recorded and after slaughter each carcass was graded.

Based on the ewes only, a stocking rate of 20,5 ewes/ha was applied on the pastures. This stocking rate was derived from a preliminary investigation into the production potential of *P. maximum*. The sheep were

kept on the pastures continuously during the growing season but during the dormant period, or periods of lack of growth, were fed surplus hay in an adjoining loafing yard. The group which received only milled lucerne hay, was kept continuously in a loafing paddock. Hay consumption was recorded.

During the experimental period a standard veterinary programme of inoculations and drenches was followed. An economic assessment of all inputs toward meat and hay production was made. For this assessment the capital investment in fixed improvements such as irrigation channels, was ignored. Tractor and implement costs were calculated from data published by Ortman, (1977) and Pretorius (1977). Costs were calculated over a 10 year period.

Results and Discussion

Pasture production

The total annual above ground phytomass production of the pastures is recorded in Table 1, together with data reflecting surplus hay production from the *Cenchrus* and *Panicum* pastures.

The data in Table 1 indicate that the production potential of *Cenchrus* at Vaalharts is considerably superior to that of *Panicum*. At the stocking rate which was applied, there was a considerable amount of surplus *Cenchrus* growth available which was harvested and fed back as hay. The grazing pressure proved too severe for the *Panicum* pasture however, and during the final season (1977/78) the pasture failed and was invaded by weeds. Out of season frosts, with a grass minimum of 0,5°C during November 1976, also destroyed all *Panicum* top growth.

Table 1

Above ground phytomass production of pastures, and surplus Cenchrus and Panicum hay production at Vaalharts (oven dry, ton/ha)

Pasture	Growing season		
	1975/76	1976/77	1977/78
<i>Cenchrus</i>			
(Phytomass production)	19,5	19,9	13,4
(hay)	6,0	3,8	3,2
<i>Panicum</i>			
(Phytomass production)	15,5	12,5	2,8
(hay)	1,6	2,2	—
Lucerne (hay)	15,3	15,3	15,3

Table 2

Grazing records on Cenchrus and Panicum pastures for three lamb production cycles at Vaalharts: 1975–1978

Production cycle	Mating period	Feed source	Grazing record	
			Cenchrus	Panicum
1 : 1976	16 Feb. 1976 to 29 Mar. 1976	Green pasturage	201 days (20-10-75: 8-5-76)	183 days (6-11-75: 7-5-76)
		Pasture hay	150 days (9-5: 5-10-76)	77 days (8-5: 22-7-76)
		Additional hay*	—	116 days (23-7: 16-11-76)
2 : 1976/77	5 Nov. 1976 to 17 Dec. 1976	Green pasturage	226 days (6-10-76: 19-5-77)	135 days (17-11-76: 1-4-77)
		Pasture hay	157 days (20-5: 24-10-77)	56 days (2-4-77: 27-5-77)
		Additional hay*	—	150 days (28-5: 24-10-77)
3 : 1977/78	5 June 1977 to 17 July 1977	Green pasturage	190 days (25-10-77: 3-5-78)	—
		Pasture hay	—	—
		Additional hay*	—	190 days (25-10-77: 3-5-78)

* Additional hay = Lucerne hay

According to Brink (1977) the average annual production potential of lucerne lands at the Vaalharts irrigation scheme is 15,3 ton/ha. This information was used as a parameter to aid the economic evaluation of this study.

Grazing data for the various treatments are given in Table 2.

The data in Table 2 emphasize the inferior production of *Panicum* as compared to *Cenchrus*. Not only did the *Panicum* pasture become available for grazing later in

spring, but the total available grazing during the summer was appreciably less than in the case of *Cenchrus*. During the 1977–1978 season no grazing on the *Panicum* pasture was available due to weed encroachment. There was always sufficient surplus *Cenchrus* hay available to maintain stock during the dormant period, but this was not the case with the *Panicum*, and additional hay (lucerne) had to be supplied. The effect of feeding lucerne hay confounds the animal production results from the *Panicum* pasture. These results are therefore not presented.

Table 3

Lambing percentage, average birth mass and average weaning mass of lambs (kg), where ewes had access to lucerne hay or Cenchrus pasture or hay, for three lambing seasons

Production cycle	Lambing percentage			Birth mass			Weaning mass		
	1	2	3	1	2	3	1	2	3
<i>Cenchrus</i>	107	54	90	3,59	4,33	4,50*	11,5	11,9	24,1**
Lucerne	121	121	150	3,99*	4,41	3,95	19,3**	20,5**	20,5

Students t-test

* difference significant ($P < 0,05$)

** difference significant ($P < 0,01$)

Table 4

Average period spent in feed unit (days), total meat production (kg/ha) and carcass grading (% supers) of lambs for three lambing seasons

Season	Days in feed unit			Total meat production			% Supers		
	1	2	3	1	2	3	1	2	3
<i>Cenchrus</i> treatment	106	99	87	170	163	217	75	83	100
Lucerne treatment	68	55	96	420	410	402	94	87	100

From the data in Table 2 it can be deduced that ewes were mated on pasture during the first production cycle, but during the final 2 months of pregnancy and during lactation, had access to only *Cenchrus* hay; during the second production cycle, ewes had just come off hay feeding when they were mated, and were fed only hay during the final 2 to 8 weeks of lactation; during the third and final production cycles ewes were mated while on hay feeding, but from the last two months of pregnancy until after the lambs were weaned, the ewes were grazed on green pasture.

Lamb production

Data relating to lambing percentage (number of lambs born/number of ewes mated), birth mass and weaning mass of the lucerne and *Cenchrus* groups are given in Table 3, while Table 4 contains data regarding the period the lambs spent in the feed unit, total meat production and carcass grading.

From the data in Table 3 it is clear that lambs, that were born or weaned when the ewes had access to only *Cenchrus* hay, were significantly lighter than the lambs born to ewes fed on lucerne hay. During the third season, however, lambs born and weaned on *Cenchrus* pasture were significantly heavier. This result must be seen in the perspective of the high twinning rate of the lucerne-fed ewes. The poor conception rate of the *Cenchrus* fed ewes during the second lambing period, can be related to the poor condition of these ewes at mating, following the suckling of lambs on a diet consisting of *Cenchrus* hay only.

The period the lambs spent in the feed unit as shown in Table 4 is a reflection of the mass at weaning and subsequent growth rate to slaughter condition. The poor condition of the lambs on *Cenchrus* during the first 2 seasons, when the ewes had access to only hay during lactation, is clearly reflected in the data contained in

Table 4. The poor performance in total meat production of the *Cenchrus* fed group as compared to lucerne is also reflected in Table 4. Individual lamb performance during the final season when lambs were born and weaned on *Cenchrus* pasture, however, matches that of the lambs born to ewes fed on lucerne hay.

In Table 5 a gross margin analysis is given of fat lamb production from *Cenchrus* or *Panicum* pastures or lucerne hay, and compared with lucerne grown as a cash crop.

In this analysis in which income and expenditure were estimated over a 10 year period on the basis of prices prevailing during 1978, it is clear that neither *Cenchrus* nor *Panicum* pastures can give a viable return when used for fat lamb production on irrigable land. While green *Cenchrus* pasture is capable of producing a good fat lamb crop, *Cenchrus* hay is not suitable as the sole feed source for reproducing ewes. These findings are substantiated by the results of intake and digestibility studies published by Engels, Ferreira, Swart & Niemann (1978). They found that the daily voluntary dry matter intake of fertilized green *Cenchrus* by sheep was in the order of $84 \text{ gm/W}_{\text{kg}}^{0.75}$ while the organic matter digestibility was 64 per cent. With milled *Cenchrus* hay, however, intake dropped to $54 \text{ gm/W}_{\text{kg}}^{0.75}$ and digestibility to 34.9 per cent. Since green *Cenchrus* pasture will normally be available for only approximately 240 days per growing season in the Vaalharts area, only one lamb crop per year can be reared on green pasture.

It is also clear the *Panicum maximum* cv Nanyuki is not well adapted to the Vaalharts environment and is not suitable for grazing with high stocking rates by sheep. This finding is in agreement with overseas published data concerning this cultivar (Anon. 1961).

In order to compare the profitability of lucerne, cut and sold as a hay crop, or utilised for fat lamb production, this data is also included in Table 5. It is clear that both

Table 5

Gross margin analysis of Cenchrus, Panicum & lucerne for fat lamb production at Vaalharts compared with lucerne hay production as a cash crop, calculated over a 10 year period

	Cenchrus	Panicum	Lucerne	Lucerne (Cash crop)
	R/ha	R/ha	R/ha	R/ha
Income				
Hay production	–	–	90,96	4819,50
Lamb production				
Super	2702,82	5320,97	6498,05	–
Grade 1	365,04	647,09	408,25	–
Hides : Ewes	10,80	10,80	10,80	–
Hides : Lambs	273,68	533,68	643,14	–
Gross income	3352,34	6512,54	7651,20	4819,50
Cost allocated to crop				
Seed	30,00	60,00	60,00	60,00
Inoculant	–	–	6,00	6,00
Fertilizer	373,28	373,28	140,74	140,74
Tillage				
Tractor	126,98	126,98	43,63	43,63
Implements	38,40	38,40	8,36	8,36
Labour	50,29	50,29	15,35	15,35
Haying				
Tractor	149,84	74,92	449,53	449,53
Implements	106,12	53,07	318,37	318,37
Labour	163,05	81,63	489,14	489,14
Binding twine	56,87	21,83	165,53	165,53
Irrigation				
Water	83,60	83,60	350,22	350,22
Labour	103,20	103,20	312,00	312,00
Total	1281,63	1067,10	2358,87	2358,87
Cost allocated to stock				
Labour	419,40	419,40	419,40	–
Fencing (4% depreciation)	569,37	569,37	78,66	–
Stockwater provision (4% depreciation)	24,18	24,18	24,18	–
Selffeeders (4% depreciation)	23,47	23,47	23,47	–
Storage (4% depreciation)	52,41	117,91	104,81	–
Feed unit	40,64	40,64	40,64	–
Ram : Depreciation	60,00	60,00	60,00	–
Lucerne hay	131,07	131,07	131,07	–
Dosing & inoculation	1,89	1,89	1,89	–
Licks	0,55	0,55	0,55	–
Ewes : Mortality	135,00	135,00	135,00	–
Dosing & Inoculation	81,00	81,00	81,00	–
Licks	32,85	32,85	32,85	–
Lucerne hay	–	3024,00	–	–
Lambs : Dosing & Inoculation	42,74	81,39	98,08	–
Fattening ration	1037,59	1918,29	2057,57	–
Total	2651,16	6661,01	3289,17	–
Total allocated costs	3932,79	7728,11	5648,04	2358,87
Gross margin	– 580,45	– 1215,57	2003,16	2460,63

practices return an appreciable gross margin. The relative profitability will depend not only on variable costs, but also on the producer price of meat and lucerne hay.

To investigate these variables a regression was calculated to determine the break even point for either profitable meat production at a constant lucerne price, or profitable lucerne production at a constant meat price. This regression is presented in Fig. 1.

Using the production data obtained from the trial, it is clear that a lucerne price of R50/ton the break even point for meat production is R1,766/kg. Should producer prices for lamb increase above this level, it would be more profitable to market lucerne via red meat production and not as a cash crop. Similarly should the producer price for lamb be less than R1,766/kg, it is obviously more profitable to market the lucerne as a cash crop.

Conclusion

The results of this trial cast serious doubts on the wisdom of using even low potential lands for intensive meat production based on pastures such as *Cenchrus ciliaris* on irrigation schemes. While *Cenchrus* pasture is suitable for lamb production, *Cenchrus* hay is obviously inadequate for reproduction, or for lactating ewes. In some areas it may, however, be feasible to integrate winter pastures with *Cenchrus* to facilitate a better fodder flow.

The results of this trial are also suitable for multilinear regression where both lamb price and lucerne price are varied simultaneously to enable the producer to determine the most profitable strategy for the disposal of the lucerne crop. Input data may also be varied as various production costs fluctuate.

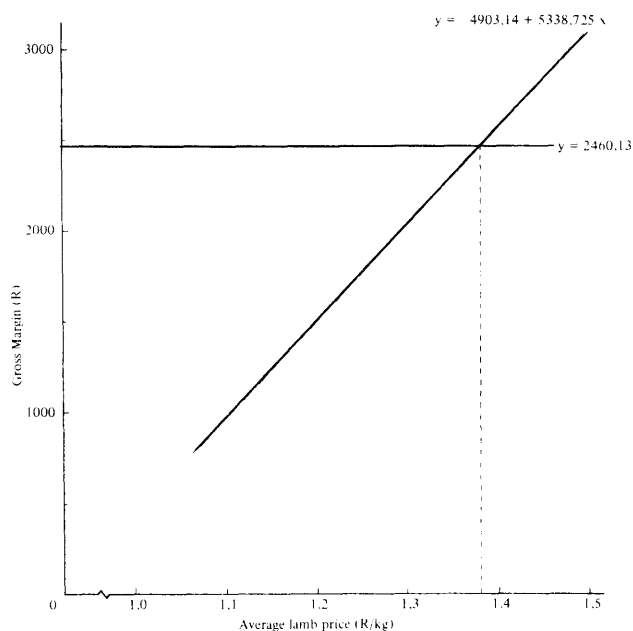


Fig. 1 Break even point for profitable meat production at a constant lucerne price

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