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LIVESTOCK PRODUCTION S
SIFIED FARMING AREA: THE
REGION[1]

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Abstract

Overwintering of livestock has been regarded as a major
rainfall, cold winters and uneven topography. The latter
predominantly sour veld; natural grazing becomes unpala
overwintering problem by moving animals to grazing outs
to determine optimal livestock and cropping systems. T
arable land should supply the dairy herd with its roughag
be used for cash crops (maize and dry beans), leaving no
keep dairy cattle, his second best choice - with much low
bers have to be adjusted to the ability of natural grazing a
land to produce feed or pastures for sheep. Beef cattle c
the main problem in this region is not overwintering, but

Samevatting

Die oorwintering van vee word beskou as 'n belangrike
koue winters en ongelyke topografie. Laasgenoemde b
natuurlike plantegroei is oorwegend suurveld; natuurlike
vee-oorwinteringsprobleem gehanteer deur met hul vee
Lineêre programmering is gebruik om optimale vee- en
winsgewende boerderyvertakking is. Weiveld en bewerk
hierdie behoeftes voldoen is moet die res van die bewerkb
ruimte oor vir vleisbeeste of wolskape nie. As die boer
winsgewend is - 'n kombinasie van kontantgewasse en wol
en oesreste om aan hul voedingsvereistes te voldoen. D
weidings vir skape nie. Vleisbeeste is nie in staat om ekon
in hierdie gebied is dus nie oorwintering nie, maar eerder

1. Introduction

Overwintering of livestock has for long been regarded
important problem in high rainfall, sour veld areas. M
the vegetation (predominantly grass) can provide lush g
for livestock in summer, but loses palatability, digestibili
nutritional value in winter. Farmers have to find w
provide alternative sources of winter feed.

In the Drakensberg regions many farmers have traditi
handled this problem by acquiring land in parts less affec
seasonal changes in the use value of natural grazing.
retained their farms in the high rainfall, sour veld reg
their main base of operations, and moved their livestock
winter grazing farms for approximately three to four m
per year.

As agriculture became more commercialised and land
higher, this practice became more expensive, and its i
tance waned. By 1985, approximately 27 per cent of farm
the Drakensberg grazing regions still trekked with live
mainly with sheep (Minnaar, 1990).

2. Area and farm system description

In the research, an attempt was made to determine an optimum organization for what may be regarded as a representative farm in the Northern Drakensberg grazing region, with Ermelo as the main centre.

In this region, mean annual rainfall varies between 600 and 1000mm, of which approximately 85 per cent occurs between October and March. The mean precipitation varies sharply over short distances (Weather Bureau, 1986; Afdeling Landbouproduksie-ekonomie, 1967). The precipitation has a high degree of reliability (approximately 80 per cent) (Transvaalstreek, 1985:5) and the region is also characterized by mist, cloudiness and high relative humidity (Transvaalstreek, 1985:7).

The region is regarded as temperate to cold, with a comparatively short growth period (Kotze, 1985). Frost occurs regularly in May, June, July and August (Transvaal Region, 1976), and snow often occurs during winter.

A variable topography and differences in soils limit arable areas (Transvaalstreek, 1983). The natural vegetation is sour grass, and acidification has occurred over the last 115 years. Grazing practices have contributed to deterioration of natural grazing (Acocks, 1975:5-7).

The present predominant farming system is a diversified one; livestock consists mainly of dairy cattle, woolled sheep and beef cattle. Arable land is used for feed crops and cash crops, particularly maize and dry beans. Approximately 27 per cent of farmers trek with livestock; there appears to be an inverse relationship between this practice and availability of crop residues (Minnaar, 1990).

3. Empirical model and data used

Linear programming was used to determine profit maximizing enterprise combinations, including intermediate production activities, for representative farms in the region. The model maximised sum of gross margins. It was a deterministic model and did not consider factors such as liquidity or solvency. Neither was risk included in the form of variability; the model was a pure static one.

Cropping activities included cash crops (maize and dry beans), maize silage, pastures (Eragrostis, kikuyu, rye, radishes and oats grazing) and hay (teff and eragrostis). Three types of livestock were considered: dairy and beef cattle and woolled sheep. Production of fodder (also from natural grazing) was determined on a monthly basis and expressed in terms of dry matter (DM) in kg per ha, metabolic energy (ME) in Mega Joules (MJ) per ha and digestible crude protein (DCP) in kg per ha. Estimates were made of quantities of unutilized nutritional value which could be transferred for use in subsequent months[2]. The nutritional needs of livestock were expressed in the same terms[3].

The constraints in the model firstly consisted of constraints regarding available arable land and natural grazing. These constraints were based on median values obtained in a mail questionnaire survey carried out by Minnaar (1990).

Transfer activities formed an important part of the constraint matrix. Livestock numbers were constrained by feed requirements which could be met by natural grazing, feed crops, pastures, crop residues and feed purchases.

Some constraints were arbitrary: The dairy enterprise was limited to 115 cows lactating at any time (thus 393 animal units) and feedlots were not considered. Other arbitrary constraints will be noted when results are presented.

of the arable area (205,2 ha out of 276) was devoted to
tion of hay and to pastures, with the remaining 70,8 ha
the production of maize and dry beans as cash crops.

Table 1: Summary of results obtained by linear progra

Model	A	B	C	D
Constraints:				
Dairy cattle (AU)	S*	≤ 393	= 0	=
Beef cattle (AU)	S	≥ 0	= 0	≥
Sheep (AU)	S**	≥ 0	= 0	≥
Arable land use (ha)	V**	W***	W	V
Purchase of licks (t)	≥ 0	≤ 10	-	≤
Land use:				
Sour veld (ha)	662,0	662,0	662,0	66
Mixed veld (ha)	326,5	326,5	326,5	32
Maize grain (ha)	151,3	56,6	220,8	21
Maize silage (ha)	-	-	-	-
Dry beans (ha)	31,7	14,2	55,2	5
Eragrostis past. (ha)	-	56,2	-	-
Eragrostis hay (ha)	36,0	19,3	-	3
Kikuyu pasture (ha)	-	-	-	-
Rye (ha)	-	-	-	-
Oats (green fodder) (ha)	-	91,7	-	-
Radishes (ha)	-	-	-	-
Teff (ha)	18,0	16,3	-	2
Crop sales:				
Maize (tons)	454,0	169,9	662,0	64
Dry beans (tons)	49,4	22,1	86,1	8
Eragrostis hay (ha equivalent)	13,6	-	-	-
Feed purchases:				
Teff hay (ha equiv.)	2,3	-	-	-
Dairy concentrate (t)	6,1	56,8	-	-
Winter licks (tons)	53,2	10,0	-	1
Total feed crop area (ha)	93,0	205,2	-	6
Livestock:				
Beef cattle (AU)	-	-	-	-
Dairy cattle (AU)	42,0	393,0	-	-
Sheep (AU)	21,9	-	-	1
Sum of Gross Margins	93265	279499	77989	78

* S - Maximum number: those on farm durin
or feed availability
** V - Same proportion as during survey
*** W - Constrained by total area available

Crop residues were also utilized by the dairy herd, as
natural grazing, leaving no room for either beef cattle
This system yielded a sum of gross margins of R279 49
is a multiple of those obtained in other solutions.

Another important conclusion is the inability of beef
compete with either dairying or woolled sheep. Thes
are particularly striking in the light thereof that in the
calculated gross margins for beef cattle and sheep
these enterprises *vis-a-vis* dairying if relative gross ma
compared with those obtained from members of t
Cooperative. A comparison is shown in Table 2.

In Solution B, the dairy herd would use up all the
feed (produced, purchased, crop residues and natural
When one turns one's attention to solution A, the co

pays better to reduce sheep numbers to a level that can be almost completely sustained by natural grazing and crop residues.

5. Conclusion

The results obtained vindicate the opinion that the livestock problem in the high rainfall sour veld areas of the Drakensberg grazing regions is not primarily one of supplying sufficient winter feed for existing livestock. It is rather one of adjusting resource use and production systems to the natural and economic environment with the purpose of optimizing results.

The two most rational choices for farmers in this area, given the present economic environment, will be to concentrate either on dairying or on a combination of cash crops and woolled sheep.

Under present conditions dairying will by far be the most remunerative option. If this system is chosen, the arable land should mainly be used as pasture and for fodder production. After the requirements of the dairy herd have been meet, the remainder of the arable land should be used for cash cropping (maize and dry beans). The dairy herd will, in this process, also use all available roughage from crop residues and natural grazing. The farm should supply all roughage; only licks and dairy concentrates should be to purchased as feeds. The best use of the land resource appears to be supply a profitable dairy herd with its roughage needs and to use what remains for cash crops.

The second viable alternative appears to be the use of the arable land mainly for cash crops, and to keep sheep to utilize natural grazing and crop residues. A very limited amount of arable land should then be used to produce some hay and green fodder for sheep. Considerable plantings of pastures or feed crops for the purpose of sheep production do not appear to be viable. Neither does beef farming seem to be able to compete with either dairying, sheep or cash cropping for the use of land resources in these regions.

A third alternative which appears to yield almost as good results as the sheep - cash cropping alternative is to concentrate on cash cropping and rent out the unused grazing.

These results tend to indicate that land conversion which will change crop land over to fodder production and pastures will in these areas be viable only if the fodder and pastures are used for dairying. If, however, the whole region would get onto the bandwagon, the dairy market may become oversaturated.

The results also tend to support the notion that grazing in these parts have been heavily overstocked and mismanaged.

Notes

1. Based on an MSc (Agric) thesis by HA Minnaar at the University of Pretoria. The authors are indebted to Prof J van Zyl and Mr WF Lubbe for numerous suggestions. The research was funded by the Directorate of Agricultural Economics.

2. Sources for production of feedstuffs: Daines (1987), Kohlmeyer (1988), McDonald *et al* (1981), Van der Merwe (1977), Barnes (1988), Bekker (1987), Meissner (1986), Eden (1988), Esterhuizen (1988), Natal Region (1983a:82), Osterhoff *et al* (1979), Rethman (1988), Schoonraad (1985), Van Heerden (1986), Van Heerden (1988), Paulsmeier (1987).

3. Sources for nutritional needs by livestock: Meissner (1986), Natal Region (1983a:8), Natal Region (1985a:64-152), Natal Region (1985b), Natal Region (1983b:8).

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