EFFECT OF GRAZING MANAGEMENT ON PASTURE PRODUCTIVITY AND SMALL RUMINANT PERFORMANCE : STOCKING RATE OF CAMEROON GRASSLAND DWARF EWES GRAZING ON *Brachiaria sp.* PASTURES

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ABSTRACT

The optimum stocking rate of Cameroon Grassland Dwarf ewes grazing on predominantly *Brachiaria sp.* pastures during the rainy season was determined by comparing animal performance, herbage yield, pasture contamination and infectivity of the animals at three stocking rates, namely 29, 39 and 47 animals/ha. The results indicated that helminth infestation rate and pasture contamination rose as stocking rate increased from 29 animals/ha. Pasture contamination at 29 animals/ha remained insignificant till after 12 weeks of animals on the pasture. Differences in stocking rate had little effect on live weight and packed cell volume. In all animals that lambed, parturition generally led to progressive decrease in live weight and packed cell volume for at least eight weeks. Herbage yield and quality decreased significantly at 39 animals/ha ($p<0.05$) and 47 animals/ha ($p<0.01$) during the 14 weeks period of the study. It is concluded that optimum animal performance and herbage yield can be achieved at a stocking level of 29 animals/ha, but animals must be moved after 3 months to avoid of helminthiasis hazards.

Keywords : Ewes, stocking rate, grazing ruminant, Cameroon.

RESUME

EFFET DE LA GESTION DES PÂTURAGES SUR LA PRODUCTIVITÉ DES FOURRAGES ET LA PERFORMANCE DES CAPRINS : DENSITÉ DU PEUPLEMENT DES BREBIS NAINES DE PRAIRIES DU CAMEROUN SUR LES PÂTURAGES À Brachiaria sp.

La charge optimale par hectare des brebis naines du Cameroun sur des pâturages à base de Brachiaria sp. *a été déterminée pendant la saison des pluies en comparant les performances des animaux, la production fourragère, la contamination des pâturages et l'infestation des animaux. A cet effet trois groupes d'animaux à savoir 29, 39 et 47 animaux par hectare ont été respectivement constitués. Les résultats indiquent que le taux d'infestation des animaux par des helminthes et la contamination du pâturage augmentent avec la charge animale à l'hectare. La contamination du pâturage avec 29 animaux par hectare reste insignifiante en deçà de 12 semaines de pâturage. La charge animale a eu un effet moindre sur le poids vif et l'hématocrite des animaux. Pour tous les animaux ayant mis bas, le poids vif et l'hématocrite ont généralement diminué pendant au moins huit semaines. La production et la qualité du fourrage ont diminué significativement avec 39 animaux à l'hectare ($p<0.05$) et 47 animaux à l'hectare ($p<0.01$) pendant les 14 semaines de l'étude. En conclusion, les meilleures performances des animaux et la production fourragère peuvent être atteintes avec une charge de 29 animaux à l'hectare. Cependant, le pâturage doit être libéré des animaux après trois mois pour éviter des risques d'helmintoses.*

Mots clés : *Brebis, pâturage, densité de peuplement, ruminant, Cameroun.*

INTRODUCTION

Stocking rate is the most important management factor influencing the output of animal products from the pasture, the stability and persistence of the pasture components and also the financial return which the farmer receives (Humphreys, 1978). The density of stocking determines the degree of hazard of helminthiasis, the rate and efficiency of herbage utilisation, the length of herbage and its production and the plan of animal nutrition.

Relatively little information exists on the relationship between flock management practices in Cameroon, the level of parasitism and herbage production. In view of the adverse effects that may arise from overstocking/overgrazing, it will be necessary to make decisions on stocking levels, or animal numbers on a seasonal or relatively short term basis. A recent study at the Animal Research Station at Mankon, Cameroon (Anonymous, 1989) suggested that the pasture be spelled for at least three months in order to decontaminate a previously grazed pasture.

The present study was intended to determine the stocking level and duration of grazing of Cameroon Grassland Dwarf ewes on *Brachiaria* pastures during the wet season.

MATERIALS AND METHODS

Recently bred ewes of the Cameroon Grassland Dwarf breed were maintained at three stocking rates (29, 39 and 47 ewes/ha) on paddocks of predominantly *Brachiaria* pastures for 14 weeks during the rainy season (July-September). The animals were dewormed with Ivermectin at 200 µg/kg body weight prior to the beginning of the study. Supplementary feeding was not practised. However, water and salt were provided *ad libitum*.

Data collected during the 14 weeks duration of the experiment included measurements of live weight, faecal strongyle egg counts, pasture larval counts, packed cell volume, forage yield (yield kg/ha) and leaf-stem ratio. A 50 cm x 50 cm square quadrant was used for herbage sampling. The quadrant was selected at random within each of the three paddocks and herbage harvested close the ground level. Two such samples were taken per paddock, one for dry matter determinations and the other for pasture larval counts after leaf-stem ratio determination.

Variables from parasitological data were continuous and analyzed according to the Kruskal-Wallis nonparametric test (Steel and Torrie, 1960) as there was non-normality. Live weight gain and packed cell volume data were subjected to analysis of variance and a paired *t*-test. Changes in forage yield within and between treatments were compared using line graphs. The slopes of the regressions were compared using *t*-test and analysis of variance.

RESULTS

LIVE WEIGHT OF ANIMALS

The data on live weight changes under the three stocking rates is shown in table 1. The weight appeared to have been more greatly affected by parturition and lactation than by stocking rate. In all the ewes that lambed, parturition and lactation generally resulted in a progressive decrease in live weight for at least 10 weeks. Thus in the groups stocked at 29 and 39 animals/ha in which the lambing rates were 67 and 71 % respectively, the mean body weight of lactating ewes had decreased significantly ($p<0.01$) by two weeks post-parturition compared to that prior to parturition.

Table 1 : Mean initial live weight and mean weight gain's in Cameroon Grassland Dwarf ewes at three stocking rates on predominantly *Brachiaria sp.* pastures.

Poids vifs et gains moyens de poids chez les brebis naines de prairie du Cameroun à trois densités de peuplement sur pâturage à Brachiara sp.

Stocking rate	Class of animal	Initial weight (kgs)	Live weight gain (kgs)
29 animals/ha	Ewes that lambed	32.3	-2.4
	Ewes that did not lamb	30.5	4.5
39 animals/ha	Ewes that lambed	32.6	-3.4
	Ewes that did not lamb	32.0	4.5
47 animals/ha	Ewes that lambed	35.5	2.0
	Ewes that did not lamb	31.8	4.2

PARASITOLOGY

Parasitological data are presented in figures 1 and 2 and tables 2 and 3. The infection rate generally rose as the stocking rate increased above 29 animals/ha, although the difference in egg count was not significant. The pasture stocked at 29 animals/ha remained noticeably free of contamination for 12 weeks from commencement of the experiment (table 2) and the animals grazing on this pasture maintained a median egg count of less than 500 epg during this period.

By contrast, at 39 and 47 animals/ha, median egg counts were generally above 600 epg between the 6th and the 12th week. Egg counts (figure 1) and pasture contamination (table 2) were lower at 47 animals/ha than at 39 animals/ha.

At the stocking rates of 29 and 39 animals/ha, where lambing rates were 67 and 71 % respectively, the post-parturient rise in faecal egg counts was more pronounced at 39 animals/ha (figure 2).

Haemonchus contortus was the predominant parasite in the animals of the three groups, accounting for 91 % of the strongyle egg types in faeces whereas as *Trichostrongylus* and *Oesophagostomum* eggs together comprised only 9 % (table 3). *Haemonchus contortus* was the only species recovered from the pasture samples.

PACKED CELL VOLUME

Packed cell volume in ewes that lambed was found to be elevated on the day of parturition and thereafter decreased progressively for at least 8 weeks afterwards (figure 3). In ewes that did not lamb during the period under study, the packed cell volume changed very little (figure 4) and did not appear to have been affected by stocking rate. In the groups stocked at 29 and 39 animals/ha where lambing rates were 67 and 71 % respectively, the packed cell volume was found to have reduced significantly ($p<0.05$, $p<0.01$, at 29 and 39 animals/ha, respectively) at the end of the experiment compared to the packed cell volume during the first month of the study.

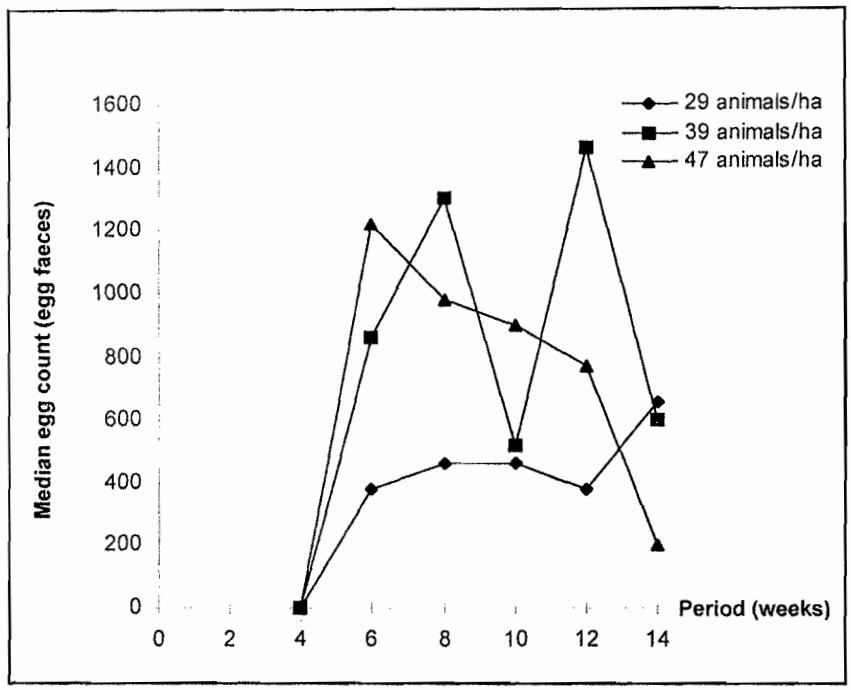

Figure 1 : Feacal egg counts in Cameroon Gransland Dwarf ewes under three stocking rates.

Evolution du nombre moyen d'oeufs des parasites dans les fèces des brebis naines du Cameroun, à trois densités de peuplement.

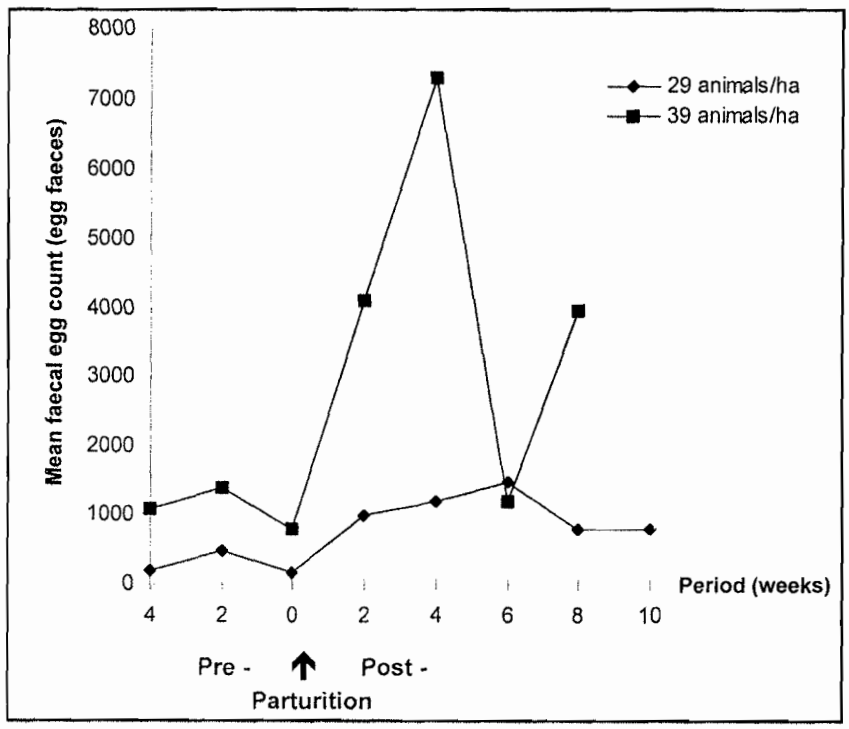

Figure 2 : Peri-parturient rise in strongyle eggs of Cameroon Granssland Duwarf ewes under two stocking rates

Evolution du nombre moyen d'oeufs de strongyle pendant la période de parturition des brebis naines de prairie du Cameroun, à deux densités de peuplement.

Table 2 : Pasture larval contamination by Cameroon Grassland Dwarf ewes at three stocking rates on predominantly *Brachiaria* pastures.

Contamination larvale des brebis naines de prairies du Cameroun à trois densités de peuplement sur les pâturages à Brachiaria sp.

Stocking rate	Infective larval counts per kg DM of pasture						
	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks	14 weeks*
29 animals/ha	0	0	0	0	0	0	146
39 animals/ha	0	0	0	0	278	250	268
47 animals/ha	0	0	0	20	105	86	124

*Period from commencement of study.

Table 3 : Proportion of each strongyle egg type in faeces from sheep grazing under three stocking rates at Mankon, Cameroon.

Proportion de différents types d'oeufs de strongyles dans les fèces de brebis naines du Cameroun, en pâturages à trois densités de peuplement.

Stocking rate	Proportion of egg type* in faeces (%)		
	Haemonchus sp	*Trichostrongylus sp*	*Oesophagostomum sp*
29 animals/ha	90.5	7.5	2
39 animals/ha	93.5	1.5	5
47 animals/ha	90.0	4.0	6

*Mean values at the 12th and 14th week from commencement of study

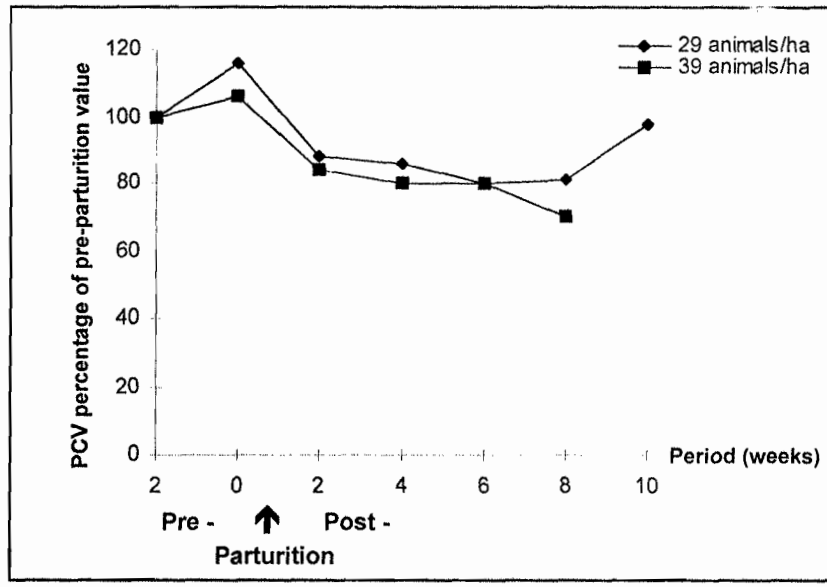

Figure 3 : Changes in packed cell volume following parturition of Cameroon GD ewes under two stocking rates.

Evaluation des volumes cellulaires après parturition des brebis naines du Cameroun à deux densités de peuplement.

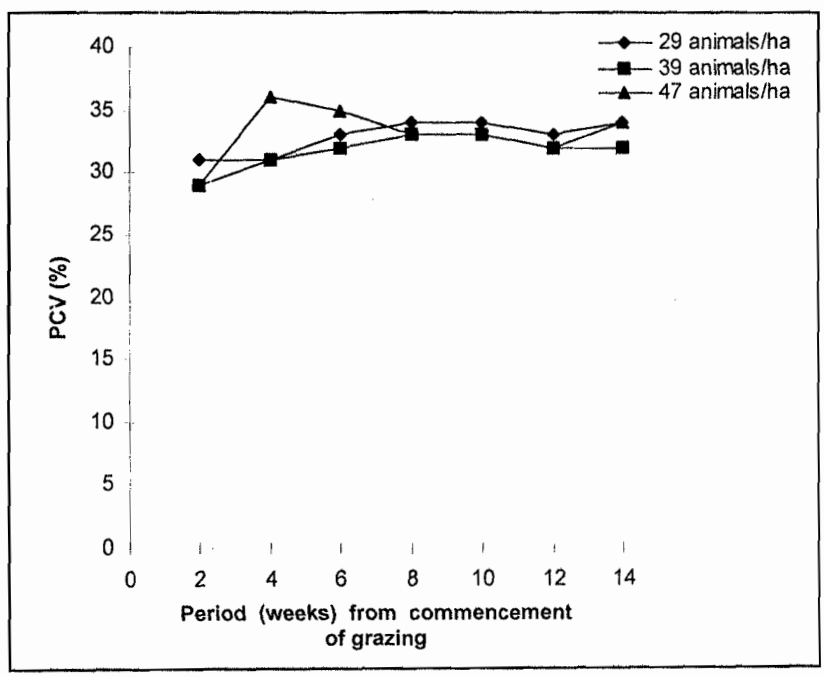

Figure 4 : Packed volume changes in non-lambing Cameroon GD ewes under three stocking rates.

Evolution des volumes cellulaires chez les brebis hors agnelage du Cameroun, à trois densités de peuplement.

Dry mater yield

The changes in herbage yield during the 14 weeks of the experiment are shown in figure 5 while the leaf-stem ratio measured from the 8th week of the experiment is shown in table 4. The data revealed that the herbage yield declined at a more rapid rate in the pastures stocked at 39 animals/ha ($p<0.05$) and 47 animals/ha ($p<0.01$) than in that stocked at 29 animals/ha. the paddock stocked at 47 animals/ha was more heavily grazed than the one stocked at 39 animals/ha ($p<0.05$). The leaf-stem ratio was lower at 39 and 47 animals/ha than at 29 animals/ha.

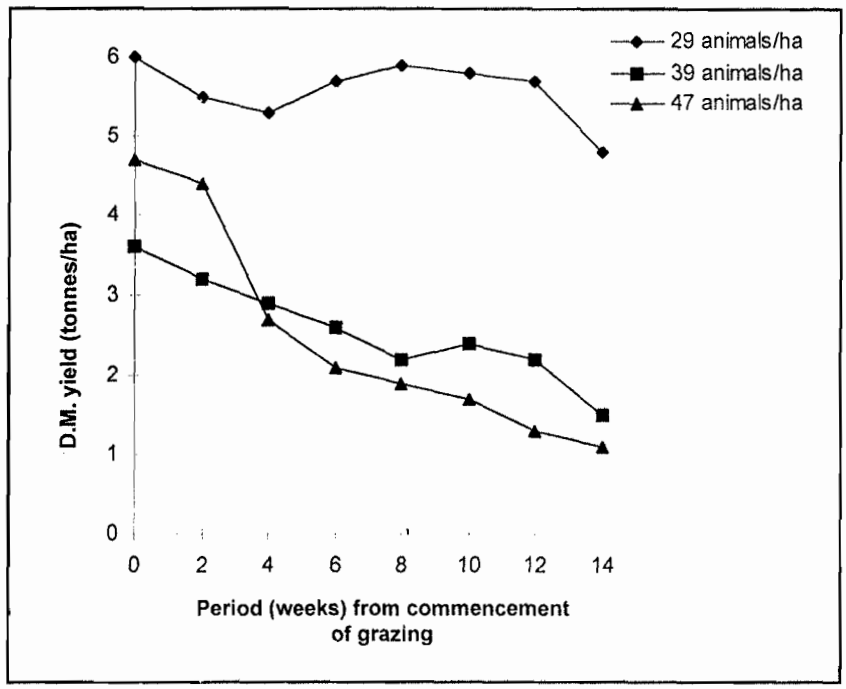

Figure 5 : Herbage yield from pastures grazed at three stocking rates.

Rendement (matière sèche) des fourrages broutées par les brebis naines des prairies du Cameroun, à trois densités de peuplement.

Table 4 : Leaf/stem ratio for pastures grazed by Cameroon Grassland Dwarf ewes at three stocking rates.

Rapport feuilles/tiges des fourrages broutés par les brebis naines des prairies du Cameroun, trois densités de peuplement.

Period (weeks) from commencement of grazing	Leaf/stem ration		
	29 animals/ha	39 animal/ha	47 animals/ha
8	1.0	0.3	0.3
10	0.9	0.3	0.3
12	0.8	0.2	0.3
14	0.8	0.3	0.3

DISCUSSION

The results of this study reveal that the best performance of Cameroon Grassland Dwarf ewes grazing on predominantly *Brachiaria sp.* pastures can be obtained at a stocking rate of 29 animals/ha. The changes in body weight following parturition confounded any effect due to stocking rate and thus rendered comparison of weights here invalid. However there was an indication that for periods of grazing on the same pasture longer than 12 weeks, body weight could be depressed at stocking rates higher than 29 animals/ha. More obvious was the effect of stocking rate on helminth infestation. The increase in level of pasture contamination with concomitant increase in infestation rate was more evident with the change of stocking rate from 29 animals/ha to 39 animals/ha. There was no evidence of increase in pasture contamination and nematode burden with the change in stocking rate from 39 animals/ha to 47 animals/ha. Cameron and Gibbs (1966) obtained lower counts of *Haemonchus contortus*, *Ostertagia circumcincta* and *Trichostrongylus sp.* in lambs stocked at 48 animals/ha than in those stocked at 41 or 35 animals/ha. Michel (1964) observed that at a heavier stocking rate, the grass is grazed low resulting in a smaller daily intake of herbage per head and, while this would result in the ingestion of fewer larvae, a lower nutritional status may adversely affect the animal's resistance to worm infection and to its harmful effects. These observations probably explain why animals grazing in the paddock stocked at 47 animals/ha had lower faecal egg counts and pasture contamination than those grazing in the paddock stocked at 39 animals/ha. However, it is also probable that the higher lambing rate (71 %) of the animals grazing at 39 animals/ha could have resulted in a more rapid increase in faecal egg count (post-parturient rise) and pasture contamination that occurred in the group with 47 animals/ha where lambings (33 % lambing rate) were recorded only during the last four weeks of the experiment.

The fall in packed cell volume of the lactating ewes compared with that in the non-lactating ewes could have been as a result of parturition since anaemia did not develop in the latter group. This is in agreement with the study of Makinde *et al.* (1983) on pregnant and lactating West African Dwarf goats.

Pasture stocking at 29 animals/ha resulted in patch grazing with uneven decline in pasture yield. This stocking level had little effect on individual animal performance since there was enough forage for each animal and an unlimited opportunity for selective grazing. However, at 39 and 47 animals/ha, the grazing pressure was heavy and the pastures were grazed more even. Overgrazing was clearly evident in the paddock stocked at 47 animals/ha where the high stocking rate resulted in availability of less feed to the animals and a rapid decline in the herbage yield.

CONCLUSION

It may be concluded from this study that optimum animal performance and herbage yield can be achieved at a stocking rate of 29 animals/ha. The risk of parasitic gastro-enteritis at this stocking level is low. However, animals should not be allowed to remain on the same paddock for more than three months since pasture larval contamination starts escalating after this period.

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