HOUSING, PASTURE MANAGEMENT AND ROUGHAGE SUPPLEMENTATION ON THE PRE-WEANING GROWTH OF GOATS IN THE TROPICAL NORTHEAST OF BRAZIL[1]

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ABSTRACT - This experiment was undertaken with 100 adult does of an undefined but most common type of goats called "sem raça definida" (SRD). The does were divided into four equal groups (each of 25 does) of comparable age and weights. These were allotted to four treatments as follows: native "caatinga" pastures with either (1) ground floor or (2) raised slatted floor system of housing; cleared pastures with raised floor system of housing either (3) without or (4) with *ad libitum* supplementation of green elephant grass (*Pennisetum purpureum* Schum.) only during dry months. Data on 250 kids born to these does over a period of two years and maintained under the same treatment as their mothers were analysed for their pre-weaning growth were studied. Until three weeks of age, the body weights were almost identical among treatments. Significant treatment effects appeared around four weeks and consistently increased till weaning at 112 days. A comparison of treatments showed that, for the growth of kids, the ground floor system of housing was better than the raised floor system, and cleared pastures had a distinct advantage over native "caatinga" pastures. The best results were obtained in the group supplemented with elephant grass during four very dry months. It appears that the best growth in the local agroclimatic conditions can be obtained when kids are maintained on the ground floor system of housing and cleared pastures with supplementation in the very lean months.

Index terms: kids, ground floor, slatted floor, green elephant grass, dry season.

INSTALAÇÃO, MANEJO DA PASTAGEM E SUPLEMENTAÇÃO VOLUMOSA NO CRESCIMENTO DE CABRITOS, NO PERÍODO DE ALEITAMENTO, NO NORDESTE DO BRASIL

RESUMO - Cem cabras de um tipo indefinido porém muito comum, chamado de sem raça definida (SRD), divididas em quatro grupos de vinte e cinco, foram mantidas em pastagem nativa e alojadas em chiqueiro de chão batido (1); mantidas em pastagem nativa e alojadas em aprisco suspenso (2); mantidas em pastagem nativa raleada e alojadas em aprisco suspenso (3) e mantidas em pastagem nativa raleada, e (4) alojadas em aprisco suspenso e recebendo uma suplementação volumosa de capim-elefante napier (*Pennisetum purpureum* Schum) *ad libitum* durante a estação seca. Dados de 250 cabritos oriundos destas cabras nascidos em dois anos consecutivos foram analisados. O crescimento dos cabritos até a terceira semana não foi afetado pelos tratamentos, sendo entretanto detectadas sensíveis diferenças após a terceira semana. Os animais mantidos em chiqueiro de chão batido tiveram um desempenho significativamente superior ao daqueles mantidos em aprisco suspenso. Os animais mantidos em pastagem nativa raleada apresentaram um desempenho superior ao daqueles mantidos em pastagem nativa, enquanto que os animais mantidos em pastagem nativa raleada e que receberam suplementação apresentaram o melhor desempenho entre todos os grupos. Supõe-se que cabritos mantidos em chiqueiro de chão batido, pastagem raleada e com suplementação alimentar durante o período seco, poderão apresentar o melhor crescimento sob as condições locais.

Termos para indexação: cabras, chão batido, aprisco suspenso, capim elefante verde, estação seca.

INTRODUCTION

The importance of goats in the tropical regions is emphasized elsewhere (Devendra & Burns 1970, Devendra 1980). Most of Brazil's goat population (7.43 millions out of 8.07) is in the Northeast which is also a dry and hot region close to the equator. These goats may have originated from European breeds, but due to several generations of selection and breeding in the local environment these have become almost a uniform group which is well adapted to local agroclimatic conditions. Mainly on the basis of body colour patterns, four breeds of these goats are often described (Mason 1980, Shelton & Figueiredo 1982). However,

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predominantly (perhaps over 90 percent, exact figures are not available) the goats belong to a group called Sem Raça Definida (SRD, without breed definition). As the name suggests, these goats vary widely in their body colour patterns and in the type and size of their ears. But in performance, these goats appear to be uniform among themselves (Mason 1980) and similar to the four local breeds, Moxotó, Marota, Canindé and Repartida. The goats are primarily maintained for meat production and, therefore, growth may be an important criteria. Although genetic improvement in growth is possible over longer periods of time, immediate improvement may be brought about by devising appropriate management systems. This experiment was planned to investigate if certain modifications in housing and grazing management would improve the growth of SRD goats.

MATERIAL AND METHODS

Animals

A total of 100 SRD does were available for this study. All of them were multiparous and about 3 years old in the beginning of the experiment and their age and parity were therefore considered controlled. These does were divided into 4 comparable groups and allotted to 4 treatments described later.

Pastures

Two types of pastures were established. The first of these was a 90 ha area of native caatinga pastures enclosed with fencing. The native caatinga pasture is characterised by small bushy trees and shrubs which turn green during rainy season and drop their leaves during dry season (Figueiredo et al. 1979). The second was a 50 ha area of cleared pasture where the trees and shrubs considered unpalatable for goats were cut leaving the stumps. The herbaceous native vegetation was expected to grow better in this type of pasture area.

Housing

Four houses, each with equal floor space, were constructed. One of these was made on ground floor and the other 3 on raised floors with little spacing between adjacent wooden planks (slatted flooring) to allow passage of faeces. In other respects these houses were similar.

Treatments

A first group of 25 does with one buck (and subsequently with follower kids) was allotted to ground floor house and a similar second group was allotted to one of the 3 raised floor houses. These two groups (comprising 50 does and 2 bucks plus followers) were sent for grazing into the native caatinga pastures as one flock every day between 7.00 a.m. and 4.00 p.m., and were brought back to their allotted houses where they stayed till next morning. Thus, these two groups had same grazing management but different types of housing. The other 2 groups (each of 25 does, one buck and followers) were allotted to the remaining two raised floor houses and were sent for grazing into the cleared pasture area as one flock for the same duration of time as the first two groups, and brought back to their allotted houses in the evening. One of these two groups received *ad libitum* supplementation of chopped elephant grass (*Pennisetum purpureum* Schum.) in the lean months of September, October, November and December. All animals in the four treatments had access to water and a mixture of sterilized bone meal and common salt in their respective houses. Thus, the four treatments were as follows:

a. native caatinga pastures and ground floor housing (NPGH);

b. native caating pastures and raised floor housing (NPRH);

c. cleared pastures and raised floor housing (CPRH);

d. cleared pastures, raised floor housing and supplementation (CPRS).

Kidding

The kidding took place throughout the year. The pattern of kidding was not considered in this study and the kiddings were only divided into 2 seasons. Within seasons, the variation between months and animals is included in the error term of the analysis. The kids had the same management as their mothers and so the treatments were applicable to the parental generation as well as the kids.

Data recording and statistical methods

The weight of kids was recorded immediately after birth, as soon as the kids were dry. Thereafter, their weight was recorded once a week on a fixed day not earlier than 3 days after birth. Thus, the weekly weights were actually recorded with a 7-day age variation of all kids and so, for example, the first week weight represents weights taken between 3rd and 9th day after birth. The data on mother-doe's body weight at parturition were also recorded. General Linear Models procedure of least-squares analysis was used for analysing the data (Barr et al. 1976). In the analysis, effects due to years, seasons of birth, types of birth and sexes of kids were included. These effects and those due to the four treatments were all considered fixed.

RESULTS

The analyses presented in this paper include only the kids that survived the whole pre-weaning period. The total number of kids was 250 and of these 196 were born in multiple births. The first analysis, in Table 1, was conducted on all the kids and the corresponding least-squares means are presented in Table 2. As the number of twin kids was rather large and as the type of birth appeared to have a marked effect, a second analysis on twin kids was carried out. The results of this analysis are presented in Table 3 and the corresponding least-squares means in Table 4.

Associated main effects

The year had a large significant effect on the growth of the kids. The year effects on the birth weight were minor and it appeared that the mean birth weight over single and twin kids was higher in the second year of experimentation. But when only twin kids were included in the analysis, there was no significant difference between years in birth weight. However, in both the analyses, the mean weights from one to seventeen weeks were significantly higher in the first year than in the second. The season of birth showed a consistent effect from birth to weaning in both the analyses. The kids born in rainy season were uniformly heavier than those born in the dry season at each stage of growth. The type of birth also showed a marked effect and single born kids were uniformly heavier than female kids irrespective of whether all kids were considered or only the twin kids. But, subsequently the sex effects disappeared and both male and female kids had comparable body weights throughout the period of experimentation.

Covariables

The body weight of dam was used as a covariable for birth weight and all subsequent weights. For body weights, other than those at birth, two additional covariables were considered: birth weight, and the exact age of kids in days at the time of weekly weighing. The dam's weight at parturition had a significant effect on birth weight and on weights at one and two weeks. Thereafter, this effect seemed to have disappeared. The only exception has been the weight of twin kids around

TABLE 1. Analysis of variance of pre-weaning growth of all SRD kids (singles and twins) under different systems of feeding and housing managements.

Source of variation	df	Mean square, body weight (kg) at:							
		Birth	One week	Two weeks	Four weeks	Nine weeks	Thirteen weeks	Seventeen weeks
Years	1	0.4580 *	2.2664 ****	4.9690 ****	32.2815 ****	63.0112 ****	127.502 ****	183.46 ****
Season of birth	1	0.3209	0.8366 ****	2.1452 ****	15.9400 ****	74.4155 ****	107.222 ****	152.80 ****
Type of birth	1	7.6681 ****	0.3403 *	4.2084 ****	14.2403 ****	50.7715 ****	73.678 ****	118.72 ****
Sex	1	2.2859 ****	0.0270	0.5167	0.2900	0.1925	1.168	4.59
Treatments	3	0.2923 *	0.0072	0.2879	2.1793 ****	15.1768 ****	25.958 ****	45.65 ****
Regression on dam's weight	1	6.3190 ****	0.6983 ****	1.3268 ****	1.1367	0.0010	1.566	8.94
Regression on birth weight	1	.	23.4410 ****	27.8352 ****	44.7528 ****	76.5482 ****	82.591 ****	83.67 ****
Regression on exact number of days at weighing	1	.	12.6676 ****	8.8744 ****	11.5192 ****	20.6584 ****	12.133 *	14.79[a]
Error[b]	241							
	239	0.1099	0.0749	0.1529	0.4812	1.5118	2.835	3.94

Note: *, $P < 0,05$; ****, $P < 0.005$; a, $P = 0.0538$; b, error d.f. for birth weight, 241; for other weight, 239.

119 days of age (weaning) where there was some evidence of an effect associated with the dam's weight. The birth weight had the most profound effect on all subsequent weights in both the analyses. The exact age at weighing was used as a covariable in the analysis and the results showed that in twin kids the small difference in age at the time of weighing had a significant effect at least till weaning. But when all kids, singles and twins, were considered, the effect seemed to have disappeared around weaning.

Treatments

The objective of this study was to find out if some management modifications in the form of treatments would alter the growth rate of kids. The weights of kids born in the 4 treatment groups were approximately the same until 3 weeks, although birth weight tended to vary ($P < 0.05$) between treatments when both types of birth were included in the analysis. However, marked differences appeared around 4 weeks in both the analyses and these differences appeared uniformly stable during the entire subsequent period.

A comparison between the first two treatments (NPGH and NPRH), both on native caatinga pastures, showed that the kids preferred the ground floor housing and the growth of kids on slatted floor houses was very poor, and in fact was the lowest among the four treatments. A comparison between the second (NPRH) and the third (CPRH) treatments, both on slatted floor houses, showed that growth of kids on cleared pastures was superior to those on caatinga pastures. Another comparison was possible between the third (CPRH) and the fourth (CPRS) treatments. In both of these, kids were maintained on cleared pastures and raised slatted floor houses, but the latter (CPRS) group received *ad libitum* supplementation of elephant grass during 4 dry months. The comparison revealed that the supplementation had a marked positive effect and the fourth group (CPRS) exhibited the best growth among the four treatments.

TABLE 2. Least-squares means of pre-weaning body weight of SRD kids under systems of feeding and housing management.

Main effects	Classification	Number of observation	Body weights (kg) at: Birth	One week	Two weeks	Four weeks	Nine weeks	Thirteen weeks	Seventeen weeks
1. Overall mean	-	250	1.754	2.242	2.805	3.833	5.997	7.597	8.796
2. Years	1978-79	149	1.834(0.035)^{a}	2.354(0.029)^{a}	3.029(0.042)^{a}	4.320(0.075)^{a}	6.707(0.132)^{a}	8.552(0.181)^{a}	9.979(0.214)^{a}
	1979-80	101	1.932(0.035)^{b}	2.131(0.031)^{b}	2.698(0.045)^{b}	3.476(0.079)^{b}	5.528(0.140)^{b}	6.874(0.192)^{b}	7.966(0.226)^{b}
3. Seasons of birth	Rainy	144	1.920(0.032)^{c}	2.305(0.028)^{c}	2.964(0.040)^{c}	4.169(0.072)^{c}	6.704(0.127)^{c}	8.417(0.174)^{c}	9.813(0.205)^{c}
	Dry	106	1.845(0.035)^{c}	2.180(0.030)^{d}	2.764(0.043)^{d}	3.626(0.076)^{d}	5.531(0.135)^{d}	7.009(0.184)^{d}	8.133(0.219)^{d}
4. Types of birth	Single	54	2.098(0.045)^{d}	2.295(0.042)^{e}	3.048(0.060)^{e}	4.236(0.107)^{e}	6.756(0.189)^{e}	8.482(0.259)^{e}	9.949(0.305)^{e}
	Multiple	196	1.667(0.024)^{e}	2.190(0.021)^{f}	2.680(0.030)^{f}	3.560(0.054)^{f}	5.480(0.095)^{f}	6.944(0.130)^{f}	7.997(0.153)^{f}
5. Sex	Male	117	1.978(0.034)^{f}	2.254(0.031)^{g}	2.912(0.054)^{g}	3.934(0.079)^{g}	6.147(0.140)^{g}	7.786(0.192)^{g}	9.116(0.226)^{g}
	Female	133	1.787(0.032)^{g}	2.232(0.027)^{g}	2.816(0.038)^{hi}	3.862(0.068)^{g}	6.088(0.120)^{g}	7.641(0.164)^{g}	8.829(0.194)^{g}
6. Treatments	NPGH*	52	1.959(0.046)^{j}	2.247(0.041)^{h}	2.896(0.059)	3.956(0.104)^{ij}	5.980(0.185)^{j}	7.509(0.253)^{xi}	8.768(0.298)^{i}
	NPRH	55	1.809(0.048)^{h}	2.241(0.039)^{h}	2.773(0.056)^{h}	3.641(0.100)^{h}	5.495(0.177)^{h}	6.899(0.243)^{xh}	7.905(0.286)^{h}
	CPRH	77	1.923(0.041)^{ij}	2.229(0.035)^{h}	2.846(0.050)^{hi}	3.878(0.089)^{hi}	6.255(0.158)^{i}	7.931(0.217)^{ij}	9.135(0.256)^{i}
	CPRS	66	1.839(0.054)^{hi}	2.253(0.037)^{h}	2.940(0.053)^{i}	4.116(0.094)^{i}	6.741(0.167)^{j}	8.514(0.229)^{k}	10.082(0.270)^{j}

*For explanation of treatments see text.

Note: (1) Figures within parentheses indicate one standard error. (2) Means with any one same superscripted letter do not differ significantly ($P > 0.05$); mean comparisons are within main effects. (3) At seventeen weeks, mean comparison for treatments, xi - xh, $P = 0.0665$.

DISCUSSION

The goats in the Northeast Brazil are primarily maintained for meat and there has been increased

TABLE 3. Analysis of variance of the pre-weaning growth of SRD kids born in multiple births under different systems of feeding and housing management.

Source of variation	df	Mean square, body weight (kg) at:						
		Birth	One week	Two weeks	Four weeks	Nine weeks	Thirteen weeks	Seventeen weeks
Year	1	0.1542	1.9509 ****	4.0572 ****	24.4569 ****	40.9185 ****	80.489 ****	131.45 ****
Season of birth	1	0.5515 **	0.7336 ****	0.9325 **	8.1891 ****	29.4660 ****	39.859 ***	65.30 ****
Sex	1	1.4032 ****	0.0014	0.5667[a]	0.2538	0.1678	1.566	4.78
Treatment	3	0.2220	0.0082	0.2363	2.0486 ****	12.3450 ****	22.361 ****	38.40 ****
Regression on dam's weight	1	4.5369 ****	0.4824 **	0.9525 **	0.6802	0.2684	5.540	20.95 **
Regression on birth weight	1	-	18.4862 ****	22.9289 ****	36.2430 ****	69.1864 ****	79.016 ****	72.14 ****
Regression on exact number of days at weighment	1	-	9.1339 ****	5.2287 ****	11.4026 ****	29.8833 ****	24.154 ****	28.92 ***
Error[b]	188							
	186	0.1053	0.0776	0.1523	0.4968	1.3843	2.601	3.68

Note: *, $P < 0.05$; **, $P < 0.025$; ***, $P < 0.01$; ****, $P < 0.005$; a, $P = 0.0553$; b, error d.f. for birth weight, 188; for other weights, 186.

TABLE 4. Least-squares means (s.e.) of pre-weaning body weights of twin kids of SRD breed of goats under different systems os feeding and housing management.

Main effects	Classification	Number of observation	Body weights (kg) at:						
			Birth	One week	Two weeks	Four weeks	Nine weeks	Thirteen weeks	Seventeen weeks
1. Overall mean	-	196	1.660	2.149	2.655	3.622	5.655	7.223	8.362
2. Years	1978-79	126	1.627(0.032)[a]	2.222(0.027)[a]	2.756(0.038)[a]	3.857(0.069)[a]	5.895(0.116)[a]	7.580(0.158)[a]	8.828(0.188)[a]
	1979-80	70	1.691(0.040)[a]	1.990(0.035)[b]	2.421(0.049)[b]	3.035(0.089)[b]	4.834(0.149)[b]	6.089(0.204)[b]	6.923(0.242)[b]
3. Seasons of birth	Rainy	114	1.716(0.032)[b]	2.173(0.028)[c]	2.665(0.040)[c]	3.671(0.072)[c]	5.792(0.120)[c]	7.331(0.165)[c]	8.510(0.196)[c]
	Dry	82	1.603(0.037)[c]	2.038(0.033)[d]	2.513(0.046)[d]	3.222(0.082)[d]	4.939(0.138)[d]	6.339(0.189)[d]	7.241(0.224)[d]
4. Sex	Male	94	1.744(0.034)[d]	2.108(0.031)[e]	2.645(0.043)[xe]	3.484(0.078)[e]	5.396(0.130)[e]	6.929(0.178)[e]	8.040(0.211)[e]
	Female	102	1.575(0.033)[e]	2.103(0.029)[e]	2.532(0.041)[xf]	3.408(0.074)[e]	5.335(0.123)[e]	6.741(0.169)[e]	7.711(0.201)[e]
5.Treatment	NPGH*	40	1.741(0.048)[g]	2.096(0.045)[gh]	2.581(.062)[gh]	3.439(0.113)[fg]	5.133(0.188)[fg]	6.508(0.257)[fg]	7.621(0.306)[xfg]
	NPRH	40	1.571(0.054)[f]	2.113(0.047)[f]	2.501(0.066)[g]	3.176(0.119)[xf]	4.786(0.199)[f]	6.031(0.272)[f]	6.752(0.324)[xf]
	CPRH	60	1.690(0.044)[fg]	2.094(0.038)f	2.594(0.053)[gh]	3.464(0.096)[xfg]	5.527(0.160)[g]	7.128(0.160)[g]	8.133(0.261)[g]
	CPRS	56	1.635(0.044)[fg]	2.120(0.038)[f]	2.680(0.053)[h]	3.707(0.096)[g]	6.016(0.161)[h]	7.671(0.220)[h]	8.996(0.262)[h]

* For explanation of treatments see text.

Note: (1) Figures within parentheses indicate one standard error; (2) means with any one same superscripted letter do not differ significantly ($P > 0.05$). Mean comparisons are within main effects; (3) probabilities of certain mean comparisons in the table are as follows: (i) at two weeks (xe - xf, $P = 0.0553$); (ii) at four weeks (xf - xfg, $P = 0.0565$); (iii) at seventeen weeks (xf - xfg, $P = 0.0524$).

emphasis on devising suitable set of management practices to improve productivity. A meeting of researchers and goat producers formulated their recommendations (Sistema de Produção para Caprinos e Ovinos 1980), but most of these recommendations are based either on the results obtained in other countries or on the experience of goat producers, and there is not much supporting evidence from scientific research carried out in the area. This study was undertaken to actually compare the performance of goats in several systems of management to reach definite and valid conclusions. The study also permitted an analysis of associated factors like years, seasons, types of birth, sex etc., that may affect the growth of kids.

The birth weight was marginally higher in the second year, difference being significant if all the kids were included in the analysis and not significant if only twins were considered. This is an expected trend as the same mothers gave birth to kids in the two years and these does must have grown and improved their pre-natal mothering ability with age. However, the difference was very small and this may be due to the fact that all does were at least in their second kidding at the begginning of the experiment. In later stages of growth, however, it was in the first year that the weights were higher, which may reflect the better condition of pastures in the first year. The grazing area may have deteriorated in the second year either due to less and erratic rainfall (Table 5) or perhaps due to higher stocking rate of animals which did not permit complete regeneration of vegetation. Continuous grazing on pastures is known to affect its botanical composition (Hendy 1975) and thereby lead to deterioration in subsequent years (Hill & Saville 1976). Significant year effects in the pre-weaning growth of lambs, grazing with their dams on similar range pastures, were also observed by Bush & Lewis (1977).

The Sertão region of Northeast Brazil has two seasons, rainy and dry, with almost constant high temperatures throughout the year. Rainy season brings a profound change in the fodder availability and consequently in the general condition of goats (Nunes & Simplicio 1980). It is, therefore, not unusual that all the weights in the present study are better for the kids born in the rainy season. Nunes & Simplicio (1980) reported that the dam's weight at parturition was better during rainy season and consequently birth weight was also higher. But at weaning the trend was reverse, indicating that the kids born during rainy season reached weaning age during dry season and so grew much slowly around weaning. On the other hand, the kids born during dry season weighed much less during the initial stages but reached their weaning age during rainy season and the surpassed their rainy season-born contemporaries. However, in the present study the kids born during rainy season were heavier at birth and continued to be heavy till weaning, thus indicating a close association between weights at birth and at weaning (Montemurro 1966, Menzies & Bassett 1968). There was a very close association between birth weight and all subsequent weights, and the corresponding values of regressions were highly significant. The dam's weight at parturition was much less important and it appeared that such an effect tended to disappear around the third week. There are two possible ways in which this can happen. Either the mismothering is too frequent or the kids start grazing much earlier in life to depend more on vegetation than on mother's milk. The regression of exact age in days at the weighing to body weights at different stages of growth indicated that this variable should

TABLE 5. The pattern of rainfall (mm) in the six months (January-June) of rainy season at Sobral, Ceará.

Years	Total rainfall in the six months	Rainfall in the first 3 months (January, February, March)	Rainfall in the last 3 months (April, May, June)	Rainfall in the last 2 months (May, June)
1979	630.5	307.5	323.0	109.8
1980	572.4	478.5	93.9	28.9

invariably be considered in the statistical analysis at least till weaning. The report of Figueiredo et al. (1980) does not show any differential effect of season on birth and weaning weights of SRD kids. Similarly, single born kids were much heavier than the twins and the magnitude of effects due to types of birth appeared to be marginally greater than that due to seasons. Similar effects have been observed in earlier communications of this Centre (Figueiredo et al. 1980, Nunes & Simplicio 1980, Simplicio et al. 1981) and elsewhere in tropical areas (Castillo et al. 1972, Gill & Dev 1972, Singh 1973, Mishra & Chawla 1976). The sex of the kids, on the other hand, was not very important on the growth in the present study and, although male kids were much heavier than females at birth, there was no sex difference during the subsequent period. In some other communications of this Centre (Figueiredo et al. 1980, Nunes & Simplicio 1980, Simplicio et al. 1981), even at birth the sex effects in SRD kids were not significant and sex differences during subsequent period were also very small. In other tropical areas, marked sex differences, favouring males, have been observed in body weight at birth and subsequently (Sacker & Trail 1966, Guha et al. 1968, Singh & Senger 1970, Castillo et al. 1972, Singh 1973).

There are very few reports on the effects of pasture modification (Empresa Brasileira de Pesquisa Agropecuária 1980, Fernandes et al. 1981, Machado et al. 1981) and virtually none on the effect of housing on the performance of goats in general and in the Northeast Brazil in particular. In the present experiment, slatted floor houses were experimented assuming that these types of floors will reduce chances of faecal contamination and thereby reduce chances of heavy intestinal worm load by repeated re-infection. Thus, if the management of these goats permitted a heavy worm load for most part of the year, slatted floor houses would show their advantage. However, in the present experiment, all the goats were periodically dewormed with broad spectrum drugs. Thus, the slatted floor houses lost their potential usefulness and, in fact, proved to be inferior to the traditional ground floor houses. The superiority ground floor housing over slatted floors has been shown in pigs (Madsen et al. 1976) and in long wool sheep (Czernek & Pilarczyk 1977) and Dattilo & Congiu (1979) have studied effect of housing on milk production. The report of Czernek & Pilarczyk (1977) is especially related to this experiment as it showed that straw bedding provided some kind of 'comfort' to the animals, and this may be the case in the present experiment.

The cleared caatinga pastures were distinctly superior to native caatinga and this shows that clearing is a better management. The stocking rate of animals was different in the two types of pastures, but it was assumed that the cleared pastures could support more animals and hence the area/animal ratio in cleared pastures was reduced. Thus, the two types of pasture enclosed an additional variable, the area per animal. However the results of this experiment have shown that the assumption may have been valid as the animals on cleared pastures did better than those on caatinga, in spite of relatively higher stocking rate. Machado et al. (1981) also found that cleared native pastures were better than caatinga and buffel grass pastures. However, it is necessary to examine such pastures, when submitted to constant stocking rate, for extended periods of time because there may be marked deterioration after a certain number of years or there may be a gradual change in the botanical composition of the vegetation. These aspects need deeper study, mostly in terms of forage preference, before these are recommended to goat producers.

During very dry lean months, the nutritional stress was apparently maximum as the goats were decreasing their body weight. Supplementation during these months of the kids on cleared pastures with green fodder in their houses further improved their growth and this showed that, in spite of available feed resources in the cleared pasture area, the kids did not express their full potential possibly due to lack of adequate nutrition. Therefore, the stocking rate may still be higher and if it can not be decreased, provision of additional roughage in the form of supplementation should be considered to optimise the productivity of SRD goats. The beneficial effects of supplementation of sheep and goat on similar range pastures have been shown by several workers (Wier & Torrel 1967, Adilov 1968, Jordon & Marten 1968, McInnes

et al. 1968, Dabadghao et al. 1976, Patnayak & Mohan 1976, Marsh & Chestnutt 1977). The results presented here can be further supplemented in future experiments by using groups of goats on cleared pastures with and without supplementation on traditional ground floor system of housing. If stocking rate is not too high, experiments should also be undertaken to compare effects of extended periods (say, 12 hours per day) of grazing.

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