Paper 10: The effects of supplementary feeding of traditionally managed Bunaji cows

E.O. Otchere
Animal Nutritionist
ILCA Subhumid Zone Programme

Abstract
Introduction
Materials and methods
Results and discussion
Conclusions
References

Abstract

The response of Bunaji cattle to supplementary feeding under pastoral conditions is described. Supplementary feeding of cows significantly improved the weights of their calves at birth and at 1 year of age compared with controls (20.1, and 107.9 kg versus 18.6 and 99.3 kg, respectively). At 365 days of age, viability of calves from supplemented dams averaged 88% versus 67% in calves from non-supplemented dams ($P<0.001$). Milk for calves and humans averaged 128 and 179 litres/cow/year ($P<0.05$). Differences between type of supplement fed were not significant ($P>0.05$). Supplementary feeding did not improve calving intervals, thus calling for a closer examination of the feeding regime.

Introduction

This paper discusses the effects of supplementary feeding of Bunaji cows on the birth weight and growth of their calves to 365 days of age. Pullan (1980) and Synge (1981) had clearly demonstrated the positive effects of such feeding under pastoral management on the Jos Plateau at sites close to ILCA's present case study areas. Synge (1981) concluded that "the increased milk production alone was not economic while the economics in terms of increased numbers of calves was staggering. Although feeding the total herd was economic at the time of study, if the price of feedstuffs were to increase markedly with respect to cattle prices the exercise may no longer be economic. However, feeding only the breeding cows a very wide profit margin, the income being seven times the outlay."

A theoretical analysis by Milligan and von Kaufmann (1979) demonstrated the inadequacy of natural forage in terms of an average Bunaji milking cow's requirements. ILCA concluded that the work of Pullan and Synge should be repeated in the subhumid zone but, in expectation of increasing shortages and rising prices of feedstuffs the feeding of agro-industrial byproducts should be introduced only as a precursor to rationing of improved forages (Papers 15 and 16), and should be directed towards the pregnant and lactating cows. The major objectives were to determine whether the pastoralist would accept the principle of rationing certain amounts to certain animals and, if he did, how the animals would respond in terms of increased productivity. The methods used were to follow the phases of livestock systems research (Paper 2) in order to ascertain the livestock owner's willingness to pay for supplementary

feedstuffs, and the extension and input requirements necessary to support a supplementary feeding scheme (Paper 19).

Materials and methods

Effects of feeding of cottonseed cake at the rate of 1 kg/cow/day or grazing of Stylosanthes fodder bank for 2.5 hours/day on the productivity of cows were studied. During the researcher-managed phase, supplementation started in November and ended in April. During the producer-managed phase, supplementation usually started in January. A 1-litre molasses-urea supplement (80 g of urea) diluted to 40 litres with water and containing 30% crude protein equivalent (as in cottonseed cake) was tried in the 1980/81 dry season only. The data analysis procedures were the same as reported in Paper 6.

The feeding trials followed the phases of livestock systems research outlined in Paper 2. In the early phases, under researcher management, there is much more control. In the later phases, under producer management, many complicating factors, such as farmers' whims and problems in extension supervision, affected the outcome (Paper 19).

Results and discussion

This section reports on the analysis of the aggregate data from both researcher-managed and producer-managed trials.

Preweaning calf growth

Table 1 shows the effect of supplementary feeding of Bunaji cows on the birth weight and growth of their calves to 365 days of age.

Table 1. Least squares means of calf body weight (kg) from birth to 365 days, ILCA case study areas, southern Kaduna State, 1979-1982[a/]

Variable	Age (days)				No. of records
	Birth	90	180	365	
Overall mean	19.4	43.6	60.2	103.6	322
Supplementation:					
No	18.6 a	42.4	56.8 a	99.3 a	218
Yes	20.1 b	44.8	63.5 b	107.9 b	104

[a/] Means within a column with differing superscripts are significantly different (P<0.05).

The birth weight of calves whose dams received supplements of any sort were significantly heavier than those from controls (P<0.05). When the supplements were partitioned, the birth weight of calves whose dams had received molasses-urea or grazed Stylosanthes fodder bank appeared significantly heavier (P<0.05) than that of calves from dams which had received cottonseed cake. These results differ markedly from those of Pleasants and Ginindza (1981), Hight (1966) and Ward (1968), who reported no improvement in the birth weight of calves from dams which were fed supplements. ILCA's results indicate the greater severity of undernutrition of cows in the present study.

At 1 year of age, the difference in weights (8.6 kg) of calves from supplemented and non-supplemented dams was still significant (P<0.05). As Table 2 shows, calves from dams fed molasses-urea had an advantage over those from dams fed other supplements, but this was not significant (P<0.05). The sample was small (14 cows) because pastoralists objected to the feeding of molasses when their animals became coated with it.

Table 2. Effect of type of supplement fed to dam on body weight (kg) of Bunaji calves.[a/]

Supplement type	Age (days)				No. of records
	Birth	90	180	365	
Cottonseed cake	18.1 a	44.7	64.2	104.0	66
Molasses-urea	21.9 b	44.3	64.9	112.2	14
Fodder bank	20.2 b	44.5	61.5	107.4	24

[a/] Means with a column with differing superscripts are significantly different (P<0.05).

The viability of calves (Table 3) from supplemented dams was significantly superior (P<0.05) to that of calves from non-supplemented dams at all ages up to 365 days. At 365 days of age, the viability of calves from supplemented dams averaged 88%, versus 67.2% in calves from non-supplemented dams (P<0.001). This dramatic reduction in calf mortality was readily acknowledged by cooperating pastoralists.

Table 3. Estimated least squares means of viability of calves from Bunaji cows fed supplements.

Variable	Age (days)					No. of records
	30	90	180	360	Mortality	
Overall mean	97.0	91.8	82.8	77.6	22.4	723
Supplementation:						
No	93.4 a	84.5 a	72.6 a	67.2 a	32.8	557
Yes	100.0 b	99.0 b	93.1 b	88.0 b	12.0	166

[a/] Means within a column with differing superscripts are significantly different (P<0.05).

Milk Yield

Table 4 shows least squares means of human milk offtake from supplemented and non-supplemented Bunaji cows. There were no significant differences (P>0.05) at any stage of the lactation up to 180 days. However, the total amount taken off supplemented dams was 9.3% higher than from the control animals. The interaction between the dry or early wet season and supplementation was significant only at 30 days after calving (P<O.05).

Table 4. Least squares means of human milk offtake (litres) to 180 days.

Variable	Days postpartum		
	90	180	No. of records
Overall mean	56.3	108.3	585
Supplementation:			
No	54.6	103.6	430
Yes	58.1	113.2	155

Table 5 shows least squares means of milk estimated to have been consumed by Bunaji calves in pastoralists' herds. The total for calves from non-supplemented dams averaged 430.3 litres or 2.4 litres per day over the 180-day period, whilst calves of supplemented dams obtained 5.6% more at 454.6 litres or 2.53 litres per day. The mean amount of milk consumed by calves from supplemented dams was significantly higher (P<0.05) only during the fourth

month after birth.

Table 5. Least squares means of estimated milk (litres) consumed by Bunaji calves.

Variable	Days postpartum		
	90	180	No. of records
Overall mean	298.1	442.3	585
Supplementation:			
No	298.0	430.3	430
Yes	298.4	454.6	155

Table 6 shows least squares means of the estimated total amount of milk produced by Bunaji cows up to 180 days after calving. That produced by cows which received supplements was 567.7 litres, only 6.4% higher than that produced by cows with no supplements.

Table 6. Least squares means of total milk (litres) produced by Bunaji cows.

Variable	Days postpartum		
	90	180	No. of records
Overall mean	354.5	550.7	585
Supplementation:			
No	352.5	533.7	430
Yes	356.5	567.7	155

Results under researcher management

The results of the two feeding trials under researcher management are summarized in Tables 7 and 8.

Table 7. Response of Bunaji cows to supplementary feeding (1979/1980).

Production trait	Control[a/]	Supplemented[a/]	Significance level
Milk offtake (ml/day ± SE) Nov 1979 - Apr 1980	424+77 (22)	750+85 (22)	P<0.01
Milk offtake during first 90 days (ml/day ± SE)	620+110 (17)	1519+150 (11)	P<0.01
Calf birth weight (kg ± SE)	18.29+1.26 (17)	22.09+0.71 (11)	n.s.[c/]
Calf weight gain during frist 90 days (kg/day ± SE)[b/]	0.19+0.02 (17)	0.23+0.03 (11)	n.s.[c/]
Total milk yield during first 90 days (ml/day ± SE)	2830+310 (17)	3880+470 (11)	n.s.[c/]

[a/] Figures in parenthesis represent number of observations.

[b/] Total milk yield = human offtake plus milk to calf. Milk to calf was calculated from calf weight gain using a liveweight gain ratio of 11.65:1 (Drewry et al, 1959).

[c/] n.s. = not significant.

Table 8. Response of Bunaji cows to supplementary feeding (1980/81).[a/]

Production trait	Control[a/]	Supplemented[a/]	Significance level

Milk offtake (ml/day ± SE) Nov 1980 - Apr 1981	341+54 (14)	636+54 (18)	P<0.01
Milk offtake during first 90 days (ml/day ± SE)	418+66 (12)	864+102 (16)	P<O.01
Calf birth weight (kg ± SE)	19.25 (12)	18.75 (16)	n.s.[c/]
Calf weight gain during first 90 days (kg/day ± SE)	0.23+0.03 (12)	0.33+0.02 (16)	P<0.01
Milk consumed by calf during first 90 days (ml/day ± SE)	2679+318 (12)	3843+276 (16)	P<0.01
Total milk yield during first 90 days (ml/day ± SE)[b/]	3096+302 (12)	4707+285 (16)	P<0.01

[a/] Figures in parenthesis represent number of observations.

[b/] Total milk yield = human milk offtake plus milk to calf. Milk to calf was calculated from calf weight gain using a liveweight gain ratio of 11.65:1 (Drewry et al, 1959).

[c/] n.s. = not significant.

The results of both trials indicate that significantly (P<0.01) more milk (about 77% in 1979/80 and 87% in 1980/81) was taken off from supplemented cows than from controls. Also, for cows to the first 90 days after calving, significantly (P<0.01) more milk (about 90% for 1979/80 and over 100% for 1980/81) was extracted from those which received cottonseed cake than from the controls. In the 1979/80 trials, there were no differences in the amount of milk consumed by the calf, nor in total milk yield during the first 90 days after calving. Whilst supplemented cows produced 37% more milk than controls, the differences were not significant (P>0.05). In the 1980/81 trials, however, the differences in milk consumed by the calf and in the total milk produced were very highly significant (P<0.01). Milk consumed by the calf and total milk produced averaged 43.4 and 52.0% higher respectively in the treatment group than in the control animals. The birth weights of calves from dams which had supplements for only 1 month before calving were not significantly different (P>0.05) from controls in either year of the experiment.

Average daily weight gains during the first 90 days postpartum of calves from supplemented dams versus control calves for 1979/80 and 1980/81 were 0.23, 0.19, 0.33 and 0.23 kg respectively. The differences in growth rate in 1979/80 were not statistically significant (P>0.05). In the 1980/81 trial, however, the differences were significant (P<0.01). Up to 90 days of age, the calves from supplemented cows grew faster by about 21% for 1979/80, but by about 43% for 1980/81 than those of control cows.

Results under producer management

Owing to the greater difficulties encountered in monitoring the producer-managed trials, and because they started more recently, it is as yet too early to report the results with any confidence. Initial indications are that under producer management, the results are similar but less marked: supplementation has little effect on calving intervals, or may even lengthen them. This 'result' may be due to producers sharing the feed with animals in the herd other than those selected for supplementation, and milking their supplemented cows over longer periods than their control animals. Increased calf survival may also be keeping more cows longer in lactational anoestrus, an effect that can be countered by early weaning and calf supplementation.

Conclusions

The main effects of supplementation are enhanced calf viability and faster calf growth. This statistically significant effect must be due to increased milk consumption, but the estimated milk consumption was not significantly different. The method for estimating milk consumed by calves therefore needs to be re-evaluated for subhumid zone conditions.

The recommended feeding regime must be amended to permit the feeding of all cows in order to break the anoestrus of non-lactating animals. It is clear from producers' responses that the extent of severe nutritional stress in individual animals had not been appreciated in the past and must be catered for. The improvement in calf viability suggests that calves should be supplemented directly, thus facilitating early weaning and possibly encouraging owners to extract more milk from their dams.

References

Drewry, K.J., Brown, C.J. and Honea, R.S. 1959. Relationship among factors associated with mothering ability in beef cattle. J. Anim. Sci. 18: 1209.

Hight, G.K. 1966. The effects of undernutrition in late pregnancy on beef cattle production. N. Z. J. Agric. Res. 9: 479-490.

Milligan, K. and von Kaufmann, R.R. 1979. Nutritional balance of the "average" Bunaji cow. Internal Communication No. 9, Mimeo, ILCA Subhumid Zone Programme, Kaduna.

Pleasants, A. B. and Ginindza, M.M. 1981. The effect of pre-calving nutrition on the productivity of beef breeding cows in Swaziland. Zimbabwe J. Agric. Res. 19: 7-12.

Pullan, N.B. 1980. Productivity of White Fulani cattle on the Jos Plateau, Nigeria, 2: Nutritional factors. Trop. Anim. Health Prod. 12: 17-24.

Synge, B. 1981. Factors limiting cattle productivity in highland areas of Nigeria. Centre for Tropical Veterinary Medicine, Easter Bush, Roslin, Midlothian, Scotland.

Ward, H.K. 1968. Supplementation of beef cows grazing on veldt Rhod. J. Agric. Res. 6: 93-101.