MILK PRODUCTION FROM THE INDIGENOUS MALAWI GOAT

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MALAWI

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5TH - 9TH APRIL 1993

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RATIONALE

It has been estimated that in some areas of Malawi, for example in Ntchisi district, the incidence of malnutrition in children under the age of 5 may be as high as 70%. The problem is particularly severe in those children who have been weaned off breast milk and who are now required to rely largely on phala (maize meal gruel). In many areas of the world milk is seen as being of special benefit to such children, providing as it does high quality protein and high levels of minerals, especially calcium, as well as energy, in a very palatable form. For some the most usual source of that milk is the cow but for many it is the goat. In excess of 60 million goats are currently being milked world wide, producing 9 million tonnes of milk annually (FAO, 1990). Many of these milking goats are to be found in Africa, especially in the Arabic-speaking countries to the north, while, despite the presence of large numbers of goats in sub-saharan Africa, the practice of milking them is uncommon in the area. Malawi is a good example of this situation.

Estimates of the number of goats in Malawi very between 1.0m (Zerfas, 1990) and 1.6m (Malawi Govt, 1988) and yet, with the exception of those on Likoma Island, and on a few localised sites on the mainland, these goats are not milked. There does not appear to be any custom or taboo prohibiting the drinking of goats milk (Chimwaza, 1982) and in a recent survey Banda (1992) showed that goats milk was acceptable to many people and was, indeed, preferred to that of the cow or the sheep.

The aim of the project reported here was therefore to examine the potential of the indigenous Malawi goat as a milk producer, when managed under a system as similar to that practiced in the villages as possible, and in particular to answer the follcwing questions:

(i) How much milk, per day and per lactation, is one doe capable of producing when milked once a day?

(ii) What effect does the removal of this milk have on the survival and growth rate of the goat kids?

(iii) Is it possible, by supplementing 'bush' grazing with maize bran (madeya) to increase milk yields economically?

MATERIALS AND METHODS

This trial was undertaken at Bunda College of Agriculture, University of Malawi, during 1991-92. In order to mimic traditional management as far as possible animals grazed unimproved grassland, largely Hypparhaenia spp., as their main forage source but during the dry season they had access to maize stover in fields and to tobacco gardens. Animals were brought in from grazing before dusk and turned out immediately after milking each morning. Housing was in a khola constructed of blue-gum poles and chain-link fencing under a galvanised-iron roof. Individual pens were approximately 4m x 4m and each housed 10-14 does and their kids. Water was available in the pens over-night. Half of the animals involved were offered a supplementary feed of one double handful (250±10g) of maize bran (madeya) daily, fed in the khola each morning before turnout. Half of the animals were also milked, once daily in the morning. These animals were removed from their kids each evening at housing and penned separately. The following morning each doe was hand milked before being rejoined with her kid(s) for the day's grazing. Milking began 25 ± 3 days after kidding and usually continued until yield fell below 50 ml/day for 3 consecutive days. Does which lost their kid(s) were removed from the trial. Thus the effective trial design was a 2 x 2 factorial with two levels of supplementation and two levels of milking.

The four treatments were:

NMNS	Not milked, no madeya
NMS	Not milked, 250g madeya daily
MNS	Milked, no madeya
MS	Milked, 250g madeya daily

Animals were blocked by week of kidding, beginning on 1 July, and allocated to treatment within block, according to litter size. Milking continued until September 1992 and a total of 50 lactations were recorded. Milk yield for each doe was measured daily and all oestruses and matings recorded. Does and kids were weighed regularly and all mortalities were noted.

RESULTS

REPRODUCTION

Kiddings in this herd took place in most months of the year. Data for the two-year period up to September 1992 are given in Table 1. Overall kidding rate was 142 live births/100 does kidding. There was no relationship between doe liveweight at kidding and numbers born, the overall correlation being 0.1.

TABLE 1 Kiddings by month

	Month	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
	Single	9	14	4	2	11	2	8	13	9	-	-	20	92
Litter size:	Twin	10	13	1	4	4	1	6	3	3	-	-	12	114
	Triplet	1	-	-	-	1	-	1	-	-	-	1	-	12
Does kidding		20	27	5	6	16	3	15	16	12	-	1	32	153
Kids born alive		32	40	6	10	22	4	23	19	15	-	3	44	218

Kid mortality averaged 33.5% of live births (Table 2). Few triplets were born but mortality was high, at 58.3%. For singles and twins it was 30.4% and 35% respectively.

TABLE 2 Kid mortality by month

	Month	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
		2	6	1		7		1	5	4				28
By month	Twin	8		2		5	1		6	3			3	40
of birth	Triplet					3		3						
By month	of death	2	5	5	8	13	4	7	12	2	7	7	5	75

The majority of deaths took place within the first 30 days after birth, that is, before hand milking had begun, and were spread throughout the year with no significant time-of-year effect. Treatment of dam had no effect on kid mortality. Numbers dying were 33 from milked does vs 43 from unmilked and 33 from madeya-supplemented does vs 42 for unsupplemented.

In the does, post-partum anoestrus was very variable, ranging from 22 to 214 days. There was a trend for longer anoestrus in milked goats (110±57 days) than in unmilked (80±52 days) but the differences were not significant. There was also a tendency for does kidding in the dry season to have longer anoestrus than those kidding in the rains. Level of supplementation had no effect on anoestrus period.

MILK PRODUCTION

Milk production was extremely variable with yields ranging from 1.5 to 61 litres. Does producing these very low yields generally produced very little each day, often less than 50 ml, so that effectively they never reached the bottom yield limit and the decision was taken to stop milking them. Lactation length was thus also extremely variable, ranging from 13 days for the very low yielders to 252 days for the better animals. Lactation details are given in Tables 3 and 4 and illustrated in Figures 1 and 2.

TABLE 3 Mean milk yield data (l)

		Supplement (n = 20)	Control (n = 20)
Yield by month of kidding	August	31.6 ± 7.5	21.2 ± 13.6
	September	17.7 ± 12.0	15.6 ± 10.9
	February/March	17.7 ± 7.5	9. + 5.7
Yield by lactation period	Weeks 1-10	3.4 ± 5.0	11 ± 5.7
	Weeks 1-20	19.4 ± 9.4	14.5 ± 9.6
	Overall	21.2 ± 13.2	15.0 ± 11.0
Mean lactation length (days) (to < 50ml/day)		19 ± 54	90 ± 47

Patterns of lactation were not different between treatments with peak yield from supplemented animals reaching 270±99ml at 26 days from commencement of milking (range 140-500ml) while equivalent figures for unsupplemented does were 259±99ml at 19 days (range 80-450ml). Milk yields overall were not significantly affected by treatment although supplemented animals produced more than controls. Supplemented does milked for longer than unsupplemented animals (147±54 days vs 117±47 days) and this difference was responsible for much of the lactation yield increase. Month-of-kidding effect was also insignificant until February/March. For those animals kidding late lactation was largely after the end of the rainy season. Supplementation of these animals led to higher yields and greater persistency with the supplemented animals producing significantly more milk (17.7±0.71 vs 9.1±1.51, $p<0.05$). There were no significant relationships between doe liveweight at kidding and subsequent milk yield. The correlation coefficients were 0.42 for supplemented animals and 0.33 for controls. The overall linear regression equation was $y = -18+571w$ ($R^2 = 10.6\%$).

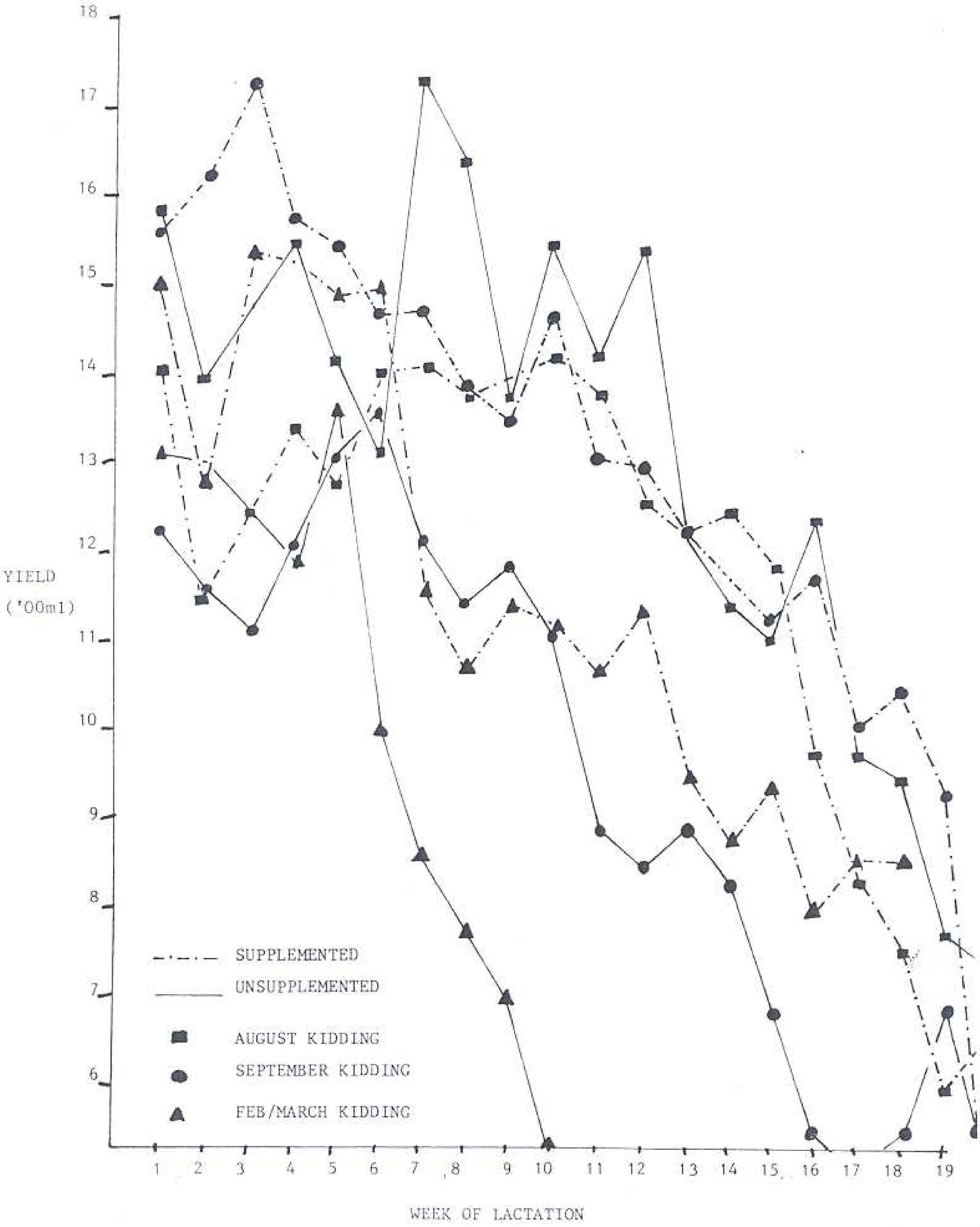
Where does are being milked for production then milking continues for the length of the lactation. From an experimental point of view milking until dry-off is time-consuming and expensive. Using the data available, regression equations were derived relating total lactation yield to yield/day at peak (yp). The correlations for these data were 0.655 for supplemented does and 0.833 for controls. The corresponding regression equations are given in Table 5.

TABLE 4

MEAN WEEKLY YIELD BY MONTH OF KIDDING (ml)

	SUPPLEMENTED			UNSUPPLEMENTED		
WEEK	AUGUST	SEPTEMBER	FEB/MARCH	AUGUST	SEPTEMBER	FEB/MARCH
1	1406±264	1564±539	1502±	1586±562	1393±562	1312±581
2	1148±162	1619±528	1276±483	1394±484	1158±381	1298±484
3	1250±111	1727±629	1538±390	1472±484	1109±361	1251±580
4	1338±155	1572±511	1526±401	1551±618	1200±519	1192±620
5	1274±54	1543±587	1491±415	1417±361	1313±719	1118±680
6	1397±267	1465±566	1500±462	1309±584	1360±619	996±432
7	1407±470	1474±654	1157±378	1735±645	1213±486	867±601
8	1377±459	1387±752	1065±300	1643±516	1144±422	782±431
9	1425±487	1351±573	1137±362	1376±468	1189±540	698±321
10	1425±487	1466±684	1122±338	1548±642	1108±497	533±179
11	1387±502	1307±650	1066±329	1418±642	895±350	411±276
12	1262±588	1302±707	1135±284	1550±731	849±441	
13	1227±581	1226±781	950±225	1213±559	896±375	
14	1252±616	1176±807	876±249	1152±618	829±320	
15	1189±617	1123±847	944±146	1111±667	690±173	
16	980±546	1177±863	805±157	1244±461	549±225	
17	832±501	1010±720	-	985±523	499±265	
18	760±302	1045±764	-	951±315	546±195	
19	601±193	932±588	-	775±293	688±140	
20	664±201	542±576	-	739±285	517± 24	

Fig 1 YIELD BY MONTH OF KIDDING AND WEEK OF LACTATION



ig 2 OVERAL MILK YIELD 5' WEEK OF LACTATION

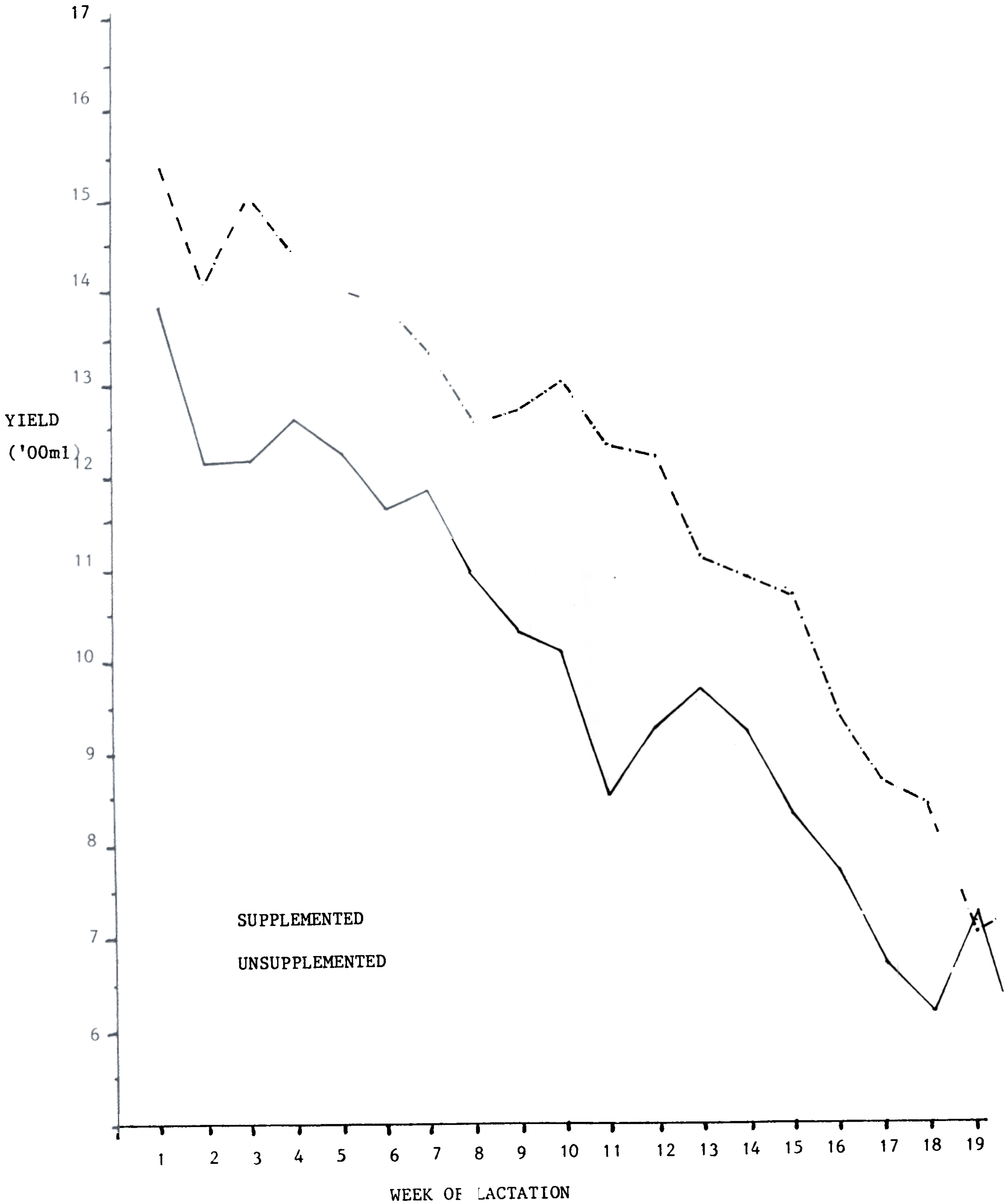


TABLE 5 REGRESSION OF TOTAL YIELD (y) ON YIELD/DAY AT PEAK (yp)

	REGRESSION	R^2	p
Supplement:	y = -11438 + 106yp	42.9	0.002
Control	y = -10388 + 92.8yp	69.3	0.001
Overall	y = -11456 + 101yp	56.8	0.001

Whilst these regressions were clearly significant and indicate that peak yield may be used to predict overall performance, in practice this might prove difficult since day-to-day variations in yield, often ± 50ml, make identification of 'peak'difficult. A more satisfactory method would be to take a specific end point, say day 70 of lactation (y70).

Regressions based on this figure are given in Table 6.

TABLE 6

REGRESSION OF TOTAL LACTATION (y) ON YIELD TO 70 DAYS OF LACTATION (y70)

	REGRESSION	R^2	p
Supplement	y = -2680 + .83 y70	42.8	0.001
Control	y = -7925 + 2.03y70	80.2	0.001
Overall:	y = -5096 + 1.93y70	55.	0.001

When these predictions are compared with those based upon peak daily yield it can be seen that for the supplemented animals, and overall, the figures are similar. For the unsupplemented animals the fit is even better, which may be explained by the shorter lactation length of these animals leading to a y70 closer to final lactation total.

KID GROWTH

Treatment of does had no effect on kid performance. As has been already noted, mortality rates were not affected. The liveweights of kids, by age and treatment, are given in Table 7. The kids from supplemented does were consistently heavier than those of unsupplemented animals and those from unmilked animals heavier than those from milked ones but none of these differences was significant.

TABLE 7

WEIGHTS OF KIDS BORN IN YEAR 1991-92 BY AGE AND TREATMENT GROUP (KG +SE)

	TREATMENT			
	NON MILKED		MILKED	
AGE (WKS)	NON SUPPLEMENT	SUPPLEMENT	NON SUPPLEMENT	SUPPLEMENT
Birth	1.88 ± 0.125	1.88 ± 0.08	1.78 ± 0.07	2.00 ± 0.11
4	3.00 ± 0.102	3.14 ± 0.09	3.06 ± 0.03	3.18 ± 0.24
8	3.42 ± 0.46	3.60 ± 0.19	3.17 ± 0.11	3.59 ± 0.20
12	4.17 ± 0.36	4.50 ± 0.79	3.96 ± 0.18	4.32 ± 0.29
16	4.83 ± 0.22	5.19 ± 0.65	4.55 ± 0.27	5.05 ± 0.29
20	5.58 ± 0.46	5.88 ± 0.59	5.25 ± 0.37	5.73 ± 0.36
24	6.25 ± 0.76	6.56 ± 0.58	5.88 ± 0.52	6.39 ± 0.42
28	7.25 ± 0.87	7.63 ± 0.55	6.75 ± 0.66	7.33 ± 0.60
52	14.00 ± .73	13.67 ± 3.76	13.25 ± .03	15.67 ± 0.88

DISCUSSION

The performance of goats in this trial was similar in all respects to that reported elsewhere. In terms of reproduction, overall kidding rate was higher than the 109% reported by Reynolds (1979) and the 103% of Karua (1988). Kid growth rates, thought somewhat disappointing, were in line with the 42g/day reported by Zerfas and Stotz (1987) and the 47g/day of Karua, despite the amounts of milk removed. The quality of milk from the Malawi goat is high. Banda (1992) reports an analysis of 5.3% Protein, 6.7% Butterfat and 4.7% Lactose, figures similar to those found in the W. African Dwarf goat (Akinsonyu et al., 1977) and the S African Boer (Raats et al., 1983) but significantly higher than that of 'Exotic' milking goats. 200ml of this milk would thus provide 10.5g high quality protein, 13.5g fat and 250mg calcium. Such amounts would go a long way towards improving the diet of children drinking this milk and the nutritive value would not be impaired by the boiling which would be necessary before it was used. [It should, however, be noted that the overall mineral composition of goats' milk is such that it is unsuitable for children below one year of age.]

CONCLUSIONS

It is concluded that:

(i) While yields vary considerably it is possible, with minor modifications to traditional husbandry practices, and at little cost, to produce usable mounts of milk from the indigenous Malawi goat

Removing this milk does not have any adverse effects on the doe or her offspring

The milk so obtained is capable of contributing significantly to the diets of children under 5 in the households in which the goats are kept

ACKNOWLEDGEMENTS

The help and encouragement of the Principal and all the staff at Bunda College is gratefully acknowledged.

This work was funded by the Natural Resources Institute of the UK Overseas Development Administration.

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