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PROFITABILITY OF REPLACING MILK WITH A CONCENTRATE FOR CALVES OF COWS REQUIRING CALF AT FOOT FOR MILKING

B. OUOLOGUEM[1], ALICE A. REESE[2], B. TRAORÉ[1] and S. K. DEBRAH[3]

International Livestock Centre for Africa, BP 60, Bamako, Mali

SUMMARY

During a 90-d study in Mali, West Africa, 18 zebu and zebu by Montbeliard calves, age 50 ± 23 d (youngest pair 3 weeks), weighing 30 ± 7 kg, under farmer management, were used to test the profitability of replacing suckled milk by a maize-groundnut cake-rice bran concentrate fed dry. During the first 45 d period there were no differences in responses of calves receiving concentrate (E) and calves suckling according to the traditional strategy (C). During the second 45 d period, milk offtake was greater for E calves, 2·34 vs. 1·77 l/d; milk suckled was less for E calves, 0·39 vs. 0·95 l/d; and average daily gain was greater for E calves, 442 vs. 139 g/d. Average concentrate consumption was 0·74 kg/d. Concentrate was compounded of locally available byproducts and cost 85 francs/kg. Considering milk sold as the only benefit, net return to unit feed cost for E calves was 1·24 and for C calves 0·81. Adding the value of the weight gain, E calves gave a 1·61 return and C calves gave a 0·98 return.

INTRODUCTION

Local breeds of dairy cattle in tropical countries often cannot be milked without the calf at foot (Diakite, 1976). In Mali calves subsist on milk that herdsmen leave for them after milking for human consumption. This is usually about half of the milk produced, or 0·5 to 3·0 l/d (Bocoum and Coulibaly, 1984; Coulibaly and Sogoba, 1990). There is no difference in total production whether calves suckle *ad libitum* or milk is partitioned between herdsman and calf (Bocoum and Coulibaly, 1984). Usually milk is the sole feed available to the calf for the first 3 months of life; thereafter, in addition to suckling milk, they graze natural pasture during the day. In Bamako, where the producer price for milk is relatively high (210 francs/l; a West African franc is an FCFA; 300 FCFA = 1 US$) and milk production is low, the interests of the producer tend to overshadow the needs of the calf. When calves are undernourished, calf mortality rates increase, and if the calf dies, milk production ceases, a double loss for the livestock producer. In commercial dairy firms owners demand the herdsmen to take the maximum amount of milk possible, but herdsmen must be careful not to jeopardise the life of the calf. When supplementary food is not given, the calf grows slowly, maturing late. The longterm effects for heifer calves destined to be herd replacements, is a reduction in the number of lactations with less lifetime output of both calves and milk.

The problem is to assure an adequate growth rate for the calf at a reasonable cost.

[1] Present address: SRZ de Sotuba, BP 262, Bamako, Mali.
[2] Address for reprints: Department of Animal Science, 310 Agriculture/Forestry Bldg, University of Alberta, Edmonton, Alberta, Canada T6G 2P5.
[3] Present address: ICRISAT, Bamako, Mali.

Calves do not have a fully functional rumen until about 3 months of age. If milk is not available for young calves, a liquid milk replacer can be fed. However, powdered milk is expensive in Mali (milk replacer should be about one-half the producer price of milk; Campbell and Marshall, 1975). Liquids are difficult to handle, and milk replacers readily spoil in hot weather.

An altenative is to stimulate rumen development so that early weaning can occur, a common practice in countries where dairy production is well developed. Vermorel *et al.* (1980) weaned Holstein calves at 10 weeks of age to a 40% maize, 60% prairie grass hay, pelleted feed. No differences in weight gain were seen between early weaned calves and calves continuing to receive milk. Kouame *et al.* (1984) weaned black and white calves to a barley-urea based diet at 6 weeks of age, but found that calves were energy deficient during the 2 weeks preceeding and the week following weaning. They found that adding groundnut cake increased weight gain from 460 to 668 g/d. Morrill (1984) described experiments for successfully weaning Holstein calves at 2 weeks of age using a prestarter of milk products fed dry to ease the transition to a calf starter based on lucerne, maize and oats.

At the Centre de Récherche Zootechnique (CRZ) at Sotuba in Mali, Doumbia *et al.* (1976) carried out a 9 week experiment to study the effect of the gradual introduction of dry feeds to European-by-local calves, 7 to 50 d old, that were being bucket fed milk. Three concentrate formulations based on sorghum, cassava and groundnut cake were used. Calf concentrate consumption averaged 0·5 kg/d, reaching a maximum of 1·1 kg/d in the final week. Calves gained well on all of the diets, averaging 500 g/d.

A different strategy was required of Diakité (1976) working at the Station d'Elevage et de Récherche Zootechnique du Sahel (SERZ/S) at Niono in Mali, where zebu cows require the calf at foot for milking. Eight purebred zebu maure and zebu peul calves, aged 10 ± 9·7 d and weighing 26 ± 4·6 kg, were divided into 2 groups. One group received decreasing amounts of milk together with a sorghum-cassava-groundnut cake-rice bran concentrate, fed dry, that had previously been tested in calf trials at CRZ Sotuba. The control group followed the traditional milking system and received no concentrate. The group receiving concentrate grew better than the control group during the 12 week experiment, 438 vs. 357 g/d.

In order to justify making a recommendation to producers, it was decided to carry out an on-farm trial to examine the profitability of replacing milk for young calves with a balanced concentrate, fed dry, while maintaining the calf at foot for milking.

MATERIALS AND METHODS

The trial was carried out on a private dairy farm in Missabougou, a village in the suburbs of Bamako. Except for the individual feeding of concentrate to calves in the experiment group, the daily individual measuring of milk offtake for cows of calves in both groups, and the weekly weighing of calves in both groups, management of the animals was carried out according to the livestock producer's usual routine.

Eighteen calves, including 9 F_1 Montbeliard by zebu maure (MT × ZM) all with the same sire, 7 zebu maure with $\frac{1}{8}$ Rouge de Steppe blood (ZM) all with the same sire, and 2 zebu peul (ZP) with unknown sires, were used for the 90 d trial. Calves were pair-selected, age was 50 ± 26 d, the youngest pair being 3 weeks of age. Calves weighed 30 ± 7 kg. Daily milk production of cows ranged from 1·4 to 7·3 l/d. We attempted to balance the 2 groups for breed, sex, weight and age of calf, lactation

TABLE I

Characteristics used for pair selecting calves

Lot	Trt	Sex	Age, d	Weight, kg	% European	Parity, no.	Milk, l/d
1	C	F	83	32·2	12·5	>1	3·9
1	E	M	80	38·6	12·5	>1	7·3
2	C	F	27	35·0	50	>1	3·6
2	E	F	46	31·6	50	>1	5·4
3	C	F	40	28·4	50	>1	3·7
3	E	F	58	32·0	50	>1	1·5
4	C	M	82	35·4	50	>1	2·7
4	E	M	20	34·6	50	>1	5·9
5	C	F	70	40·4	50	>1	4·0
5	E	F	55	30·2	50	>1	1·8
6	C	M	43	30·2	0	>1	3·4
6	E	M	56	23·6	12·5	>1	1·4
7	C	M	40	25·2	12·5	1	3·4
7	E	F	24	24·0	12·5	1	2·5
8	C	M	50	29·0	75	1	4·3
8	E	F	101	33·6	12·5	1	2·1
9	C	F	16	16·8	25	1	1·8
9	E	F	23	19·0	0	1	2·6
	C	Mean	50	30·3			3·4
		s.d.	24	6·8			0·8
	E	Mean	51	29·7			3·4
		s.d.	27	6·2			2·2

Trt = treatment, C = control, E = experiment, F = female, M = male, Milk = milk production of calf's mother.

number (first lactation or not first lactation), and milk production of the mother of the calf (Table I). Two other calves, one a Montbeliard by zebu peul (MT × ZP), the other a zebu maure with $\frac{1}{8}$ Rouge de Steppe blood (ZM), were added to the experiment group at 3 weeks of age in order to determine the age at which calves would start to eat a dry feed.

Calves were vaccinated against anthrax (Anthrovac, Laboratoire Central Vétérinaire, Mali), dosed with an anthelmintic, morantel tartrate (Exhelm II, Pfizer, France), and treated for external parasites with cyflutrin (Bayticol, Bayer, Germany) at the beginning of the trial.

Calves were separated by treatment group and continuously confined in adjacent pens except during the morning and afternoon milkings. At milking time they were released and allowed to suckle for one minute in order to stimulate milk letdown. They were then tied to the front foot of the cow while the herdsman milked. When the herdsman had finished, he released the calf and allowed it to suckle the remaining milk.

Control calves (C) followed the traditional practice described above. Experiment calves (E) followed a similar schedule, but a different feeding strategy was used. They received a concentrate composed of byproduct feeds that are available from local markets. Of the feed components, only the vitamin-mineral mix (Biacalcium, Biara, France) is not produced in Mali. Calves in the E group were individually fed the maize-groundnut cake-rice bran concentrate during the day (Table II). Concentrate was fed dry. Habituating to dry feed was accomplished by putting the calf's nose in the dry feed causing it to be licked clean. This approach appeared to work

TABLE II

Composition and cost of concentrate (per kg DM except where indicated)

Diet component	As fed g/kg	DM %	CP g/kg	ME MJ/kg	Ca g/kg	P g/kg	Cost as fed FCFA/kg
Maize	500	94	90	14·11	0·4	3·5	65
Groundnut cake	230	92	422	13·06	1·8	6·6	50
Rice bran	200	91	75	10·67	0·7	15·0	45
Meat & bone meal	60	94	585	7·62	96·0	46·0	115
NaCl	7	99	0	0	0	0	100
Biacalcium[1]	3	99	0	0	170·0	100·0	1900
Concentrate	1000	93	192	12·65	7·0	9·3	85[2]

[1] Additional components per kg: Vit. A 2·5 million IU, Vit. D3 800, 000 IU. Vit. E 150 IU, Vit. K3 100 IU, Fe, Cu, Zn, Mn (oligomineral concentrations not given), betaine 25 g, methionine 20 g, choline 25 g.
[2] Includes 19 FCFA/kg mixing and transport costs.
FCFA = Franc (West African).

well. Both groups were allowed *ad libitum* access to straw, water, and mineral blocks (NaCl 41·7%, P 11%, Ca 9%, Mg 1·2%, Fe 1%, Co 100 mg/kg, I 200 mg/kg, Mn 1,200 mg/kg, Cu 450 mg/kg, Vit. A 140,000 IU/kg, Vit. D3 28,000 IU/kg, Vit. E 50 IU/kg). The E group did not have access to water and straw during the time that concentrate was offered. To stimulate rumen development, calves were offered rice straw (3·6%CP) for the first 7 weeks and thereafter bush hay, mainly *Schoenfeldia gracilis* (2·8% CP).

Calves were tied and offered concentrate from 09.00 to 12.00 h, released for 2 hours to drink water and eat straw, then retied and offered concentrate again from 14.00 until 16.00 h (Table III). Supplement was always offered in excess of the calves' ability to consume it. Feed was weighed in the morning and distributed. If little remained, additional supplement was weighed and added for the afternoon feeding. Concentrate refusals were weighed after the afternoon feeding and given to cattle not participating in the study. After the evening milking calves were separated from their mothers and remained unattached in their pens with access to straw, minerals and water until milking time the following morning. In the morning straw refusals were weighed and discarded, and fresh straw weighed and distributed. Individual calf straw intake was calculated as the proportion of the pen intake equivalent to the individual calf weight as a proportion of the pen weight.

TABLE III

Daily schedule for control (C) and experiment (E) calves

Time	Trt	Activity
07.00–09.00	C&E	Calf used to stimulate milk letdown.
	C&E	Cow milked by herdsman.
	C&E	Milk remaining suckled by calf.
09.00–16.00	C	Water and straw offered to treatment group.
09.00–12.00	E	Concentrate offered individually.
12.00–14.00	E	Water and straw offered to treatment group.
14.00–16.00	E	Concentrate offered individually.
16.00–18.00	C&E	Calf used to stimulate milk letdown.
	C&E	Cow milked by herdsman.
	C&E	Milk remaining suckled by calf.
17.00–07.00	C&E	Water and straw offered to treatment group.

Trt = treatment.

Herdsmen were encouraged to strip milk from cows of calves receiving concentrate. Milk offtake was measured daily with a 5-kg spring balance (Salter, England). Calves were weighed before and after milking one evening and the following morning once per week to determine milk taken by the calf. These data were not collected one week because there was not enough staff. Calves were weighed with a 50 kg Salter spring balance using a sling made from plastic sacks.

Cows were fed according to the farmer's usual regime. They were grazed on natural pastures from 08.00 to 16.00 h, and group fed an evening supplement of cottonseed cake averaging 2 kg per head.

Feed components were dried in a forced air oven at 100°C until a constant weight was reached. Crude protein was determined by multiplying nitrogen values obtained from microkjeldahl (Parnas, Prolabo, France) determinations by 6·25. Metabolisable energy, calcium and phosphorus values were taken from Andrieu, Demarquilly and Sauvant (1989).

Statistical differences were determined using NCSS v.5, 1990 (a statistical percentage developed by NCSS, Kaysville, USA). Responses measured were milk offtake, milk intake and average daily gain. The 90 d experiment was divided into 2, 45 d periods. Main effects were treatment and period. Total milk production of cows was used as a continuous covariate. Responses presented in tables and figures are unadjusted values.

Net benefit was calculated as benefit(s) divided by total cost minus one.

RESULTS

In the first 45 d period there were no treatment differences in milk sold (offtake), amount of milk suckled by the calf (intake), or calf weight gain (Tables IV and V). By the end of this period, however, there were obvious differences between the 2 calf groups. Herdsmen commented on the fact that calves being fed concentrate were noticeably glossier and friskier. A few E calves had diarrhoea for 2 or 3 days

TABLE IV

Average unadjusted milk production of dams of study calves (l/d)

	Experiment			Control		
Week	Offtake	Intake	Total milk	Offtake	Intake	Total milk
1	2·50	1·80	4·30	1·99	1·21	3·20
2	2·53	1·49	4·02	1·99	1·09	3·08
3	2·61	1·37	3·98	2·13	1·68	3·81
4	2·50	1·08	3·58	2·13	1·36	3·48
5	2·37	0·91	3·28	1·87	0·82	2·69
6	2·17	n.a.	n.a.	1·75	n.a.	n.a.
7	2·23	0·41	2·64	1·64	0·79	2·43
8	2·38	0·82	3·20	1·82	0·83	2·66
9	2·29	0·24	2·54	1·84	0·58	2·42
10	2·26	0·32	2·58	1·88	1·11	2·99
11	2·37	0·19	2·56	1·93	0·72	2·66
12	2·37	0·40	2·77	1·93	1·29	3·22
Mean	2·38	0·82	3·22	1·91	1·04	2·97
s.d.	0·13	0·53	0·63	0·14	0·31	0·42

n.a. = not available.

TABLE V

Average unadjusted weight gain of calves (g/d)

Week	Experiment	Control
1	166	165
2	208	242
3	231	186
4	282	247
5	382	255
6	507	244
7	363	104
8	395	43
9	439	81
10	481	102
11	560	201
12	443	269
Mean	371	178
s.d.	125	78

in the third and fourth weeks of the trial. Diarrhoea occurs when there is a dietary shift away from milk sugars (Doumbia *et al.*, 1976; Morril, 1984).

In the first 45 d period there was no difference in milk offtake, 95 litres for cows of the C calves and 102 litres for cows of the E calves ($P > 0{\cdot}05$; Fig. 1). However, during the second 45 d period, less milk was sold from cows with calves surviving on milk alone than from cows of calves receiving concentrate, 80 vs. 105 litres ($P < 0.01$).

Although there was no difference in the amount of milk suckled by the calves in the first period, 49 vs. 42 litres for the C and E groups, respectively, there were differences in the second period, 43 vs. 18 litres ($P < 0{\cdot}01$).

Calves consumed an average of 66 kg of concentrate during the 90 d study. Average

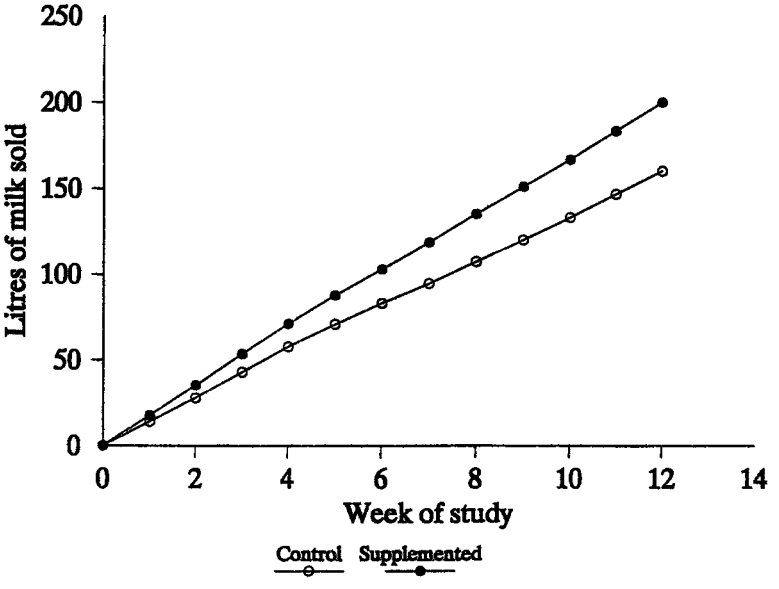

FIG. 1. Effect of calf supplementation on average cumulative milk sales per cow.

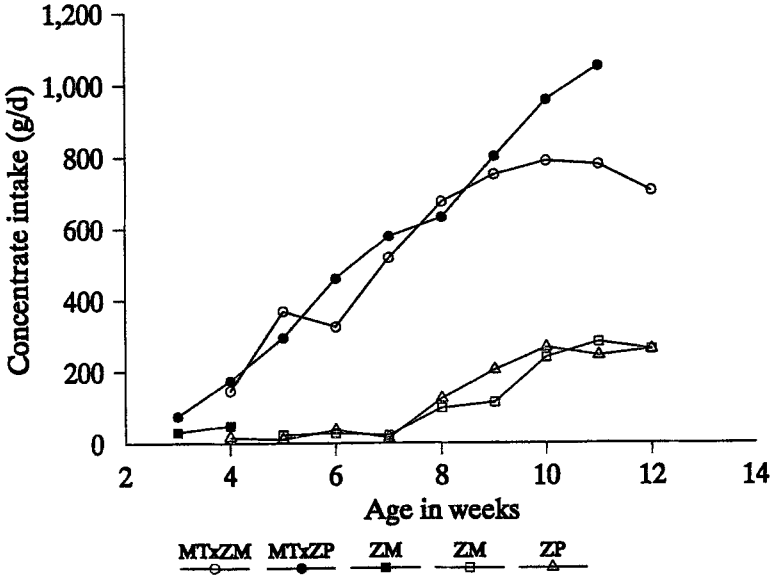

FIG. 2. Individual concentrate intake of 5 calves. MT × ZM = Montbeliard × zebu maure, MT × ZP = Montbeliard × zebu peul, ZM = zebu maure with $\frac{1}{8}$ Rouge de Steppe blood, ZP = zebu peul.

consumption was 0·74 kg/d; 0·20 kg/d in the first week and 1·4 kg/d the last week. There were marked differences in age at which calves began eating concentrate. Five experiment calves started the study between ages 3 and 4 weeks. F_1 Montbeliards began eating concentrate immediately (Fig. 2). Purebred or nearly purebred zebus did not begin eating more than 0·1 kg/d until they were 8 weeks of age. Level-

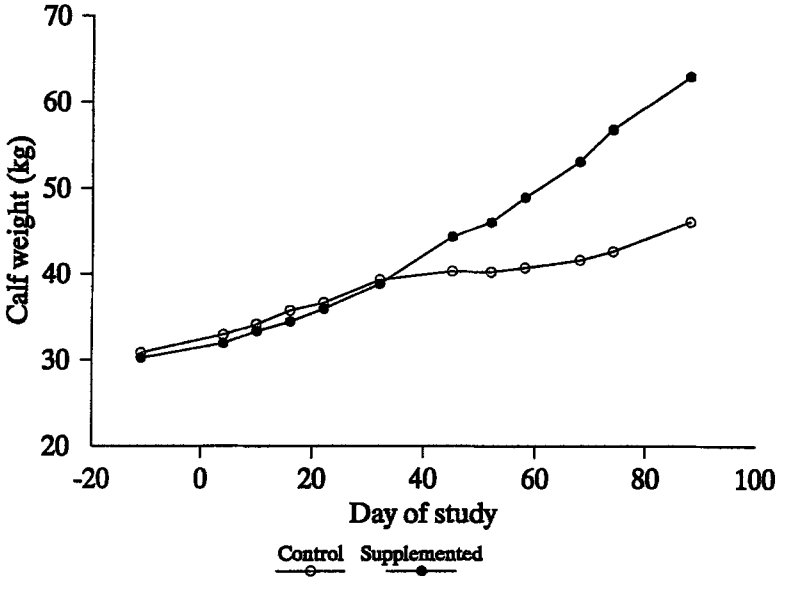

FIG. 3. Effect of calf supplementation on weight gain. Supplementation starts on day 0.

ling-off of intake curves at relatively low values is indicative of the unfamiliarity of this strategy and the reluctance of attendants to feed more because of fear of digestive problems. Straw was eaten readily by both groups. The C group ate more straw than the E group, 41 kg during the 90 d period, (0·5 kg/d) versus 24 kg (0·3 kg/d).

There was no difference in calf gain during the first 45 d period, 11 vs. 14 kg for the C vs. E groups, respectively. However, during the second period the effects of herdsman–calf competition for milk were showing, and C calves gained only 6 kg while E calves gained 20 kg (Fig. 3).

Calves were 3 breed types: MT × ZM, ZM and ZP. There were no breed differences in weight gain response to the traditional feeding strategy, 195, 174 and 162 g/d, respectively ($P > 0·05$), but there was a breed effect in the group being fed concentrate. Average gains were 481, 438 and 145 g/d for the MT ×\ZN, ZM and ZP, respectively ($P < 0·05$).

Economic analysis

Partial budgets were done to evaluate relative profitability of the 2 different calf feeding strategies (Table VI). Value of milk was set at 210 FCFA/l, the price paid to producers by Union Laitiere du Mali, the only milk processing plant in Bamako. The 73 kg of concentrate fed included 10% losses during handling. Both milk consumed and straw intake were higher for C calves. Since the 2 groups of calves differed only in terms of feeds consumed (management remained constant), partial budget considers only the costs and benefits of the different feeding strategies. The direct costs associated with concentrate feeding are the costs of the feed components, the purchase of miscellaneous equipment associated with feeding, i.e. calf ropes and buckets or feed bins, and labour for feeding. Cost of feed equipment is minimal, and additional labour requirements (about one hour per day) can be met by the existing labour force in most herds in suburban Bamako (unpub. observations). These expenses were not included in the economic analysis.

TABLE VI

Per calf costs and benefits associated with feeding concentrate for 90 days

	Experiment		Control	
	Amount, kg	FCFA	Amount, kg	FCFA
Cost				
Concentrate (85 FCFA/kg)	73	6205	0	0
Milk consumed (210 FCFA/kg)	60	12600	92	19320
Straw (25 FCFA/kg)	24	600	41	1025
Total feed cost		19405		20345
Benefit				
Milk sold (210 FCFA/kg)	207	43470	175	36750
Weight gain (210 FCFA/kg)[1]	34	7140	17	3570
Total benefit		50610		40320
Net return on unit feed cost				
On milk sold only		1·24		0·81
On milk sold + weight gain		1·61		0·98

[1] One kg gain is assumed to have the same value as a litre of milk.
FCFA = Franc (West African).

Consumption of concentrate was accompanied by a reduction of milk intake. C calves consumed 32 litres of milk more than E calves, costing the producer 6,720 FCFA. Factoring in milk at 210 FCFA/l, total feed costs for C calves were 5% higher than for E calves.

If we assume that the farmer is only interested in the short term, then milk sales are his primary return. An additional 32 litres of milk were sold from cows of calves being fed concentrate. Net return to unit feed cost from milk sold was 1·24 for concentrate fed calves and 0·81 for C calves. It should be kept in mind that a number of other costs must be met from sales, including herding and health costs, as well as capital investments.

This profitability analysis does not include the benefits derived from heavier calves resulting from concentrate feeding. Calves receiving concentrate gained twice as much weight as milk fed calves, 34 vs. 17 kg. Assuming a kilogram of weight to be equal in value to a litre of milk, net return to unit feed cost is 1·61 for E calves and 0·98 for C calves.

DISCUSSION

Milk production is not high in either village or commercial milk producing systems in the area surrounding Bamako. Average total production is 2·6 and 3·8 l/d for village and commercial systems, respectively (Reese *et al.*, 1990). The production is less than that of cows in northern Mali, 5·5 l/d (Coulibaly and Sogoba, 1990) and beef breeds in the USA, 5·3 to 6·2 l/d (McCarter *et al.*, 1991). In both of the aforementioned Malian systems milk is divided between producer and calf. If all of the milk is given to the calf, gains are between 400 and 500 g/d (Diakite, 1976; Bocoum and Coulibaly, 1984; Coulibaly and Sogoba, 1990).

There is tremendous pressure on the land around Bamako. As the population increases, construction encroaches on land traditionally used for grazing, and larger areas are needed for food crops. Profitable milk production is dependent on large quantities of good quality forage. As the land surrounding Bamako is developed, less grazing land is available, and more of the better areas are being used for crops. Even access to rivers for drinking water for cattle is limited or blocked because of cultivation along river banks.

Rainfall in the Bamako area is adequate to support good pastures (800 to 1,100 mm/yr), but rain is limited to a 4 month period, mid-June to mid-October. Crop residues extend the period of adequate feed through January. Starting in February and extending through the hot, dry season, March to June, forage is insufficient and unsupplemented cattle lose weight.

Malians traditionally drink milk. The demand for milk, especially fresh milk, is high and prices are good. Since local cattle have been selected for milk production and husbandry of dairy cattle is traditional, the government's goal of self sufficiency in milk production appears to be consistent with Mali's resources.

The situation in the herd described in the present investigation with cows in early lactation producing an average of 3·0 l/d of milk which is partitioned between producer and calf, is not atypical for Bamako. In the drier areas of the north, where competition for grazing land is less, milk production is higher. At the Station d'Elevage et de Récherche Zootechnique du Sahel (SERZ/S) in Niono, Coulibaly and Sogoba (1990), using unsupplemented zebu maure and zebu peul calves, found that herdsmen normally took 2·7 l/d of milk during the first 3 months of lactation, leaving 2·8 l/d for the calf.

There is little potential for profit if a large proportion of limited resources, such as money and labour, is required simply to maintain a herd. Similarly, profits are low if feed resources are used disproportionately for maintenance requirements of a cow with little remaining for increasing her milk production.

Previous experiments with calf feeding in Mali have been more concerned with weight and health of the calf than an increase in the milk offtake. Diakite (1976) found that zebu calves refused concentrate at 2 weeks of age, ate small amounts at 3 weeks of age (20 g/d), but by age 3 months were consuming an average of 1·2 kg/d. This is slightly lower than our results, 0·2 kg/d the first week of the experiment and 1·4 kg/d the last week, but our animals were somewhat older and half were F_1s.

In previous experiments when milk offtake was measured, differences were not significant. For instance Diakite (1976) found that milk offtake was only slightly increased, 2·5 vs. 2·1 l/d, for cows of calves being fed concentrate vs. cows of calves subsisting on milk alone. The difference between the 2 sets of results could be due to our close cooperation with the herdsmen. Since determination of profitability is not ordinarily among the objectives, active solicitation of the cooperation of the milkers may not have been sought in previous studies.

Because economic analyses have not commonly been carried out on calf feeding experiments in Mali, the lower cost of the concentrate feeding strategy was a surprise. Our initial goals had been to sell enough additional milk to pay for the concentrate, while maintaining weight gains of the experimental group similar to the control group.

The average gain of calves on the traditional treatment, 190 g/d, was less than calves on similar treatments at SERZ/S in Niono. Diakité (1976), using zebu calves, found that the group receiving concentrate grew better than the control group during the 12 wk experiment, 438 vs. 357 g/d.

During 1990 the government began offering an artificial insemination service. Limited amounts of Montbeliard semen were sold to producers. A number of questions arose regarding the suitability of F_1s for existing dairy production systems, especially the traditional village systems.

Breed difference in calf intake responses to concentrate feeding indicate that the faster potential growth rate of F_1 calves, and even calves of local breeds with good growth potential, may not be realised with traditional management strategies. Additional feed may be necessary for optimum performance. Results of this study indicate that calves with good growth potential may require supplementary feeding at a young age. At the going rates for the inputs and outputs, replacing milk with a dry feed for calves is a profitable venture.

Results showed that the cost of feeding calves concentrate was less than the cost associated with the traditional practice of dividing the milk with the calf. An additional 32 litres of milk was available for sale. Calves receiving concentrate gained twice as much weight during the 90 d study as the control calves being reared under the traditional system. As livestock producers move into commercial production, cows with good milk producing potential, including exotic crosses, will become more common. Traditional feeding practices appear to be inappropriate for high producing animals.

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RENTABILITE DU REMPLACEMENT DU LAIT PAR UN CONCENTRE POUR LES VEAUX DONT LES MERES EXIGENT LA PRESENCE AU MOMENT DE LA TRAITE

Résumé, – En vue d'une étude durée de 90 jours réalisée au Mali (Afrique de l'Ouest) les auteurs ont utilisé 18 veaux zébu et zébu × Montbéliard agés de 50 ± 23 jours (plus jeune couple agé de 3 semaines), pesant 30 ± 7 kg et élevés en milieu fermier.

Son objet était de vérifier si le remplacement du lait tété par un concentré distribué sec, à base de son de riz, de maïs et de tourteaux d'arachide était rentable.

Pendant la première période de 45 jours, il n'y a eu aucune différence entre les veaux recevant le concentré (groupe E) et ceux bénéficiant de la tétée selon le mode traditionnel (groupe C). Pendant la deuxième periode (45 j), la traite était plus importante pour le groupe E, avec 2,34 litres/jour contre 1,77 (groupe C). La quantité de lait tétée était moindre pour la groupe E, 0,39 contre 0,95 litre/jour et le gain moyen quotidien était plus élevé pour les veaux du groupe E avec 442 g/jour contre 139 g/jour.

La consommation moyenne de concentré était de 0,74 kg/jour. Sa composition a été réalisée à partir de sous-produits disponibles localement et son coût était de 85 F CFA le kg. En considérant que le lait vendu représantait le seul bénéfice, le profit net par unité de coût de la nourriture pour le groupe E était de 1,24 contre 0,81 pour le groupe C. Si on l'ajoute au gain de poids, le groupe E à réalisé un profit de 1,61 comtre 0,98 pour le groupe C.

RENTABILIDAD DE REMPLAZAR LECHE ENTERA CON UN CONCENTRADO PARA TERNEROS DE VACAS QUE REQUIEREN LA PRESENCIA DEL TERNERO EN EL ORDENO

Resumen, – Durante un estudio de 90 días realizado en Mali, Africa Occidental, 80 Cebú y terneros de cruces de Cebú con Monbeliard, con edades de 50 ± 23 d (el par más joven de 3 semanas), con un peso de 30 ± 7 kg, bajo el manejo tradicional, se utilizaron para explorar la rentabilidad de remplazar la leche

con un concentrado con base en maíz-torta de nuez molida y salvado de arroz suministrado en forma seca. Durante los primeros 45 días del experimento no se detectaron diferencias entre grupos. Durante el segundo período de 45 días, en el grupo que recibió concentrado la producción de leche de las madres fue superior 2·34 vs 1·77 l/día; la leche consumida fue menor para el grupo con concentrado 0·39 vs 0·95 l/día; la ganancia de peso diaria fue superior en las que recibieron concentrado 442 vs 139 g/d. El promedio de consumo de concentrado fue 0·74 kg/día. El concentrado se preparó de subproductos locales y costó 85 francos el kilo. Considerando la venta de la leche como único beneficio, el retorno neto por unidad de alimentación para el grupo conconcentrado fue 1·24 y para el grupo sin concentrado 0·81. Añadiendo el valor del peso ganado, los terneros con concentrado dieron un índice de retorno de 1·61 contra 0·98 del grupo sin concentrado.

BOOK REVIEW

Veterinary Public Health. Parts I and II. Office International des Epizooties, 12, rue de Prony, 75017, Paris, France. Vol 10 No 4. 1991. 316 pp. ISBN 92-9044-298-0 and Vol 11 No 1. 1992. 316 pp. 1992. 316 pp. ISBN 92-9044-299-9.

These two volumes, devoted as a special issue on the topic of Veterinary Public Health, are from the valuable series of scientific and technical reviews published on a quarterly basis by the OIE. The issue begins with a review of the work of the Veterinary Public Health (VPH) unit of the World Health Organisation. This is followed by a series of reviews on the history and organisation of VPH in different regions of the world including the tropics. In a section on specialised activities three core functions of VPH, namely food hygiene, environmental protection and the control of zoonoses, are addressed. The issue concludes with a final section on the future perspectives for VPH.

The two volumes provide a wealth of information on a broad range of topics relevant to VPH. The continued importance of zoonotic diseases such as salmonellosis, brucellosis, tuberculosis, rabies, echinococcosis and cysticercosis are emphasised and set in the framework of the other zoonotic conditions, of which a total of 146 are listed by one author, and the wider roles of VPH in the fields of food hygiene and control of animal environmental pollution.

There is much of direct relevance in these two volumes to VPH throughout the world and they should be viewed as required reference material for Institutes and Departments with a responsibility for the delivery of veterinary services in the tropics. The importance of and benefit from co-operation between Veterinary and Medical authorities in the field of VPH is given due emphasis. Perhaps herein lies the most important contribution by these volumes as it begs the question of how effective and routine is the practice of this potentially valuable collaboration between the health professions in the tropics?

C. J. Daborn