Feeding Experiments on Dairy Cattle

Feeding UMB supplements to farm animals should also be regarded as an additional farm input which demands an optimum return to satisfy the overall economic needs of farmers. Hence, a better production performance is obviously expected from animals receiving UMB, in terms of milk yield, liveweight gain, better reproductive performance, and in overall productivity. Among them the most common and relevant measure of production is the daily milk yield of cows. It was, therefore, proposed to conduct feeding trials on dairy cows, given paddy straw as a base diet, at government farms as well as in field conditions, to study the effect of UMB supplements on milk yield so that an input output assessment could be made.

On receiving approval for the study from the Animal Husbandry Department, more than 300 kg of UMB (with *Til* cake and oven dried) were moulded at the 'Feed Mixing Plant' and brought to the Feed Analytical Laboratory where all the blocks were dried at controlled temperatures. These blocks were used for feeding experiments on dairy cattle at government farms and in field conditions.

Table 4: A Comparison between Nutrient Supplied by Supplementation of UMB and that Required by Farm Animals

		Sheep	Cow	Bull
1	Average liveweight (kg)	40	350	400
2	Daily UMB intake (grammes)	147.5	925	1120
3	Crude Protein (CP) supplied by UMB (g/d)	50.1	315	381
4	CP required for body maintenance (g/d)	75.0	432	478
5	TDN supplied by UMB (g/d)	78	490	595
6	TDN required for body maintenance (g/d)	410	2600	2900

Government Farms

The first feeding trial was conducted on Jersey cross-bred dairy cattle, fed on paddy straw and offered UMBs at will, from December 1990 to February 1991, at Wangchutaba Dairy Farm, situated at about 9,000 ft. A total of six cows were divided into two equal groups making sure that the total amount of milk in each group was the same. Then, they were randomly given UMB at will or UMB was with-held. Concentrate feeds were supplied to all cows according to the existing feeding schedule of the farm.

The average amount of UMB licked daily, at will, by the three experimental cows for 32 days was 0.787 kg/day/head. The control group of cows received an additional amount of 0.5 kg cattle

concentrate/head/day as a replacement for UMB. The intake of UMB alone supplied about 267 grammes of crude protein which was sufficient to meet 95 per cent of the amount required for the maintenance of cows. This level of UMB consumption also supplied daily about 71 grammes of urea, which was a safe level. No harmful effects of UMB on animals were noticed throughout the experiment.

The average amount of milk yield observed for six weeks, in cows given UMB at will, was recorded at 2.04 litres per day per head which was about 0.5 litres higher than recorded for cows not receiving UMBs (Table 5).

Table 5: Average Performances of Cows Given UMB Supplement and Control Groups

Observations	Experimental Group	Control Group
1. Straw intake, kg/d/h.	4.19	4.2
2. Cattle concentrate, kg/d/h.	2.0	2.5
3. UMB intake, g/d/h.	787.	---
4. Milk yield, 1/d/h.	2.04	1.54
5. Cash from milk, *Nu.*/d/h.	14.28	10.78
6. Cost of feed, *Nu.*/d/h.	13.74	11.58
7. Profit and loss, *Nu.*/d/h.	+ 0.54	- 0.80

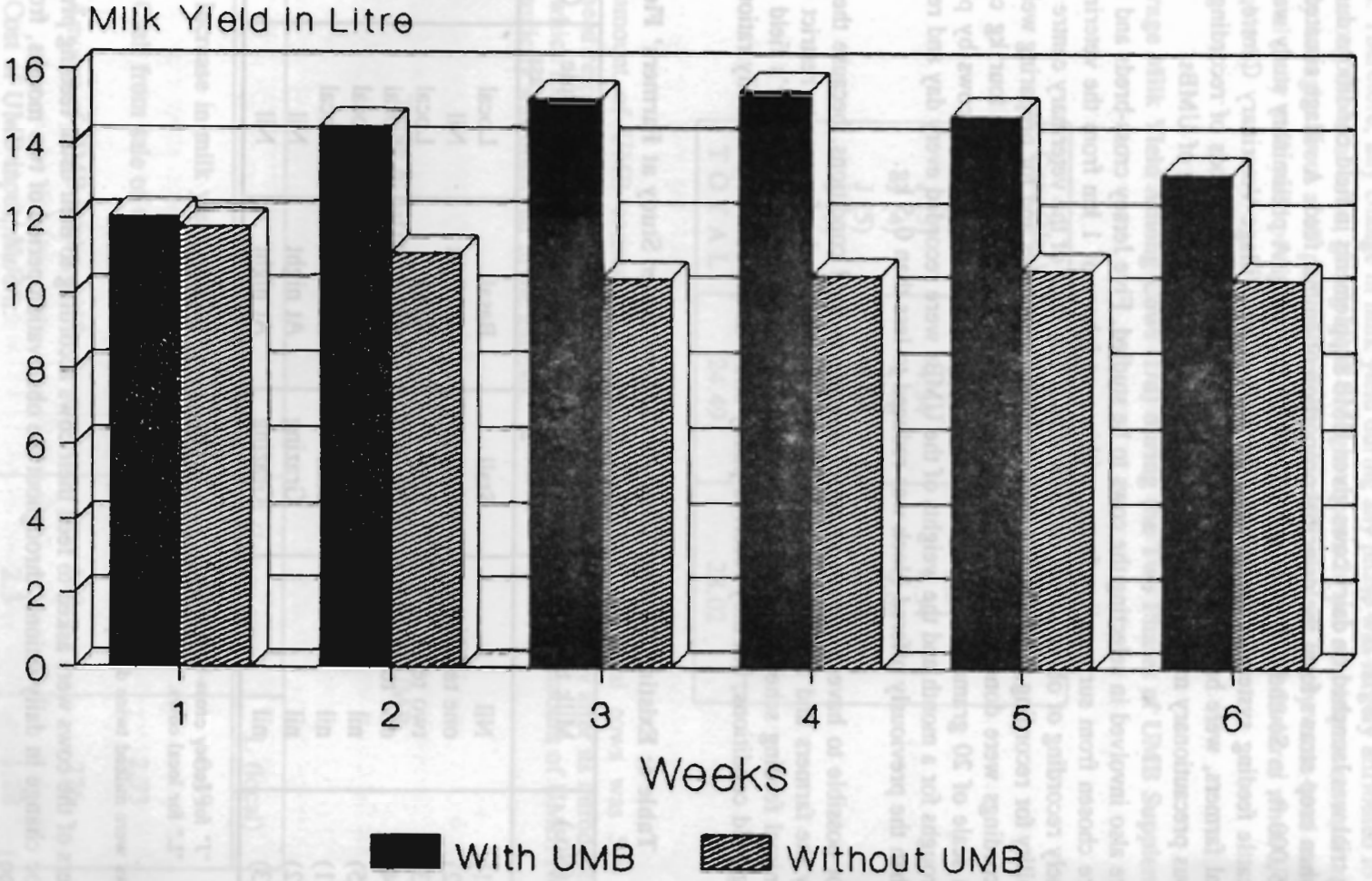
Note: Cost of straw = 1 *Nu*/kg
Cost of Cattle concentrate = 2.95 *Nu*/kg.
Selling price of milk = 7 *Nu*/1.

There was substantial improvement (24.5%) in the milk yield of cows receiving UMB throughout the experiment. But a noticeable fall in milk yield was observed in cows not given UMB and under a control diet (Figure 1). However, these results might have been affected by factors other than the supplementation of UMB such as limited numbers of experimental animals, difference in lactation stage, and difference in calving dates.

The UMB supplements did not cause a significant improvement in the intake level of paddy straw by the experimental cows (Table 6). The lack of effect of UMB on straw intake can be explained by the fact that the nitrogen requirement for maximum microbial activity in the rumen was satisfied by the provision of cattle concentrate, which was given to all cows. The normal concentrate supplementation practice on the farm was two kg/head/daily, providing about 390 g of crude protein. The crude protein requirement of rumen microbes for maximum microbial activity would be about 285 g for an adult cow with a 300 kg body weight (the average live weight of the cows under study).

The cost analyses of feed input and milk output showed a net profit of about 0.5 *Nu* from the sale of milk produced by each cow given UMB compared to a daily net loss of 0.80 *Nu* per cow in the control group (Table 5). The overall observation of the feeding trial indicated that the daily UMB supplements to cows not only increased the milk yield but also improved the economic status of the dairy enterprise.

Fig 1 : Total Weekly Milk Yield in Cows with/without UMB



Village Level

A feeding trial was launched on dairy cows given UMB supplements in field conditions during the winter months when crop straws form the principal proportion of animal feed. A village situated at an altitude of about 5,000 ft, in Southern Bhutan, was chosen for the study. A preliminary study was made on the existing cattle feeding system in the village. The staff of the Village Veterinary Centre, together with some local farmers, were briefed on the nature of the experiment, methods of recording observations, and various precautionary measures to be undertaken for proper handling of UMBs.

They were also involved in selecting the cows to be studied. Five Jersey cross-breds and three local *siri* cows were chosen from surrounding farms, within a periphery of 1 km from the veterinary centre, so that a timely recording of observations could be made. The head of the veterinary centre was given full responsibility for recording the daily milk yields of individual cows and for preparing weights of UMB. These recordings were done with the help of pocket size spring balance for four kg capacity with a minimum scale of 20 grammes. The UMB was made available *ad lib* to all cows by placing them in feeding troughs for a month and the weights of the UMBs were recorded every day and replaced by new blocks when the previously offered block was reduced to less than 0.5 kg.

It was not possible to have a control group of animals in field conditions, because the animals were owned by the farmers and it would not have been acceptable to the farmers to restrict them from the normal animal feeding schedule. All cows were herded in the respective farmer's field and fed in the prevailing field conditions, but they received paddy straw as the bulk of their daily rations as shown in Table 6.

Table 6: Existing Feeding Schedule of Cows under Study at Farmers' Field

Cows (No.)	Milk to Calf	Daily Grazing	Feeding Straw	Schedule Cut Grass	Conc. Feed
J (1)	Nil	Stall	Basal	Local	1.5 kg
J (2)	one teat	Grazing	At night	Nil	1.5 kg
J (3)	two teats	Stall	Basal	Local	1.75 kg
J (4)	one teat	Stall	Basal	Local	2.0 kg
J (5)	nil	Stall	Basal	Local	1.5 kg
J (1)	nil	Stall	Basal	Local	1.0 kg
J (2)	nil	Grazing	At night	Nil	nil
J (3)	nil	Grazing	At night	Nil	nil

Note: "J" for Jersey cross-bred cows,
"L" for local cows.

All cows were milked twice daily

The owners of the cows were asked to feed their cows according to their usual feeding practices, without any ad hoc change in daily rations, throughout the observation period of two months, from February to March 1991.

The observations regarding milk yield were made in cases where UMB supplements were given and in control conditions. The milk yield of individual cows, prior to giving the UMB supplements, was recorded for 15 days and was regarded as the first phase. This was followed by a month-long recording of milk yield in cows given UMB supplements.

The composition of the daily ration was relatively similar among all cows throughout the three phases of observation. Therefore, any change in milk yield during any phase was largely attributed to the UMB supplement. Among the local cows, giving UMB brought about a 26 per cent improvement in milk yield, whereas it only brought about a 12 per cent increase in milk yield in Jersey cross-bred cows. On an average, the total daily milk yield of eight cows increased from 24.49 to 28.03 litres when UMBs were introduced (Table 7).

Table 7: Average Milk Yield Among Cows (1/d) during the Two Phases of UMB Supplementation

Cow (No.)	Before	During
J (1)	3.87	5.06
J (2)	3.17	3.51
J (3)	4.34	4.34
J (4)	4.98	4.68
J (5)	3.69	4.83
J (1)	1.77	1.73
J (2)	1.70	2.28
J (3)	0.97	1.59
TOTAL	24.49	28.02

The average amount of UMB consumed by Jersey cross-bred and local cows was 510 and 276 grammes/day/head respectively (Table 8). All cows licked UMB immediately after its introduction, apart from one cow which took about five days before consuming an appreciable amount of UMB. No adverse effect of urea toxicity was observed in the animals.

Table 8: Gross Return from the Introduction of UMB

	J (Jersey cross)	L (local)
1. Increase in milk yield, 1/d/h.	0.474	0.39
2. Cash from sale of milk *Nu*/d/h.	3.32	2.73
3. Amount of UMB intake, g/d/h.	510	276
4. Cost of UMB input, *Nu*/d/h.	2.3	1.28
5. Profit in *Nu*/d/h.	0.96	1.45

Note: Cost of Milk = 7 *Nu*/1
Cost of UMB = 4.64 *Nu*/kg

The economic aspect of UMB technology was also studied during the village level trial at Tala. The improvement in the milk yield can be considered to be directly related to the intake level of UMB, since the UMB supplement was the only major change in the feed input given to each cow within the two phases of milk production. The overall results showed that an additional amount of 0.441 litres of milk/cow/day was produced when the cows were given UMB (with 0.42 kg UMB intake/cow) Table 9). This increase in milk yield was equivalent to 3.09 *Nu*/day/cow and gave a net profit of 1.15 *Nu*/day/cow, a higher figure than the 0.54 *Nu*/day recorded at the Wangchutabe Dairy Farm (Table 6). The net return was higher than from local cows (*Nu*/d/cow) compared to Jersey cross-bred cows (*Nu* 0.96/d/cows). The general impression regarding the application of UMB technology in village conditions suggested that the technology could be a cost-effective approach to improving the economic status of dairy farmers.

The veterinary centre at Tala provides artificial insemination (A.I.) services to animals and maintains progeny records. It was observed that five out of eight cows came into heat when the UMB was introduced. General improvements in the body condition of the animals were also reported.