CASE STUDY ON CATTLE FEED UTILIZATION IN MILK COOPERATIVES IN INDIA

by

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Dairying in India

Of India's 700 million people, 75 percent live in 576 000 villages covering 145 million hectares of land. Surveys show that there are 70 million households of which 42% farm on average 2 hectares of land and 37% are landless. These groups possess 55% of all the milch animals and produce, 51% of the total milk in the country. In the early 1900s, dairying in India was largely unorganized. After 1947, the Greater Bombay Milk Scheme came into existence. A milk plant was established in Bombay and was supplied with milk largely by the Kaira district co-op, Milk Producers Union Ltd., Anand. Milk was then transported long distances to supply urban needs for the first time in India.

Establishment of a dairy cooperative managed by the village farmers enabled them to market their milk efficiently avoiding the depredations of the traditional middlemen, who had up to this time been able to monopolize the sale of milk in India. From this time a notable feature of India's dairy scene has been the broad acceptance of a cooperative organizational structure, (Anand Pattern) that now has a great impact on milk production, farm incomes and living standards of the rural people. This revolutionary change has been effected through a dairy development programme called "Operation Flood" which involves 10.2 million rural households. An evaluation committee constituted by the Ministry of Agriculture, Government of India summed up their overall assessment of Operation Flood as follows: "By any standard, Operation Flood has been a successful programme, implemented with competence and dedication, for which the credit should go to the National Dairy Development Board (NDDB) and Indian Dairy Corporation (IDC)". The development of feeding strategies through the establishment of feed manufacturing plants has been of major significance in stimulating milk production throughout the country.

Feeding milch animals

Almost 70 percent of the cost of milk production is directly attributable to feed costs. The most expensive component in a cattle feed ration is the concentrate and the economics of milk production depends on the degree to which the concentrate intake can be minimized and the utilization of crop residues, cut grass and other fibrous materials can be maximized for milk production. Concentrates for

lactating cattle and buffalo must be formulated keeping in mind the availability of resources and the total ruminant population in the country. According to the Twelfth All India Livestock census 1977, there are 180 million cattle and 62 million buffaloes in India. The estimated availabilities of feed resources (1985) are given in Table 1. India's indigenous cows (Bos indicus) survive, produce calves on a low plane of nutrition based mainly on coarse roughages such as straws and stovers. The Riverine buffaloes appear to make better use of roughages than cattle and produce milk of a higher fat content. Milk production from cows totals 10-11 million tons per year, whereas from buffalo it is 25 to 30 million tons per year.

The feeding strategies developed under Operation Flood are described below using the Amul Dairy Cooperative as an example.

Amul Dairy Cooperative Union

The Kaira District Cooperative Milk Producers' Union Ltd., Anand is popularly known as Amul. The district is densely populated with 3 million people in 6917 sq.km. About 80% of the population (where individual land holding is about 2 acres) live in villages and depends on farm produce or farm labour for their livelihood.

Milk animals (mainly buffalo) are fed largely on local crop by-products as the basal feed and average productivity is as follows. Dairy milk yield per buffalo 3.1 kg; lactation period 270 days; calving interval 17 months; annual milk production per buffalo 591 kg.

Traditional feeding system:

In Kaira district, traditionally farmers use cotton-seed meal as the main concentrate supplement for their lactating buffaloes. Since it contains gossypol, they boil cotton-seed meal for 3 to 4 hours before feeding.

Other feed supplements include agricultural by-products such as rice, wheat and sorghum as brans and chunis. However, the bulk of the ration was millet stover. During those days, wheat and rice straw was burnt. The average feed cost for 100 kg. milk production was calculated as $4.66. A typical dairy ration used in the villages for Surli buffaloes (450 kg/weight) is given here. Cotton seed 2.0 kg; grain + byproducts 1.0 kg; natural herbage 5.0 kg; millet stover 4.0 kg; milk yield/day 3.1 kg; fat (%) 8.0.

The total milk procured from the area during the 1950s was around 39,000 kg/day i.e. 14,000 MT/year.

Based on the above ration, there would have been a utilization of around 9,000 MT cotton seed and 4 600 MT sorghum and grain byproducts in a year and a typical farmer used to spend 8.5% of his income to feed his buffalo. The cost of cotton seed meal increased from Rs. 0.21 per kg during 1954 to Rs. 0.34 per kg. during 1960.

The Amul Management was thus motivated to develop more national supplements for dairy animals. Dr. B.M. Patel, Professor of Animal Nutrition, Agricultural Institute, Anand was commissioned to formulate a balanced feed concentrate for milk production based on available resources. The new feed mix increased average milk production and lactation length and was less expensive, saving the farmer, Rs. 70/- per animal per lactation. For this reason Amul management decided to build a feed mill with a capacity of 150 MT/day and this was inaugurated in October 1964. The pelleted feed produced was as follows: maize (40); peanut meal (33); cotton seed (5); cotton seed cake (10); molasses (10); mineral mixture (1); salt (1).

Farmers' reaction:

Pelleted feed was new to farmers and when used for the first time, replacing cotton seed cake, it resulted in a temporary depression of milk fat. Demonstration trials were conducted in villages to convince farmers that milk fat would not be permanently depressed (see Figure 1). Based on the economic benefits of using this feed efforts were made to popularize the new feed among milk producers. Demand for feed has increased and the capacity of the feed plant was increased to 300 MT/day as then, to 600 MT/day capacity in 1981. With increasing demand for the raw materials prices have also increased and more emphasis has been placed on using non-conventional feed ingredients.

Least cost formulation

The Indian Council of Agricultural Research (ICAR) has identified more than a hundred unconventional feed ingredients some of which are being used in compound feed (see Table 2). Feeding trials indicated that the digestible crude protein of the compound feed was optional at 14%. A more typical least cost formulation is as follows: milo (10); damaged wheat (10); cassia tora (3); kardi ext. (5); watermelon cake (7); mango kernel ext. (7); groundnut shell powder (2); Acacia aralica ext. (5); Lady finger cake (3); groundnut ext. (8); urea (1); molasses (12); mineral mixture (1); salt (2); calcite powder (1); rice polishings (7); rice bran ext. (16).

Productivity of buffaloes in Kaira following production of a supplement was increased during this period and the annual milk yield has increased (591-1080kg).

Annual milk collection in the Kaira dairy plant was increased from 14 196 MT in 1961 to 127 017 MT in 1976.

Under Operation Flood a total of 38 feed plants have been established to cater for the requirements of balanced cattle feed in all the milk shed areas under the cooperative management area. The total installed capacity of these plants is 4 100 MT/day.

Productivity of buffaloes in Kaira following introduction of a cattle feed supplement was increased from 3.1 to 4.5 kg/d and the annual yield from 591 to 1080 kg. The milk collected annually was increased from about 14,000 MT in 1961 to 127,000 MT in 1976.

The pattern of use of raw ingredients for feed manufacture is shown in Table 3 showing the increasing dependence on non-conventional feed materials.

Urea/molasses animal lick

A seminar conducted by the National Dairy Development Board, to formulate policy on breeding, and feeding strategies for milk production in 'Operation Flood', recommended that the objectives must be to utilize crop residues and minimize the reliance on green forage and concentrates. The NDDB accepted a new approach to feeding ruminants based on scientific principles of utilizing non-protein nitrogen to stimulate feed utilization in the rumen and bypass protein to provide amino acids for milk production (see the discussion by Leng in this symposium).

Based on these principles a new feed supplement was developed by the National Dairy Development Board. The new feed supplement is in the form of a lick or block consisting of molasses, urea, protein and mineral mixture. A manufacturing plant, designed by the Dairy Board, has been installed at the Cattle Feed Factory in Kaira District co-op, Anand. This is marketed by the Gujarat Co-operative Milk Marketing Federation, Anand, and is known as AMUL MOL-U-MIN (Urea Molasses Animal lick). This is a hard, 3 kg. solid block. It is kept in the manger of the cow/buffalo to allow the animal to lick whenever it is required. Feeding molasses urea block has resulted in a stimulation of intake of the basal diet by 30% and has resulted in a reduction of the concentrate requirement by 40% without loss of milk production or body weight. Overall there has been an obvious increase in health and reproduction. Some farmers have found it possible to reduce the use of green forage and in some cases milk fat has been increased.

The economics of feeding molasses-urea block is indicated in Figure 6. The data of feeding trials conducted in Kaira district is shown in Table A - comparison of production data before and after introduction of a molasses urea block is shown in Table 3.

By-pass protein

The need to bypass dietary amino acids to lactating animals is being accepted by animal nutritionists. The digestion of starch (or sugar), proteins and even fats in the intestine avoids the heat and methane losses which occur when these nutrients are fermented in the rumen and provide nutrients critical for the production of milk directly (Preston & Leng, 1984). The empirical evaluation of dietary nitrogen as DCP does not take full account of the relationship between energy availability and nitrogen requirements and cannot predict with sufficient accuracy the true availability of protein for production in the body (ARC, 1980). However special processing may be costly and in compound cattle feed, the natural protection of protein meals appears to be high. Thus by using molasses-urea block good quality protein has been replaced by urea and the protein is largely used in the intestine. The composition of the compound feeds aimed at providing bypass nutrients is shown below and is combined with feeding Mol-U-Min.

Bypass protein cattle feed: maize/milo (20); rice polish (10); molasses (8); mineral mixture (1); salt (1); cotton seed meal (20); peanut ext./rape seed meal (15); soya meal (15); guar meal (10).

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Table 1: Estimated utilization of agro-industrial by-products and conventional feed materials for cattle-feed manufacture in Kaira District

Sr No.	Period	Av.cattle feed prod. M.T.	Maize/ Bajra M.T.	Cotton seed M.T.	C.S. cake M.T.	G.N. cake M.T.	G.N. Ext. M.T.	Rice Bran M.T.	GNSP M.T.	Water melon cake (MT)	Urea M.T.	Damaged wheat M.T.
1.	1960-65	Nil	4 580	9 160	Nil	NA	Nil	Nil	Nil	Nil	Nil	Nil
2.	1965-70	25 000	10 000	750	2 500	8 250	NA	Nil	Nil	Nil	Nil	Nil
3.	1970-75	45 000	4 500	Nil	1 350	3 150	4 500	7 200	1 350	1 350	Nil	2 250
4.	1975-80	90 000	4 500	Nil	Nil	4 500	6 300	22 500	4 500	6 300	900	9 000
5.	1980-85	105 000	Nil	Nil	Nil	3 150	8 400	36 750	7 350	7 350	1 050	10 500

Table 2: Estimated projection on utilization of different raw materials groups

Sr No.	Period	Production M.T.	Low Prod. High E.		High P. High E.		Med P. Med E		Fillers	
			Qty (MT)	Per over prod.	Qty (MT)	Per over prod.	Qty (MT)	Per over prod.	Qty (MT)	Per over prod.
1.	1964	NA	4 580	33	9 160	67	Nil	Nil	Nil	Nil
2.	1970	25 000	3 750	15	3 500	14	14 000	56	Nil	Nil
3.	1975	45 000	6 750	15	4 725	10.5	26 133	58	Nil	Nil
4.	1980	90 000	18 000	20	7 200	8	47 728	53	1 800	2

Table 3: The responses on feeding AMUL Mol-U-Min in villages:

Sr. No.	Village	Milk		Fat		Net return over feed cost*		Net gain (Rs.)
		Before Kg	After Kg	Before Kg	After Kg	Before Rs.	After Rs.	
1.	Mogri	6.3	6.4	0.46	0.50	9.84	12.74	2.90
2.	Daliapura	4.7	4.8	0.32	0.36	5.12	7.36	2.24

*Because farmers reduced the use of concentrates when the urea/molasses block was given there was a large saving in concentrate use and milk production was less expensive and the profit margin increased.

Table 4: The observations at nucleus Jersey farm, Ooty Tamil Nadu after feeding Mol-u-Min for a period of 6 months

Months	No. of cows in milk		Concentrate (kg)		Legume (kg)		Green Forage (kg)		Hay (kg)		Silage (kg)		Block (g)		Milk (kg)	
	84	85	84	85	84	85	84	85	84	85	84	85	84	85	84	85
January	41	35	4.7	4.3	-	-	21.3	23.4	1.8	1.1	10.4	5.0	-	236	7.87	10.64
February	44	35	4.7	4.7	-	0.2	21.4	17.8	1.5	1.9	10.1	12.1	-	255	9.33	10.45
March	45	36	4.4	5.1	-	-	16.4	11.9	1.9	4.3	9.6	17.6	-	207	8.59	10.00
April	48	39	4.5	4.7	-	-	13.8	3.1	1.6	4.3	22.6	26.4	-	204	8.92	9.73
May	52	31	4.1	4.9	-	-	17.8	23.4	0.1	0.9	6.6	14.9	-	256	8.08	9.36
June	26	31	4.7	4.6	-	1.0	36.6	27.2	1.6	1.7	-	2.7	-	257	8.67	9.46

Source: Dr. Godhanda Pany. Nucleus Jersey Farm, Ooty (Tamil Nadu)