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Assessment of Economic Impact of Implementing Ration Balancing Programme in Lactating Cows and Buffaloes under Field Conditions

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ABSTRACT

Lactation trial of 120 days duration was conducted on 2536 lactating animals in twenty five villages in Junagadh District in Gujarat State to study the effect of implementation of ration balancing programme on milk production and cost of milk production. For the field study, 2536 lactating animals (cows-827 and Buffaloes-1709), 8-10 weeks post calving, yielding 6 to12 kg milk/d, belonging to 1250 farmers were selected. Daily milk yield and feed intake of all the animals were recorded. Milk samples were drawn monthly and analysed for milk fat. After 15 days of recording, the ration of all the animals was balanced for total digestible nutrients (TDN), crude protein (CP), calcium and phosphorus using the ration balancing software developed by National Dairy Development Board (NDDB), which is based on Kearl (1982) standards for buffaloes and NRC (1989) for cows, and the balanced diet was fed to all the animals. Analysis of nutritional status of animals before ration balancing revealed that 89.4 and 60.9% of animals were overfed in terms of TDN and CP, respectively and 45.8% and 76.00 of the animals were underfed in terms of calcium and phosphorus, respectively. Average increase of 0.58kg milk/ animal /day and 0.5% milk fat, were observed in the lactating animals after ration balancing which were significantly ($P<0.05$) higher than before implementation of the programme. After ration balancing, there was also an average reduction in feeding cost (Rs/kg milk) from 9.45 to 7.47, which was significantly ($P<0.05$) lower. With ration balancing the farmer's net income increased by Rs 31.49/day. The results suggest that ration balancing has the potential to improve performance of animal and farmers income in lactating buffaloes and cows.

Key Words : Ration balancing, Economics, Lactating Cows, Lactating Buffaloes, Milk yield, Milk fat, Field Trial.

INTRODUCTION

Low genetic potential and imbalanced feeding are the main reasons for low productivity of animals in India. Despite the concerted efforts put forth by various agencies to popularise various types of feed and feed supplements, most of the farmers still follow the traditional methods of feeding, based on one or two locally available feed resources. Various studies conducted at field level have shown that either there is deficiency of energy (Mudgal et al., 2003) or it is in excess (Singh et

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al., 2002). Similarly, protein is either deficient (Mudgal et al., 2003, Singh et al., 2002) or in excess (Gupta et al., 2006). Traditional feeding usually results in over or underfeeding, thereby it paves way for the importance of balanced ration for improving milk production of animals. And also very few farmers are supplementing mineral mixture in the ration, thereby leading to widespread mineral deficiency which results in poor productive and reproductive performance of the animals (Garg et al., 2000).

Due to the growing human population and shrinkage in availability of land for grazing and fodder cultivation, there is urgent need for judicious use of available feed resources for improving productivity. Keeping this in view, the present study was carried out to know the nutritional status of animals in traditional feeding practices and also to see the effect of ration balancing on milk production and cost of milk production in lactating cows and buffaloes under field conditions.

MATERIALS AND METHODS

Experimental site

The location selected for field study, Junagadh district of Gujarat state has an annual rainfall of 110cm. Groundnut, wheat, cotton and sugarcane are the main cultivated crops and by-products from these form the basal diet. Milk production in the area is characterized by high yielding Jaffarabadi buffaloes and Gir cows, marginal farmers with small land holdings (less than 1 hectare) and scarce land for fodder cultivation.

Feeding and Management

For the field trial, 2536 lactating animals (cows-827 and Buffaloes-1709), 8-10 weeks post calving, yielding 6 to12 litre of milk/d, belonging to 1250 farmers were selected. The feed intake of each animal was measured and representative sample taken for dry matter analysis and for proximate and cell wall constituent analysis. The milk yield of individual animal was recorded daily in the morning and evening. Milk samples were drawn monthly and analysed for milk fat (IS: 1224, 1977). TDN values were adopted from Sen et al. (1977).

After 15 days recording, the ration of all the animals was balanced for total digestible nutrients (TDN), crude protein (CP), calcium and phosphorus using the ration balancing software developed by National Dairy Development Board (NDDB), which is based on Kearl (1982) standards for buffaloes and NRC (1989) for cows, and the balanced diet was fed to all the animals. The milk yield was recorded as discussed earlier. The body weight of the animals were calculated using Shaeffers's formula (Sastry et al.,1982).

Body weight (in kgs) =([(heart girth in inches) 2 × length of the body in inches] /300) × 0.4536

Chemical and Statistical Analysis

Proximate composition of feeds and fodders were analyzed as per the methods of AOAC (1995). Acid detergent fiber (ADF) and neutral detergent fiber (NDF) of feeds and fodder determined as per the methods of Van Soest et al. (1991). Data generated were statistically analyzed using Z test as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Feeding and Management

The body weights of the animals selected for the study were in the range of 425 kg to 660 kg and 360 kg to 490 kg for buffaloes and cows, respectively. The dry matter intake of the animals was in the range of 10.5 kg

Table1. Chemical composition of feeds and fodders fed to the animals (%DM)

Item	DM (%)	CP (%)	EE (%)	NDF (%)	ADF (%)	Ash (%)	Ca (%)	P (%)
Cotton seed cake	92.17	29.43	6.71	52.33	37.24	6.10	0.12	0.26
Wheat bran	91.12	15.02	3.84	31.17	8.97	7.50	0.10	0.38
Jowar fodder	17.27	7.00	1.50	58.42	40.12	10.12	0.16	0.10
Lucerne fodder	25.00	17.05	1.98	46.39	36.13	9.26	0.78	0.10
Wheat straw	92.11	4.21	0.78	73.59	47.97	9.37	0.33	0.06
Groundnut straw	90.25	11.42	1.00	58.63	35.68	8.80	0.78	0.05
Sugarcane tops	97.48	6.22	1.73	70.43	39.51	8.00	0.25	0.05

to 21.2 kg and 9.25 to 15.80 kg per animal per day for buffaloes and cattle, respectively. The chemical composition of the feeds fed to the animals is presented in Table-1. The area has good quality feed resources like cotton seed cake (good source of protein), wheat bran (medium in energy and protein), lucerne fodder (good source of protein), Jowar fodder (medium in energy) and groundnut straw (good source of protein and calcium).

Analysis of the feeding practices of the farmers for animals revealed that the common dry roughages fed to the animal were wheat straw followed by groundnut straw and dried sugarcane tops. Farmers were also feeding small quantity of whole sugar cane, jowar green fodder and Lucerne fodder with basal roughages, but availability was seasonal. The farmers were supplementing the ration of animals with wheat bran and cottonseed cake. There was no practice of feeding cattle feed prevalent in the area. Most of the farmers were not feeding mineral mixture.

Nutritional status of animals before ration balancing

Analysis of nutritional status of animals (Table-2) before ration balancing revealed that 89.4% and 60.9% of animals were overfed in terms of TDN and CP, respectively; and 45.8% and 76.00% of the animals were underfed in terms of calcium and phosphorus respectively. Overfeeding energy and protein during early phases of lactation is a common practice followed by the farmers in the study area. Analysis of the results showed that, the animals which were highly overfed on energy are generally underfed or adequately fed for protein and those animals which were highly overfed on protein are generally underfed or adequately fed for energy. Some farmers were feeding, wheat bran + whole sugarcane + wheat straw combination, which leads to energy excess and protein deficiency and some farmers were feeding, cottonseed cake + groundnut straw combination leading to energy deficiency and protein excess. The feeding of judicious mix of wheat bran, cottonseed cake, whole sugarcane, groundnut straw and wheat straw is not practiced, leading to imbalance in availability of nutrients to the animals.

The overfeeding of lactating animals were also reported by others (Gupta et al.,2006). Gupta et al. (2006) who reported that cross bred cows producing 5, 5 to 8, 8 to12 and more than 12 kg milk per day, respectively, were overfed, 100, 100, 94.75 and 100 % in respect to TDN, in Vadodara district in Gujarat state. Similarly Singh et al. (2002) also found excess feeding of TDN to lactating buffaloes in Mohindergarh district of Haryana. Gupta et al. (2006) also reported that cross bred cows producing 5, 5-8, 8-12 and more than 12 kg milk per day, respectively, were overfed, 33.33, 62.50, 84.21 and 92.00 % for DCP, in Vadodara district in Gujarat state. The protein is an expensive ingredient of dairy ration and its over feeding has been shown to increase blood urea nitrogen, an indicator of inefficient utilization of dietary nitrogen (Moore and Varga,1996), which has a negative impact on health and fertility in dairy cattle (Blanchard et al.,1990; Shingfield et al.,1999).

However, calcium and phosphorus were underfed in 45.8 % and 76.00 % of animals, respectively. More than 30% deficiency was noticed in 21.2 and 51.0 percent of animals for calcium and phosphorus, respectively. Mineral mixture feeding is not prevalent in the area. Animals were getting calcium mainly from groundnut straw and Lucerne fodder and phosphorus from wheat bran and cottonseed cake. Studies by our lab reported mineral deficiencies in various states of India (Garg et

Table 2. Nutritional status of lactating animals before receiving balanced ration

Parameter	Nutritional status of animals (%)						
	Underfed			Adequately fed	Overfed		
	30% less than the requirement	15-30% less than the requirement	5-15% less than the requirement	+5% of the requirement	5-15% above the requirement	15.30% above the requirement	30% above the requirement
TDN	0.24	1.35	3.30	5.73	16.55	24.62	48.21
CP	3.41	6.74	12.68	16.25	20.37	18.71	21.84
Calcium	21.15	14.78	9.86	28.45	10.79	7.20	7.77
Phosphorus	50.96	15.02	10.02	13.72	4.51	3.01	2.76

al.,2000 and Garg et al., 2005). Large animal populations in the world, particularly in the tropics suffer from mineral imbalances or deficiencies (McDowell et al.,1993) and deficiency of essential minerals may result in failure of homeostatic mechanism, affecting the productive and reproductive performances of animals (Garg et al., 2005). Mineral supplementation dramatically improves the condition of dairy animals suffering from mineral deficiency (McDowell, 1992).

Effect of Ration Balancing on Milk Yield

Due to implementation of ration balancing programme, there was an average increase of 0.58 kg milk/animal/day and 0.5% milk fat, which was significantly ($P<0.05$) higher than before implementation of the programme (Table-3). The improvement in persistency of lactation and also improvement of milk fat (%) may be due to balancing of nutrients which might have improved microbial protein synthesis and also due to supply of good quality mineral mixture which might have alleviated the deficiency of calcium and phosphorus thereby leading to more milk yield and milk fat (%). In South Africa, feeding of bone meal to cows on calcium deficient pasture increased the milk yield by 40 %, while in Minnesota the addition of phosphorus increased the yield by 50 to 146 % (Maynard et al., 1979).

Effect of Ration Balancing on Cost of Milk Production

Feeding cost contributes to 60 to 70 % of total cost of milk production (Bardhan et al., 2005). After ration balancing, there was also an average decrease in feeding cost (Rs/kg milk) from 9.45 to 7.47, which was significantly ($P<0.05$) lower. It was observed that due to implementation of the RB programme the daily increase in income was Rs 31.49 per animal per day for the farmer, the details of which are given below.

Economic Advantage of Ration Balancing Programme (RBP):

Average milk yield of animals before implementation of RBP = 8.25 kg

Average milk yield of animals after implementation of RBP = 8.83 kg

Average increase in milk yield per animal per day = 0.58 kg

Average fat in milk of animals before implementation of RBP = 5.79 %

Average fat in milk of animals after implementation of RBP = 6.29 %

Average increase in fat in milk per animal per day = 0.50%

Average market price of one kg fat = Rs 250 -

Average value of 8.25 kg of milk before RBP with 5.79 % fat = Rs 119.41 (@Rs14. 48/kg milk)

Average value of 8.83 kg of milk after RBP with 6.29 % fat = Rs 138.85 (@Rs15.73/kg milk)

Average increase in gross income per animal per day = Rs 19.43

Daily average feeding cost/kg milk production before RBP = Rs 9.45

Average feeding cost of 8.25 kg milk production before RBP = Rs 77.96

Daily average feeding cost/ kg milk production after RBP = Rs 7.47

Average feeding cost of 8.83 kg milk production after RBP = Rs 65.89

Average decrease in feeding cost per animal per day = Rs 12.06

Average net daily increase in income = Rs 19.43 + Rs 12.06 = Rs 31.49 per animal per day

It was observed that the daily increase in income was Rs 31.49 per animal per day for the farmer.

Table 3. Effect of implementation of ration balancing programme on milk yield (kg/day), milk fat (%) and feeding cost (Rs/kg milk) in lactating cows and buffaloes

Parameter	Before RBP	After RBP (Average of 4 months)
Milk yield* (kg/day)	$8.25^{a}\pm0.04$	$8.83^{b}\pm0.04$
Milk fat* (%)	$5.79^{a}\pm0.03$	$6.29^{b}\pm0.03$
Feeding cost per kg milk production* (Rs)	$9.45^{b}\pm0.04$	$7.47^{a}\pm0.04$

$^{a\text{-}b}$ Means with different superscripts in a row differ significantly, *($P<0.05$)

CONCLUSION

The present study indicates that ration balancing programme has the potential to increase milk production and reduce cost of milk production. More trials on these lines are required to be conducted to generate more information and also to popularize the ration balancing programme to increase milk production and efficient utilization of available feed resources.

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