Journal of Animal Research: v.12 n.1, p. 93-98. February 2022

DOI: 10.30954/2277-940X.01.2022.14

Economic Impact of Challenge Feeding on Milk Production of Crossbred Cows

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Received: 16 Dec., 2021 **Revised:** 27 Jan., 2022 **Accepted:** 30 Jan., 2022

ABSTRACT

The aim of the present study was to find out the effect of 'challenge feeding' on the performance and economics of milk yield of crossbred cows. During the research trial in the pre-partum period, animals of the T_1 control group were fed 1 kg concentrate for maintenance per day from the 60th day to prior to calving till the day of parturition. T_2 group animals were fed 1 kg concentrate for maintenance plus 1.5 kg concentrate as challenge feed per day from 60th day to 22nd day prior to calving and from 22nd day prior to calving till parturition animals were fed 1 kg concentrate for maintenance plus 2 kg concentrate as challenge feed per day. T_3 group animals were fed 1 kg concentrate for maintenance plus 2 kg concentrate as challenge feed per day from 60th day to 22nd prior to calving and from 22nd prior to calving till parturition animals were fed 1 kg concentrate for maintenance plus 2.5 kg concentrate as challenge feed per day. The overall mean daily milk yield per animal was significantly higher ($P<0.05$) in T_3 (11.03 kg) as compared to T_2 (9.85 kg) & T_1 (6.96 kg). The cost of per litre milk production was ₹ 25.90, 23.79, and 23.72 in T_1, T_2, and T_3 groups respectively. It was concluded that the practice of challenge feeding of crossbred cows improved the production performance during early lactation without affecting their periparturient health and was found to be economical.

HIGHLIGHTS

- We studied on effect of Challenge feeding on performance and Economics of crossbred Cows.
- Practice of Challenge feeding during transition period improved production performance during early lactation period without affecting their periparturient health.

Keywords: Pre-partum, Post-partum, Calving, Milk yield, Challenge feeding

India is predominantly an agriculture country as 65% of India's population is dependent on agriculture and allied enterprises. The population of female crossbred cattle stand at 46.95 million (Krishi Jagran, 2019) and milk production is about 28 % contributed of the total milk produced in country. During last five decades, interest in crossbreeding has increased in several countries due to its well-established benefits due to heterosis, where the crossbred animals are more robust and more efficient in terms of economics in comparison to the parental breeds (Kumar *et al.,* 2018). In developing countries, more than 70% of the expenditure, in dairy farming is on the feeding of animals. Most of the farmers are, not aware of the benefits of quality feeding and that of balanced diet. In India, concentrate feeding to animals is neglected due to poor economic condition of farmers. The milch animals are deprived of concentrate during dry period as well as in milking stage and thus these dairy animals are deprived of essential nutrients. These nutrients are very much essential to fulfil the requirements of growth and maintenance of foetus, placenta, and uterus as well as to replenish the body tissue losses due to milk production postpartum. This lack of concentrate feeding along with low availability of good quality fodders is the major reason behind the poor productivity of our crossbred cattle population. Many reports are available on challenge feeding however, the

How to cite this article: Singh, N., Kahate, P.A. and Shelke, R.R. (2022). Economic Impact of Challenge Feeding on Milk Production of Crossbred Cows. *J. Anim. Res.,* **12**(01): 93-98.

Source of Support: None; **Conflict of Interest:** None

information showing the effect of Challenge feeding on performance and economic of animal is good under Indian condition. The present work was under taken up to make comparative study of challenge feeding.

MATERIALS AND METHODS

The present investigation entitled "Economic Impact of Challenge Feeding on Milk Production of Crossbred Cows" was conducted at Livestock Instructional Farm, Department of Animal Husbandry & Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2018-19.

Selection of Animals

Eighteen pregnant crossbred cows were selected 2 months prior to calving according to data obtained from breeding records of animals. As and when available animals were selected and divided in 3 groups based on parity, body weight and milk yield of previous lactations to maintain homogeneity among experimental animals (Table 1). The same process was adopted till there were six animals in each treatment group. The experimental animals were separated from the main herd 7-10 days before start of experiment to make the experimental animals adjust to the new environment.

Duration of experiment

The present study was conducted for a period of 60 days pre-partum to 60 days postpartum. The total duration of the experiment was approximately 6 months as all the animals were not available at the same time.

Feeding and Management

Eighteen dry pregnant crossbred cows were selected from the Instructional Farm of the university on the basis of Parity, body weight, previous lactation yield and expected date of calving (Table 1). The experiment lasted 60 days pre-partum and 60 days post-partum period duration. The animals divided into three equal groups were offered feed animals of T_1 control group were fed 1 kg concentrate for maintenance per day from 60th day to prior to calving till the day of parturition. T_2 group animals were fed 1 kg concentrate for maintenance plus 1.5 kg concentrate as challenge feed per day from 60th day to 22nd day prior to calving and from 22nd day prior to calving till parturition animals were fed 1 kg concentrate for maintenance plus 2 kg concentrate as challenge feed per day. T_3 group animals were fed 1 kg concentrate for maintenance plus 2 kg concentrate as challenge feed per day from 60th day to 22nd prior to calving and from 22nd prior to calving till parturition animals were fed 1 kg concentrate for maintenance plus 2.5 kg concentrate as challenge feed per day. During the postpartum period, animals of T_1, T_2 and T_3 group were fed based on their milk yield *i.e.*, 1 kg concentrate per day for maintenance and 1 kg concentrate per 2.5 kg of milk production.

The animals were fed individually. Water was available to the animal around the clock. The animals were weight twice in week before offering them any feed or fodder in morning. All the animals in both the treatment groups were maintained under uniform housing conditions. All the animals were housed in the shed for the entire period of experiment except before 8 days of calving all the animal were transferred in the individual calving pens. Immediately after parturition, the animals were closely watched for incidence of any metabolic disorder like parturient paresis, ketosis and other disease mastitis, which were treated accordingly by the Veterinarian. All the Eighteen crossbred cows were milked by hand milking twice a day *i.e.*, 6 A.M., 5 P.M. As a usual practice the animals were washed before milking. Before each milking teats and udders were massaged to initiate let-down of milk. The animals were handled gently and calmly. Milk yield was recorded after each milking.

Milk yield and composition of milk

The colostrum yield was recorded twice a day for the first 5 days after calving i.e., 7 A.M. and 5 P.M. The animals were cleaned in stanchions in milking byres. The udders and teats were cleaned with a milk antiseptic solution. All the necessary precautions for clean milking were followed. After milking yield of individual animals were recorded. Milk obtained from twice times milking was combined together to get the actual milk yield of the cows for the day. Thus, milk yield records of the experimental animals for a period of 60 days postpartum were recorded. Weekly samples of individual animal were collected during milking time (morning, evening) in a cleaned

plastic bottle. The milk samples collected during 2 times were stored below 5 ºC. Milk samples were analysed for fat, solid-not-fat, total solids using Gerber method for fat analysis and Gravimetric method for Total solid.

STATISTICAL ANALYSIS

The data obtained was analyzed by Randomized Block Design (RBD) as per the procedure described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The results of challenge feeding of crossbred cows on Dry matter intake, Milk production, Peak milk yield, days taken to achieve peak milk Yield, and economics of challenge feeding on milk yield production.

Dry matter intake

The dry matter intake includes pre-partum and post-partum average daily dry matter intakes of cows in all treatment are presented in table 3. The feed intake in crossbred cows during pre-partum period 18.00, 19.58 and 21.17 kg in T_1, T_2 and T_3 group respectively. The feed intake was significantly higher in T_3 as followed by T_1 and T_2 group of cows while lowest in treatment T_1. The average daily intake

Table 1: Details of experimental animals

Groups*	Sl. No.	Animal No.	Lactations completed	Average lactation yield of previous lactations (kg)	Body weight (kg)
T_1	1	CB- 732	1	1640	241
	2	CB- 696	2	1701	340
	3	CB- 791	3	1760	282
	4	CB- 779	2	1680	316
	5	CB- 752	2	1780	304
	6	CB- 756	1	1650	294
Average			**1.83 ± 0.30**	**1701.8 ± 23.43**	**296.16± 13.69**
T_2	7	CB- 695	3	1680	262
	8	CB- 664	2	1720	335
	9	CB- 772	1	1750	280
	10	CB- 773	2	1620	320
	11	CB- 757	3	1790	305
	12	CB- 762	1	1660	290
Average			**1.83 ± 0.30**	**1703.33±25.38**	**298.66± 10.92**
T_3	13	CB- 788	1	1710	261
	14	CB- 731	3	1770	334
	15	CB- 746	2	1750	278
	16	CB- 730	2	1690	317
	17	CB- 776	3	1650	302
	18	CB- 778	1	1680	289
Average			1.83 ± 0.30	1708.33±18.33	296.83± 10.82

*T_1: Control group T_2 & T_3: Treatment group.

Table 2: Chemical composition of feedstuff (%DM) basis)

Sl. No.	Name of fodder crop	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	Total ash (%)
1	Berseem	14.38	16.34	22.3	3.2	51.9	15.4
2	Maize	23.3	7.9	28.7	1.9	48.53	7.0
3	Hy. Napier	21.4	1.8	35.76	2.40	44.18	10.16
4	Soybean straw	90.51	6.81	38.32	1.65	41.36	11.86
5	Concentrate	90.80	17.63	11.68	2.72	64.08	3.89

of dry matter during pre-partum period was 7.82, 9.04 and 10.09 kg per cows in T_1, T_2 and T_3 group respectively. The cows from T_3 group consumed more DM than that of T_1 and T_2 group. Higher intake of DM per 100 kg body weight was observed in treatment T_3 and lowest in T_1. The present results of investigation are agreement with Vandehaar *et al.* (1999) and Keady *et al.* (2001) reported that higher feeding of regime in pre-partum periods increases the dry matter intake significantly.

The feed intake in crossbred cows during post-partum period 20.01, 21.47 and 22.64 kg in T_1, T_2 and T_3 respectively. The feed intake was significantly higher in T_3 as compare to T_1 and T_2 group respectively. The overall means of daily dry matter intake during two months of postpartum period were 9.66, 10.74 and 11.40 kg for T_1, T_2 and T_3 group respectively. The average daily dry matter intake of the T_3 group was significantly higher ($P<0.05$) over the T_1 and T_2 group during the postpartum period.

The overall mean of DMI per 100 kg BW during the postpartum period were 3.12, 3.37 and 3.57 kg in T_1, T_2 and T_3 treatment groups respectively. The average daily DM intake per 100 kg BW in treatment T_3 was significantly higher over to T_1 and T_2 groups. Also, the treatment T_2 was higher than the treatment T_1 group. This is might be due to increase the concentrate in challenge feeding. The present results of investigation are agreement with Agenas *et al.* (2003) reported that the pre-partum DMI corresponded well with the experimental design but there was no significant difference in postpartum DMI of the three treatment groups.

The overall mean daily milk yield per cows was in 1st week 5.55, 7.66 and 8.65 kg for T_1, T_2 and T_3 group respectively. The milk yield was also increasing significantly ($P<0.05$) in all weeks. The daily milk yield of cow in week 8th was 6.96, 9.58 and 11.03 kg in T_1, T_2 and T_3 group respectively. Cows fed the challenge diet in this study might be due to positive energy balance in pre-partum as well as postpartum as compared with control (T_1) group of cows and this might be resulted in their higher average daily milk yields.

This positive effect on milk yield due to challenge feeding was also reported by Singh *et al.* (2003) and Das *et al.* (2007).

On the perusal of data, it is revealed that mean peak yield of the cows of T_2 and T_3 group (11.16 ± 0.47 and 12.50 ± 0.42 kg) was higher than the T_1 group (7.16 ± 0.30 kg). However, the difference in peak milk yields of the cows of the treatment groups was found statistically significant. The highest peak milk yield of the individual animal in T_1, T_2 and T_3 groups was 8, 13 and 14 kg and the lowest peak yield was 6, 10 and 11 kg, respectively. The higher plane

Table 3: Effect of challenge feeding on Dry matter intake during pre-partum and post-partum period

Particulars	T_1	T_2	T_3	F-test	SE(m)	CD at 5%
Pre-partum DMI (kg/day)						
Average daily feed intake	18.0	19.58	21.17	Sig.	0.20	0.60
Average DMI	7.82	9.04	10.09	Sig.	0.01	0.04
Average DMI/100kg BW	2.55	2.84	3.16	Sig.	0.04	0.12
Post-partum DMI (kg/day)						
Average daily feed intake	20.01	21.47	22.64	Sig.	0.12	0.40
Average DMI	9.66	10.74	11.40	Sig.	0.02	0.08
Average DMI/100kg BW	3.12	3.37	3.58	Sig.	0.04	0.12

Table 4: Effect of challenge feeding on Milk production

Particulars	T_1	T_2	T_3	F-test	SE(m)	CD at 5%
Milk yield (kg/day) in 8th week	6.96	9.58	11.03	Sig.	0.09	0.31
Mean peak yield (kg)	7.16	11.16	12.50	Sig.	0.26	0.84
Time taken to attain peak yield (days)	40.33	49.33	53.66	Sig.	0.74	2.36

Table 5: Economics of challenge feeding

Particulars	T_1	T_2	T_3
Average daily milk production per cow (kg)	6.51	8.94	10.07
60-day total milk production per cow (kg)	390.6	536.4	604.2
Amount from sale of milk (in ₹ 40/litre.)	15624	21456	24168
Total concentrate mixture consumed during pre-partum & post-partum period (kg)	276	434.7	491.7
Cost of total concentrate mixture (₹ 20/ kg)	5520	8694	9834
Total income (₹)	10104	12762	14334
Cost of milk per litre	25.90	23.79	23.72

of pre-partum and postpartum nutrition may have provided impetus to the animals of treatment group towards higher peak yield of milk.

These findings are in accordance of the findings of researchers were reported by Singh *et al.* (2003) who reported significant higher peak yield in animals fed at higher level than those fed at lower level. From the table 4 revealed that the mean number of days required to attain peak yield in cows of T_1, T_2 and T_3 group were 40.33 ± 0.66, 49.33 ± 0.80 and 53.66 ± 0.49 days respectively. The cows of T_1 group attained peak yields earlier than the cows of T_2 and T_3 treatment group at 5 % level.

The present results of investigation are agreement with Kale (1984) and Bhat *et al.* (2000) reported that extra feeding prior and during lactation has no significant effect on days taken to achieve peak milk yield. Das (2000) also reported that animals of control group achieved peak milk yield significantly earlier than treatment group of animals fed on higher level of concentrates pre-partum (26 days vs 35 days).

The total milk yield obtained per cow of T_1, T_2 and T_3 group during first 60 days of lactation was thus calculated as 390.6, 536.4 and 604.2 kg respectively. Since the milk is sold on basis of fat percentage, and the selling price was taken into account as ₹ 40 per litre and amount from sale of milk was ₹ 15624, 21456 and 24168 in T_1, T_2 and T_3 group respectively. The total concentrate mixture consumed during entire pre-partum and post-partum period was 276, 434.7 and 491.7 kg per cow by the animals of T_1, T_2 and T_3 group respectively. The cost of per litre milk production was 25.90, 23.79 and 23.72 in T_1, T_2 and T_3 group of cows respectively by providing the extra concentrate as challenge feeding during dry period of cows. The present result of cost of milk production is agreements with Singh *et al.* (2003) and Bindal (2012).

CONCLUSION

The practice of challenge feeding of crossbred cows improved the production performance and calf birth weight during early lactation without affecting their peri-parturient health and calf birth weight increased T_2 and T_3 group over control group by 18.09 and 23.61 per cent respectively. The practice of challenge feeding was found economical in view of cost of per litre of milk production. The cost of milk production per litre in T_1, T_2 and T_3 were 25.90, 23.79 and 23.72 during the early stage of lactation.

ACKNOWLEDGMENTS

The authors acknowledged the Dean (Agriculture), Dr. PDKV, Akola, Associate Dean, Post Graduate Institute and Head Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) providing necessary facility and support to carry out this research work.

REFERENCES

Agenas, S., Burstedt, E. and Holtenius, K. 2003. Effects of feeding intensity during the dry period Feed intake, bodyweight, and milk production. *J. Dairy Sci*., **86**: 870–882.

Alam, M.G.S., Rahman, M.A., Khatun, M. and Ahmed, J.U. 2009 Feed supplementation and weight change, milk change, and milk yield and post-partum oestrus in *desi* cows. *The Bangladesh Vet.,* **26**(2): 39-47

Bhat, A.S., Parmar, O.S. and Gill, R.S. 2000. Economic impact of challenge feeding on milk yield and its composition in high yielding crossbred cows. *Indian J. Dairy Sci*., **53**(2): 93-98.

Bindal, S. 2012. Effect of challenge feeding on performance and economics of milk production of crossbred cows. M.V.Sc. Thesis submitted to National Dairy Research Institute Karnal, Haryana.

Chaudhary, J.L. and Jat, H.R. 2013. Effect of feeding different levels of whole cottonseed (*Gossypium* spp.) on performance of lactating buffaloes. *Anim. Nut. Feed Technol.*, **13**: 99 – 107.

Das, K.S. 2000. Studied on prepartum management and its relationship with subsequent production and reproduction in crossbred dairy cows. Ph.D. Thesis submitted to Indian Veterinary Research Institute, Izatnagar.

Das, K.S., Das, N. and Ravikumar, G.V.P.P. 2007. Effect of 'steaming-up' on subsequent production in dairy cows. *Indian J. Anim. Sci.,* **77**(7): 583-585.

Deen, A.U., Tyagi, N., Yadav, R.D., Kumar, S., Tyagi, A.K. and Singh, S.K. 2018. Feeding balanced ration can improve the productivity and economics of milk production in dairy cattle: a comprehensive field study. Tropical Anim. Health Prod., DOI. 10.1007/s11250-018-1747-8.

Godara, A.S, Tomar, A.K.S., Triveni, D., Patel, B.H.M., Kumari, A., Singh, M. and Verma, M.R. 2017. Effect of post-partum body condition score on productive, reproductive and calf birth weight performance in Tharparkar Cattle. *Int. J. Livest. Res*., **7**(4): 166-171.

Kamboj, M.L., Mengistu, R.A., Bindal, S. and Datt, C. 2016. Challenge feeding and milk production performance in crossbred cows. *Indian J. Anim. Nut*., **33**: 285-289.

Keady, T.W.J., Mayne, C.S., Fitzpatrick, D.A. and McCoy, M.A. 2001. Effect of concentrate feed level in late gestation on subsequent milk yield, milk composition, and fertility of dairy cows. *J. Dairy Sci.*, **84**: 1468– 1479.

Panigrahi, B., Pandey, H.N. and Patnaik, A.K. 2005. Effect of prepartum feeding of crossbred cows on growth performance, metabolic profile and immune status of calves. *Asian-Aust. J. Anim. Sci.*, **18**: 661-666.

Prasad, S. and Tomar, O.S. 1995. Effect of prepartum level of conditioning of certain calving and related parameters in crossbred cows. *Indian J. Anim. Prod. Mgmt*., **11**: 139-42.

Sarker. N.R., Bashar. M.K., Hossain. S.M.J., Alam. M.K and Huque. K.S., 2015. Study on Feeding Effect of Different Levels of Protein and Energy on Production Performance of Pregnant Mother and Neo-Natal Calves. *J. Agric. Sci. Technol. A*. **5**: 81-89.

Singh, J., Singh, B., Wadhwa, M. and Bakshi, M.P.S. 2003. Effect of level of feeding on the performance of crossbred cows during pre-and post-partum periods. *Asian Australas. J. Anim. Sci*., **16**(12): 1749-54.

Sushil Kumar, Alex R., Gaur G.K., Mukharjee S.S., Mandal D. K., Singh U., Tyagi S., Kumar A., Das A. K., Deb R., Kumar M., Sirohi A. S., Chand N., Prasad R., Bhasin V., Prakash B. and Kashyap S. 2018. Evolution of frieswal cattle: A crossbred dairy animal of India. *Ind. J. Anim. Sci*., **88**(3): 265-275.

Vandehaar, M.J., Yousif, G., Sharma, B.K., Herdt, T.H., Emery, R.S., Allen, M.S. and Liesman, J.S. 1999. Effect of energy and protein density of prepartum diets on fat and protein metabolism of dairy cattle in the periparturient period. *J. Dairy Sci*., **82**: 1282-1295.