Indian Journal of Agricultural Economics
Volume 77, Number 2, April-June 2022

RESEARCH NOTES

Feed Cost and Return Over Feed Cost of Holstein Friesian x Kankrej Crossbred Cows Reared under Different Feeding Regimes

Manzarul Islam* and Shailesh Shah†

ABSTRACT

An experiment was conducted to study the effect of different feeding regimes on feed cost and return over feed cost of crossbred cows. For the purpose a study was conducted on 18 crossbred cows, distributed into three treatment groups comprising six animals in each group. Considering the amount of milk produced during lactation period, net profit was maximum in T_2 group followed by T_3 and T_1 groups. It may be concluded from the present study that even after spending less amount on feed, the performance of the modified feeding group was at par in terms of milk production and net profit with farm feeding group.

Keyword: Feeding regimes, Feed cost, Return over feed cost, Crossberd cows

JEL.: O13, Q11, Q13

I

INTRODUCTION

The livestock sector plays a significant role in the welfare of India's rural economy. Milk production alone involves more than 30 million small producers, each raising one or two cows or buffaloes. As per 20th Livestock Census, out of 536.76 million livestock in the country, around 36.04 per cent (193.46 million) are cattle population. The population of indigenous cattle is declining while crossbred cattle is increasing, which constitute 51.36 million (26.54 per cent) of the total cattle population in India. Annual milk production in India during 2019-20 was 198.4 million tonnes, and with contribution of 22 per cent to global milk production, India ranks first in the world. The per capita availability of milk in India was 406 g/d (BAHS, 2020).

In developing countries like India, 70 per cent of expenditure in dairy farming is on the feeding of animals (Singh *et al.,* 2003). Most of the poor and illiterate farmers are not aware of the benefits of quality feeding leading to underfeeding of animals in field conditions (Khan *et al.,* 2004). Improper feeding during this phase could lead to low birth weight of new born calf, delayed post-partum estrus, and obviously low milk production of cows (Sasser *et al.,* 1988). The success of livestock farming greatly depends on the continuous supply of good quality balanced feed (Suharyono *et al.,* 2018). Green roughage feeding to livestock is restricted to certain parts of our country. Animals are maintained on straw-based rations, and on such rations, often they suffer

*Pashupalan Sanshodhan Kendra, Veterinary College, AAU, Ramna Muvada, Gujarat, and †Department of Livestock Production Management, Veterinary College, KU, Anand, Gujarat.

from malnutrition (Kumar *et al.,* 1980). The relationship between feed intake during the pregnancy of cow, post-partum milk production, milk composition, early embryonic death, reduced viability, and low birth weight of calves are of considerable practical importance in dairy cattle farming (Mc Donald *et al.*, 1985; Khan *et al.*, 2004). The livestock sector is providing the highest employment opportunities next to agriculture. In the changed scenario, rearing of milch animals is gaining importance among rural households. As there is an inverse relationship between rural poverty and livestock share in agricultural value of output, the expansion of the livestock sector among resource-poor people will help in reducing their poverty level. At present, the procurement price of milk is determined by two-axis formula based on fat and SNF content of milk without considering the cost structure of milk production. The major share in the total cost of milk production is variable cost (87 per cent), which is completely ignored while fixing the milk price. Presently, dairy farmers are getting about 25-30 per cent profit margin over the total cost of milk production/litre. It is advisable to fix milk price considering fat, SNF, and the cost of milk production (Kaur *et al.,* 2012). This study has planned to estimate feed cost and return over feed cost from crossbred cows reared under different feeding regimes.

II

MATERIALS AND METHODS

The present experiment was conducted at Livestock Research Station (LRS), College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, Gujarat, India, during the year 2018-19. The study was conducted on 18 dry pregnant HF x Kankrej (50:50) crossbred cows. Experimental animals were randomly selected on the basis of first lactation milk (300 d) yield, calving sequence (parity), and body weight (kg) in sequence. The experiment was conducted from 45 d prior to calving (advance pregnancy) to 300 d post-partum. Animals were distributed into three treatment groups comprising of 6 animals in each. Animals of T_1 (Farmer's feeding) group were maintained as per the feeding regime, followed by small and marginal farmers. Concentrate feed was not given during pre-partum period and fed @ 50per cent of milk production in the lactation period. Calving mixture (500 g/cow) was prepared by mixing equal proportion of Purple Fleabane (*Centratherum anthelminticum*), Garden Cress (*Lepidium satuvum*) and Dill Seeds (*Anethum graveolens*). Cows of only T_1 group were fed daily @ 100 g after boiling and mixing with 250 g jaggery from the day of parturition to 5 d post-partum. Animals were devoid of mineral mixture and fed with paddy straw on *ad-lib.* basis and 10 kg/animal/d hybrid napier green fodder. Feeding of animals of T_2 (Modified feeding) group comprised of feeding with scientific interventions with resources available with farmers. Animals were provided concentrate feed @ 1 kg/animal/d during pre-partum and @ 50per cent of milk production in the lactation period. The mineral mixture was provided to animals @ 30 g/animal/d throughout. Pigeon pea straw and paddy straw (50:50 ratio) were given to animals on *ad-lib.* basis and 10 kg/animal/d hybrid napier green fodder were

given to the animals. Animals of T_3 (Farm feeding) group were fed as per standard feeding followed at LRS. Concentrate feed was given for steaming up in pre-partum period, starting from 500 g/animal/d in the first week of the experiment and increasing by 500 g every week, reaching 3.5 to 4.0 kg/animal/d till parturition. During the lactation period, concentrate feed was given @ 40per cent of milk production plus 1 kg maintenance/animal/d. Animals were fed with 50 g/animal/d mineral mixture. Jowar hay was fed to the animals on *ad-lib.* basis and 10 kg/animal/d hybrid napier green fodder was fed to the animals. The cost of feeding (Rs.) under different feeding regimes was calculated from the record of feed consumption and by the annual average cost of feed ingredients which was prevailing for farmers throughout the year (Table 1) used for feeding experimental animals. The sale price of milk to AMUL was calculated on the basis of minimum, and maximum fat and SNF observed during the experiment, and the cost per kg milk yield was calculated for the individual animals (Table 2). The formulae for calculating price of milk was obtained from Amul.

TABLE 1. COST OF FEEDS AND FODDERS USED FOR FEEDING EXPERIMENTAL ANIMALS

Sr. No.	Feeds and Fodders	Cost (Rs) per kg
(1)	(2)	(3)
1)	Concentrate feed (Amul dan)	17.52
2)	Jowar hay	8.50
3)	Hybrid napier fodder (CO-3)	1.00
4)	Pigeon pea straw	7.50
5)	Paddy straw	4.00
6)	Mineral mixture	100.00

TABLE 2. COST OF MILK (RS./KG) FOR INDIVIDUAL ANIMALS OF THE EXPERIMENT

Animal No.	T_1	T_2	T_3
(1)	(2)	(3)	(4)
1)	29.38	30.49	32.55
2)	28.62	29.91	31.11
3)	30.20	31.16	29.55
4)	28.79	28.14	31.52
5)	30.18	31.39	32.30
6)	30.44	30.90	28.43

The observations of various parameters recorded during the experimental period were statistically analysed by Completely Randomized Design (Factorial) as described by Snedecor and Cochran (2002) using SAS software 9.3 version. Some of the data were also analysed by one-way ANOVA using SPSS software 20.00 version.

III

RESULTS AND DISCUSSION

Feed Intake and Milk Yield

Average fortnightly DMI either kg/animal/d or kg/100kg b.wt. was significantly ($p<0.05$) more in T_2 and T_3 as compared to T_1 group. Average fortnightly milk yield

and average 4 per cent Fat Corrected Milk (FCM) yield was significantly ($p<0.05$) higher in T_2 and T_3 as compared to T_1 group. Lactation yield was highest in T_3 followed by T_2 and T_1 groups. However, there was no significant difference among treatment groups. Average peak milk yield was found to be maximum in T_3 followed by T_2 and T_1. Although there was non-significant difference due to high variation within treatment groups, average peak yield was quite high in T_2 and T_3 compared to control group which might be due to feeding effect (Table 3).

TABLE 3. FEED INTAKE AND MILK YIELD OF CROSSBRED COWS DURING THE EXPERIMENT

Parameters	Treatments		
	T_1	T_2	T_3
Feed intake			
DMI (kg/animal/d)	9.71^{a}±0.20	12.45^{b}±0.28	12.62^{b}±0.22
DMI (kg/100kg b.wt.)	2.24^{a}±0.05	2.74^{b}±0.06	2.81^{b}±0.06
Milk yield			
Average fortnightly milk yield (kg/animal/d)	7.65^{a}±0.28	10.51^{b}±0.44	10.41^{b}±0.39
Average fortnightly FCM yield (kg/animal/d)	7.54^{a}±0.27	10.51^{b}±0.41	10.59^{b}±0.41
Lactation yield (kg)	2143.65±194.13	2843.37±473.71	2837.63±417.42
Peak milk yield (kg/animal/d)	12.87±1.09	16.10±2.45	16.33±1.37

Means with dissimilar superscripts in a row differed significantly ($p<0.05$).

Cost of Feeding Animals

Feed cost during pre-partum period was 27.84±1.27, 67.07±4.03, and 115.37±5.91 Rs./animal/d, respectively in T_1, T_2, and T_3 groups which differed significantly ($p<0.05$) among each other. The very low cost of feeding in T_1 group was due to sudden change in feeding regime. Before the experiment (adaptation period) started, the cows were on routine farm feeding. By switching from farm feeding to only straw feeding (experimental feed) the intake of feed was reduced to great extent. Feed cost during the lactation period was 99.43±6.37, 143.95±13.96, and 165.89±12.82 Rs./animal/d in T_1, T_2, and T_3 groups, respectively. Feed cost was significantly ($p<0.05$) less in T_1 group as compared to T_2 and T_3 groups during the lactation period. Although there was quite a difference in the cost of feed between T_2 and T_3 groups during the lactation period, a significant difference was not achieved. Similarly, the cost of feed during the whole experimental period was significantly ($p<0.05$) higher in T_2 (131.31±12.22) and T_3 (157.53±11.74) as compared to T_1 (87.76±5.29) group. Even there was quite a difference in the cost of feed between T_2 and T_3 groups during the experimental period; a significant difference was not achieved. Cost of feeding (Rs./animal/d) was similar before (144.02±7.51) and after (146.60±5.4) ration balancing as per the study of Garg *et al.* (2016), which is not in accordance with the present findings.

Feed Cost and Total Cost Per Kg Milk Yield

The cost of feed per kg milk yield was 14.05, 15.69, and 17.17 in T_1, T_2, and T_3 groups, respectively. However, the cost of feed per kg FCM yield was 14.24, 15.50,

and 17.08, respectively, in T_1, T_2, and T_3 groups. Cost of feed, neither per kg milk yield nor per kg FCM yield differed significantly among each other. Cows in T_2 group produced 700 kg more milk than cows of T_1 group with somewhat more cost of feeding. Although the feed cost per kg milk yield was lower in T_2 group, milk yield was similar to T_3 group. Considering feed cost as 70 per cent of the total cost of milk production (Singh *et al.*, 2003), total cost per kg milk yield was Rs. 20.07, 22.41, and 24.53 in T_1, T_2, and T_3 groups, respectively. Corresponding value on FCM yield basis was Rs. 20.34, 22.14, and 24.39, respectively, in T_1, T_2, and T_3 groups. The margin of profit per litre of milk was maximum in T_1 followed by T_2 and T_3 groups. Considering the total amount of milk produced, maximum profit was observed in T_2 group as compared to the other two groups.

The cost of cow milk production was Rs. 14.29/lit, while profit/lit of milk production was Rs. 3.34 in cow milk, as reported by Kaur *et al.* (2012). In the present study, the cost of milk production varied from Rs. 20.07 to 24.53 in different groups with different feeding regimes. Considering the year of study of Kaur *et al.* (2012), the results are in accordance with present findings. According to Garg *et al.* (2016) cost of ration per kg milk yield was Rs. 14.31±0.46 before ration balancing, which decreased to Rs. 12.93±0.26 after ration balancing. Similar results were obtained by Sherasia *et al.* (2015), where the cost of feeding (Rs.) decreased significantly ($p<0.01$) from Rs. 17.0±0.79 (before ration balancing) to Rs. 14.1±0.43 (after ration balancing), which supports the present findings. As per the report of Kumawat *et al.* (2014) average cost of production per litre of milk was Rs. 14.27, and the average net return per litre of milk was Rs. 8.28. Considering year of work, the results are in accordance with the present findings.

Return over Feed Cost and Total Cost

Return over feed cost (Rs.) either per kg milk yield or per kg FCM yield was maximum in T_1 (2.13 and 2.10) followed by T_2 (2.03 and 2.06) and T_3 (1.83 and 1.85), respectively. The corresponding value for return over total cost (Rs.) was also maximum in T_1 (1.49 and 1.47), followed by T_2 (1.42 and 1.44) and T_3 (1.28 and 1.29), respectively. Return over feed cost per kg of milk production was found to be Rs. 2.66, 2.31, and 2.22 in cows fed 120per cent NRC for last 60 d of gestation, 120 per cent NRC for last 120 d of gestation, and 100per cent NRC, respectively, as reported by Singh *et al.* (2003), which is contradictory to the present findings. The input-output ratio was worked out at 1.58 as per the study of Kumawat *et al.* (2014), which is lower in the present study.

Income from the Sale of Milk

Income from the sale of milk (Rs./animal) was highest in T_3 (88332.79), followed by T_2 (85638.13) and T_1 (63519.92). Corresponding values from FCM yield were 62545.92, 85701.69, and 89870.49 in T_1, T_2, and T_3, respectively.

Net Profit Per Animal Per Day

On a feed cost basis: Net profit (Rs./animal/d) for lactation period either on milk yield or FCM yield basis was highest in T_2 (163.00 and 163.63) followed by T_3 (153.28 and 157.70) and T_1 (125.74 and 122.37), respectively. Corresponding values for the experimental period were highest in T_2 (130.78 and 131.27) followed by T_3 (114.85 and 118.80) and T_1 (104.51 and 101.59) groups, respectively.

On a total cost basis: Net profit (Rs./animal/d) for lactation period on milk yield basis was highest in T_2 (100.53) followed by T_1 (82.48) and T_3 (81.48) groups and on FCM yield basis also net profit was highest in T_2 (101.15) followed by T_3 (85.90) and T_1 (79.11) groups. During the experimental period, net profit either on milk yield or FCM yield basis was highest in T_2 (73.02 and 73.51) followed by T_1 (65.63 and 62.72) and T_3 (46.00 and 49.95) groups, respectively.

Net Profit Per Animal

On a feed cost basis: Net profit (Rs./animal) for lactation period either on milk yield or FCM yield basis was highest in T_2 (45335.81 and 45398.37) followed by T_3 (42392.03 and 43929.73) and T_1 (35312.37 and 34338.37) groups, respectively. Corresponding values for the experimental period were highest in T_2 (42318.17 and 42380.73) followed by T_3 (37054.12 and 38591.82) and T_1 (34075.64 and 33101.64), respectively.

On a total cost basis: Net profit (Rs./animal) for lactation period on milk yield basis was highest in T_2 (28062.96) followed by T_1 (23223.41) and T_3 (22703.13) groups and on FCM yield basis also net profit was highest in T_2 (28125.52) followed by T_3 (24240.83) and T_1 (22249.42) groups. During the experimental period net profit either on milk yield or FCM yield basis was highest in T_2 (23752.04 and 23814.60) followed by T_1 (21456.66 and 20482.66) and T_3 (15077.55 and 16615.25), respectively.

It was observed in the present experiment that by investing additional Rs. 4764/ animal in feeding (additional cost of pigeon pea straw instead of paddy straw) during the experimental period, an additional income of Rs. 9279/animal was generated in T_2 group as compared to T_1 group.

IV

CONCLUSION

The cost of feed either per animal per day or per kg milk yield was highest in T_3 group followed by T_2 and T_1, indicating that even after spending less amount on feed, the performance of the modified feeding group (T_2) was at par in terms of milk production with farm feeding group (T_3). Further, net profit per animal per day was highest in T_2 followed by T_3 and T_1 groups. It is advisable for dairy farmers to feed a

combination of straws (paddy and pigeon pea) in 50:50 ratio and mineral mixture to increase profit from milk production.

Received January 2022. *Revision accepted June 2022.*

REFERENCES

Basic Animal Husbandry Statistics. (2020), Department of Animal Husbandry & Dairying. Ministry of Fisheries Animal Husbandry and Dairying, Government of India. New Delhi. (https://dahd.nic.in/animal-husbandry-statistics).

Garg, M.R.; B.M. Bhanderi, A. Goswami and S. Shankhpal (2016), "Effect of Balanced Feeding on SNF Content of Milk: A Field Study", *International Journal of Development Research*, Vol.6, No.11, pp.10054-10059.

Kaur, I.; V.P. Singh, H. Kaur and P. Singh (2012), "Cost of Milk Production in Punjab: A Pre-Requisite for Pricing Policy", *Indian Research Journal of Extension Education*, Vol.1, pp.313-321.

Khan, M.A.A.; M.N. Islam, M.A.S. Khan and M.A. Akbar (2004), "Effects of Feeding High and Low Energy Levels During Late Pregnancy on Performance of Crossbred Dairy Cows and Their Calves", *Asian-Aust. J. Anim. Sci.*, Vol.17, No.7, pp.947-953.

Kumar Amrith, M.N.; K. Sundereshan, J. Suryanarayana, T.R. Murthy and S.R. Sampth (1980), *Availability of Nutrients to Graded Buffaloes in East- Godavari District, Andhra Pradesh.* Paper presented in the Seminar on Buffalo Reproduction, Hyderabad, India.

Kumawat, Raju.; N.K. Singh and C.L. Meena (2014), "Economic Analysis of Cost and Returns of Milk Production, Extent of Adoption of Recommended Management Practices on Sample Dairy Farms in Bikaner District of Rajasthan", *Global Journal of Science Frontier Research (D),* Vol.24, No.5(I), pp.47-53.

McDonald, P.; R.A. Edwards and J.F.D. Greenhalgh (1985), *Animal Nutrition (3rd ed.*) Longman Group Limited. Longman House. Burnt Mill. Harlow Essex, CM20 2 JE, England.

Sasser, R.G.; R.J. Williams, R.C. Bull, C.A. Ruder and D.G. Falk (1988), "Post-Partum Reproductive Performance in Crude Protein Restricted Beef Cows: Return to Estrus and Conception", *J. Anim. Sci.*, Vol.66, No.12, pp.3033-3039.

Sherasia, P.L.; B.T. Phondba, S.A. Hossain, B.P. Patel and M.R. Garg (2015), "Impact of Feeding Balanced Rations on Milk Production, Methane Emission, Metabolites and Feed Conversion Efficiency in Lactating Cows", *Indian Journal of Animal Research*, Vol.50, pp.505-511.

Singh, J.; B.M. Singh, M. Wadhwa and M.P.S. Bakshi (2003), "Effect of Level of Feeding on the Performance of Crossbred Cows during Pre and Post-Partum Periods, *Asian-Aust. J. Anim. Sci.*, Vol.6, pp.1749-1754.

Snedecor, G. W. and W.G. Cochran, (2002), *Statistical Methods*. 7th ed, The Iowa State University press, Ames, Iowa, USA.

Suharyono.; S.N.W. Hardani, P.D. Sitoresmi and Adiarto (2018), *Effect of Feed Supplementation in Holstein Friesian Crossbred Cows at First Quarter on the Production and Quality of Milk.* Paper presented at the IOP Conference Series: Earth and Environmental Science. Vol.119, pp.1-12.