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Analysis of Rearing Cost of Vrindavani Heifers at Different Stages of Growth

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Abstract

The present study was conducted in Vrindavani breed of cattle at Farm of Livestock Production and Management, Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly, Uttar Pradesh for the estimation of rearing costs of heifers at various ages. The actual live body weights (LBW) at different ages in Vrindavani heifers were considered for the estimation of rearing costs which were 21.94, 45.72, 83.38, 145.32, 217.03 and 276.30 kg for LBW of heifers at birth, 3, 6, 12, 18 and 24 months of age, respectively. In the current study, the highest-producing and equally most profitable herds achieved the earliest AFC, at 780 d ($P < 0.05$), but also the highest culling rate of 38% ($P < 0.05$). The group of high-producing herds in the current study showed the lowest death rate for calves (2.43%) and second-lowest total loss of calves (8.33%). Feed is the greatest input cost contributing 43.8% overall if grazing was also included. The other main costs were labour (22.3 ± 10.1%), bedding (8.7 ± 4.4%) and disposal of slurry and soiled bedding (7.1 ± 3.8%).

Key words : *Dairy, vrindavani, parity, culling, calving, management.*

Introduction

Dairy farming in India is under pressure because of the high variable input cost and poor returns. In a dairy farm, many young heifers are required as replacement and these heifers are the future revenue-generating units. However, least importance is given towards the replacement of heifer management rather all aim focussed towards increasing the production and income generation. During the pre-productive period of heifers, a significant expenditure is involved in their management. The cost to raise heifers has been averaged Rs. 60,000/- from birth to calving, with feed representing 73% of the total costs (1). Efficiency was attained by herds with the lowest input costs, but herds with higher input costs could also be efficient if age at first calving ((AFC) was low and milk production was high for heifers compared with the rest of the herd.

Moreover, the animals having similar amount of milk yielding capabilities, but the one attaining late peak yield is desirable for selection than the early peak yield dam. The management decisions concerning replacement of heifers can have a profound effect on the profitability of a dairy farm as a whole. Heifers have the greatest capacity for frame growth in their first six months of life. Furthermore, many operations fail to realize that management and care of dairy heifers throughout this pre-productive period directly influence productivity and income generating potential of these animals during their first and subsequent lactations. Daily management decisions relating to heifers can compound to have a great effect on current and future farm profitability in the form of hidden expenses and lost productivity (2). However, as a component of the management system, the rearing of dairy replacements is often over-looked. Rearing dairy heifers from birth to first, calving is an expensive investment, which takes a significant time to repay. To make the right decision, dairy farm managers need insight into the potential impact of management decisions on technical performance and economic results. The goal of this study was to determine the actual cost to raise Vrindavani heifers up to various ages.

Materials and Methods

The study was conducted in Vrindavani breed of cattle at Farm of Livestock Production and Management, Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly, Uttar Pradesh. The estimation of rearing costs of heifers up to various ages was done as suggested by (3,4). The following assumptions were considered.

Sale price of milk	Rs. 22/kg
Unit price of concentrate mixture	Rs. 15/kg

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Unit price of calf starter	Rs. 18/kg
Unit price of green fodder	Rs. 200/quintal
Average dry matter content of green fodder	18.0%

Procedure adopted for calculating cost of rearing of female calves:

Feeding cost during different stages : Following formulae was used to calculate different variables during various stages :

Per day dry matter requirement	= Average weight during the period 2.5/100
Requirement of green fodder	= (DM requirement - Conc. allowance) 100/20
Total cost of feeding/day	= cost of conc. + cost of green fodder
Cost of per kg gain up to different stages	= Total cost incurred on raising a calf during particular stage/Weight gain during the stage

Results and Discussion

Estimation of rearing cost of Vrindavani heifers up to different stages : Rearing cost of Vrindavani heifers up to different ages were estimated based on following facts and figures and assumptions.

Assumptions considered :

(i) Rate of raw milk = Rs. 22/- per kg

(ii) Rate of concentrate mixture = Rs. 15/- per kg

(iii) Rate of calf starter = Rs. 18/- per kg

(iv) Dry matter percent in green fodder = 18%

(v) Rate of green fodder = Rs. 2.00 per kg

The actual live body weights (LBW) at different ages in Vrindavani heifers were considered for the estimation of rearing costs which were 21.94, 45.72, 83.38, 145.32, 217.03 and 276.30 kg for LBW of heifers at birth, 3, 6, 12, 18 and 24 months of age, respectively (Table-1). When target growth is applied systematically, heifers should achieve the desired size and weight while calving at the target age. Recent data from Cornell University shows that heifers calving at 20 months of age produced as well as heifers calving at 24 months. The mean cost of rearing a dairy heifer to the point of calving, including fixed and variable costs. Age at breeding and age at conception were both major influences on AFC. The next most influential variable was calving pattern, showing the importance of seasonality. Autumn and multi-block calving herds had intermediate mean total costs. Spring calving herds had the lowest mean total cost of rearing, whereas all-year-round calving herds were the highest.

The per day - total dry matter requirement (PDDMR), requirement of green fodder (PDGFR), total feeding cost (TFCO/d) and cost for specified periods (0-3 m, 3-6 m, 6-12 m, 12-18 m and 18-24 m) along with total cost per day (including labour, medicines and miscellaneous costs *i.e.* additional 30% cost assuming total feeding cost as 70% of the total variable cost or recurring cost) along with live body weight (LBW) gains and average daily gains (ADG's) during different periods are presented in Table-2.

In the current study, the highest-producing and equally most profitable herds achieved the earliest AFC, at 780 d ($P < 0.05$), but also the highest culling rate of 38% ($P < 0.05$). (5) shared the general opinion that increase in milk output is often connected to reduced reproductive ability. The group of high-producing herds in the current study showed the lowest death rate for calves (2.43%) and second-lowest total loss of calves (8.33%). The reason for this probably lies in better nursing care for calves in high-producing herds. Fertility problems were the most common reasons for culling of cows and heifers. Mortality had a greater cost implication on smaller herds as the cost was spread over a smaller number of surviving heifers.

At the same time, total heifer rearing cost per kg live body weight gain, as well as total heifer rearing cost per day for different periods *i.e.* 0-3 m, 3-6, 6-12 m, up to 12 m, 12-18 m and 18-24 m were also calculated and are presented in the Table-2.

Assuming that a calf consumes 250 kg whole milk/colostrum and 16.5 kg calf starter up to 90 days of age (3, 4), the total feeding cost for this period came to be Rs. 5797.00 only, which was assumed to be 70% of total recurring/variable cost. Additional 30% was added to it on account of miscellaneous and labour cost to arrive at total recurring cost in rearing heifers up to different periods. Finally, total feeding cost (TFCO) was estimated. The LBW gain during different periods was estimated by subtracting initial weight from final weight of heifers. Similarly, average daily gains (ADG) were calculated by dividing LBW gain by respective periods. The total cost of rearing heifer per kg LBW and per day were arrived at by dividing total cost by total LBW gain and total period (Table-3).

The total costs of raising dairy replacements depend on the costs directly associated with growing heifers and the number of heifers grown. The highest cost category in the rearing period is feeding (6). Feed is the greatest input cost contributing 43.8% overall if grazing was also included. The other main costs were labour (22.3 ± 10.1%), bedding (8.7 ± 4.4%) and disposal of slurry and soiled bedding (7.1 ± 3.8%). In a dairy farm production system, management decisions concerning the rearing of young stock and replacement of dairy cows strongly influences one another (7). There are significant

Table-1 : Live body weights of Vrindavani cattle.

SOB	SEX	Parameters	BWT	WT3	WT6	WT12	WT18	WT24	WT_AFC
Winter	Male	Mean	22.72	51.93	88.30	168.56	252.89	330.42	-
		±SE	0.20	0.87	2.06	4.82	11.04	12.26	-
		N	427	143	77	45	19	12	-
	Female	Mean	22.06	47.60	88.92	147.87	216.20	276.34	349.93
		±SE	0.17	0.61	3.03	1.31	1.96	2.90	6.48
		N	545	293	284	268	238	213	71
		Mean	22.35	49.02	88.79	150.85	218.91	279.22	349.93
	Total	±SE	0.13	0.51	2.42	1.38	2.07	2.93	6.48
		N	972	436	361	313	257	225	71
Spring	Male	Mean	23.65	51.59	81.88	154.05	241.00	325.00	-
		±SE	0.26	1.02	2.26	6.27	14.70	-	-
		N	174	81	52	21	5	1	-
	Female	Mean	22.61	46.08	80.54	153.73	213.28	283.09	369.71
		±SE	0.28	0.93	1.36	2.19	3.25	3.87	11.45
		N	263	145	141	118	102	94	34
		Mean	23.03	48.06	80.90	153.78	214.58	283.53	369.71
	Total	±SE	0.20	0.72	1.16	2.08	3.21	3.85	11.45
		N	437	226	193	139	107	95	34
Summer	Male	Mean	23.48	49.26	89.07	162.31	222.50	320.00	-
		±SE	0.36	1.10	3.35	7.22	11.65	5.00	-
		N	185	84	29	13	8	2	-
	Female	Mean	22.22	43.56	76.48	148.15	206.97	274.26	345.65
		±SE	0.30	1.11	1.49	3.13	4.46	5.62	14.73
		N	207	117	100	84	76	74	23
		Mean	22.82	45.94	79.31	150.05	208.45	275.46	345.65
	Total	±SE	0.24	0.81	1.45	2.91	4.20	5.54	14.73
		N	392	201	129	97	84	76	23
Rainy	Male	Mean	21.92	46.91	88.39	154.62	253.68	321.11	-
		±SE	0.22	0.67	2.07	3.42	7.20	11.42	-
		N	497	193	77	53	19	9	-
	Female	Mean	21.45	43.24	81.42	142.39	216.74	271.05	341.48
		±SE	0.19	0.52	0.83	1.48	1.96	2.71	7.18
		N	578	313	306	280	220	220	80
		Mean	21.67	44.64	82.82	144.34	219.67	273.01	341.48
	Total	±SE	0.14	0.42	0.79	1.37	1.99	2.71	7.18
		N	1075	506	383	333	239	229	80
Autumn	Male	Mean	21.82	51.98	81.39	157.50	260.71	295.71	-
		±SE	0.26	0.93	1.77	4.85	11.61	16.88	-
		N	276	123	66	32	14	7	-
	Female	Mean	21.88	47.40	83.88	140.12	225.09	280.21	351.18
		±SE	0.21	0.61	1.04	1.74	2.24	3.15	6.73
		N	405	253	224	211	175	170	68
		Mean	21.85	48.89	83.31	142.41	227.72	280.82	351.18
	Total	±SE	0.16	0.52	0.90	1.68	2.34	3.09	6.73
		N	681	376	290	243	189	177	68
Total	Male	Mean	22.50	49.98	85.77	159.54	250.15	319.03	-
		±SE	0.11	0.40	1.00	2.22	5.01	7.08	
		N	1559	624	301	164	65	31	
	Female	Mean	21.94	45.72	83.38	145.32	217.03	276.30	349.87
		±SE	0.10	0.31	0.92	0.79	1.10	1.50	3.66
		N	1998	1121	1055	961	811	771	276
		Mean	22.18	47.24	83.91	147.39	219.49	277.96	349.87
	Total	±SE	0.07	0.25	0.75	0.77	1.12	1.49	3.66
		N	3557	1745	1356	1125	876	802	276

Table-2 : Total rearing cost calculation for Vrindavani heifers.

Particulars	Periods				
	0-3 m	3-6 m	6-12 m	12-18 m	18-24 m
Total LBW gain (kg)	23.78	37.66	61.94	71.71	59.27
LBW gain/d (kg)	0.26	0.42	0.34	0.40	0.33
PDDMR (kg)	-	1.61	2.86	4.53	6.17
Concentrate Allowance/d (kg)	-	1.00	2.00	2.00	2.00
DM to be given through GF (kg)	-	0.61	0.86	2.53	4.17
PDGFR (kg)	-	3.41	4.77	14.05	23.15
Total feeding cost in Rs. (Cost of conc. + cost of green fodder - TFC)	5797.00	1963.75	7117.50	10458.75	13733.25
TFC/d (Rs.)	64.41	21.82	39.54	58.10	76.30
Miscellaneous cost in Rs. (Labour, medicine etc. - 30% of the TFC)	2484.43	841.61	3050.36	4482.32	5885.68
Total cost	8345.84	2827.18	10207.40	14999.18	19695.22
Total cost/d (Rs.)	92.73	31.41	56.71	83.33	109.42

Table-3 : Per kg and per day rearing costs for different periods in Vrindavani heifers.

Heads	Periods					
	0-3 m	3-6 m	6-12 m	Up to 12 m	12-18 m	18-24 m
Total Rearing cost of Heifers/d (Rs.)	92.73	31.41	56.71	58.58	83.33	109.42
Total cost per kg LBW gain (Rs.)	350.96	75.07	164.79	173.29	209.16	332.30

economic gains from rearing heifers efficiently yet most farms do not calculate the true costs, as it is hard to separate the inputs from other aspects of the farm business (Mohd. Nor *et al*., 2015). The total LBW gain in Vrindavani cattle ranged from 23.78 (0-3 m) to 59.27 kg (18-24 m) which resulted in an ADG range of 0.26 (0-3 m) to 0.42 kg/d (3-6 m, Table 2). The PDDMR for Vrindavani heifers ranged from 1.61 (3-6 m) to 6.17 kg (18-24 m). In this study, the high-producing herds were shown to have the lowest conception rates among cows at first and overall services. Higher MY led to lower conception rates in cows, but the highest MY group also had the shortest days open and a calving interval. The level of reproductive performance directly affects the economic performance of a dairy herd (8) and its production. Nonetheless, the group of high-producing herds was the most profitable in the current study. Conception at first and overall services (cows) was greatest in herds with AFC = 800 d.

The daily average concentrate allowance has been taken as 1 kg for 3-6 m and 2 kg from 6-24 m. Now, the DM to be supplied through green fodder has been estimated by subtracting concentrate allowance from PDDMR. Feed accounted for 60% and 73% in two studies in the United States (1,9). There are significant economic gains from rearing heifers efficiently yet most farms do not calculate the true costs as it is hard to separate the inputs from other aspects of the farm business (10). (11) using data from 44 dairy operations in Pennsylvania, (12) estimated at present cost of Rs. 1,49,180/- from birth until calving. In the Netherlands, (10,13) developed a Monte Carlo simulation model that mean AFC for the farms in the study was 784 days (25.8 months) with a range of 639 to 973 days (21 to 32 months), which estimated rearing costs ranged between Rs. 1,49,415/- and Rs.1,80,075/-.

Here in our study, per day green fodder requirement (PDGFR) was estimated assuming that green fodder contains 18% DM and it ranged from 3.41 (3-6 m) to 23.15 kg (18-24 m). The total feeding cost (TFCO) ranged from Rs. 1963.75 (3-6 m) to Rs. 13733.25 (18-24 m). The TFCO per day ranged from Rs. 21.82 (3-6 m) to Rs. 76.30 (18-24 m). The total miscellaneous costs (including cost of labour, medicines *etc*.) ranged from Rs. 841.61 (3-6 m) to Rs. 5885.68 (18-24 m). The grand total cost, including feeding and other miscellaneous costs ranged from Rs. 2827.18 (3-6 m) to Rs. 19695.22 (18-24 m, Table-2). The grand total cost per day ranged from Rs. 31.41 (3-6 m) to Rs. 109.42 (18-24 m, Table-3). The total cost per kg LBW gain in rearing Vrindavani heifers during 0-3, 3-6, 6-12, up to 12, 12-18 and 18-24 m were Rs. 350.95, Rs. 75.07, Rs. 164.79, Rs. 173.29, Rs. 209.16 and Rs. 332.30 per kg LBW gain, respectively (Table-3).

Conclusions

Efforts should be taken to attain 60% body weight of cow to optimise AFC range at 950-1050 days to get maximum production and to reduce cost of rearing on first calvers. At the same time, the rearing cost of heifers could me decreased by using non-conventional sources of feeds.

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