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Short Communication

Replacement Index in Karan Fries Cattle

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The herd size and its maintenance in subsequent years is one of the most important factor limiting the intensity of selection. A high intensity of selection reduces the herd size which consequently reduces the selection differential. In a herd of large size the selection differential is large and the intensity of selection is high. Efforts should therefore be made to maximize the intensity of selection without reduction in herd size. It may be possible only to get more number of replacement heifers. The heifer calving and the number of old cows leaving the herd due to their death and culling during a particular year decides the increase or decrease in herd size. The annual replacement index based on heifer calvings and loss of adult cows is an indication of the increase or decrease or constancy in herd size. These information are required in formulation of breeding plan for the genetic improvement of dairy animals. Information are not available in crossbred on replacement index. Therefore the present study was carried out on mortality and culling of adults cows and replacement heifers to estimate the annual replacement index.

The study was conducted on 1210 Karan Fries cattle evolved and maintain at NDRI Karnal, spread over a period of 31 years (1964 to 1994). All the cows were kept under similar feeding and management conditions. The replacement index in any year was taken as suggested by Ram and Tomar (1993) as :

$$\text{Replacement Index} = \frac{\text{No. of heifer calving}}{\text{No. of Cow which left the heard}}$$

Therefore, data were taken for those cows which left the herd due to their death and culling and the number of heifer calvings in different years. The complete information on death, culling and survival of female calves born and entering the milking herd were available. The mortality and culling rate in lactating cows during different years and lactations were worked out as well as the number of heifer calving during the different years. Analysis of variance has been carried out to find out the significance of differences in mortality and culling rate in cows among different years and lactations.

Average losses of adult cows due to their death and culling in different lactations and annual replacement index have been presented in Table 1 and the ANOVA have been given in Table 2.

It was observed that 21.12 percent of the cows died while they were in herd and rest 78.76 percent were culled from the herd. Low death rate in comparison of the present study for Zebu and crossbred cattle was noted earlier also[2, 3].

Annual loss of cows was observed to be 24.6 percent (Table 1). The annual loss of adult cows ranged between 15 to 24 percent[2,3]. On various breeds of Zebu and crossbred cattle. Out of the total losses the annual mortality was found to be 5.02 percent and culling was found 19.43 percent in this (Karan Fries) crossbred herd[1, 4]. Death rate in Sahiwal cows of 5 herds and the annual culling rates from 8.9 to 14.9% was observed and the annual death losses as 1.8, 2.5, 1.9, 1.5 and 2.7% whereas the average annual culling rates have been observed as 11.0, 20.7, 16.8, 17.8, 14.3 and 21.7 percent, respectively[2, 3].

Table 1 Annual mortality and culling in adult cows, heifer calvings and annual replacement index

Years	Opening Balance	Addition by heifer calving	Total cows	Loss of cows			Closing balance	Replacement index
				Death	Culling	Total loss		
1973	1	3	4	0(0)	0(0)	0(0)	4	-
1974	4	24	28	0(0)	7.1 (2)	7.1 (2)	26	12.0
1975	26	48	74	0(0)	2.7 (2)	2.7 (2)	72	24.0
1976	72	81	153	1.3 (2)	8.4 (13)	9.8 (15)	158	5.40
1977	158	35	173	2.8 (5)	15.6 (27)	19.0(33)	140	1.06
1978	140	52	192	3.1 (6)	13.0(25)	16.1(31)	161	1.67
1979	161	51	212	4.2 (9)	7.07(15)	11.3(24)	188	2.12
1980	188	72	260	3.4 (9)	25.7(67)	29.2(76)	184	0.947
1981	194	70	254	2.3 (6)	20.4(52)	22.8(58)	196	1.20
1982	196	95	291	2.7 (8)	19.58(57)	22.3(65)	226	1.46
1983	226	59	285	6.6 (19)	18.5(53)	25.2(72)	213	0.81
1984	213	93	306	2.9 (9)	19.6(60)	22.5(69)	237	1.34
1985	237	84	321	7.4 (24)	33.64(108)	41.4(132)	189	0.26
1986	189	71	260	3.4 (9)	20.7(54)	24.2(63)	197	1.12
1987	197	56	253	4.7 (12)	13.0(33)	21.7(55)	198	1.01
1988	198	68	266	4.8(13)	16.5(44)	21.4(57)	209	1.19
1989	209	64	273	6.5 (18)	19.0(52)	25.6(70)	203	0.91
1990	203	44	247	10.9(27)	22.6(56)	33.6(83)	164	0.53
1991	164	58	222	9.9 (20)	28.82(64)	37.8(84)	138	0.69
1992	138	62	200	6.5 (13)	21.5(43)	28.0(56)	144	1.10
1993	144	17	161	8.6 (14)	13.6(22)	22.3(36)	125	0.47
1994	125	2	127	12.5 (16)	33.8(43)	46.4(59)	68	0.03
Overall		**1210**	**4590**	**5.02 (239)**	**19.43 (892)**	**24.64 (1131)**	**-**	**1.06**

Table 2 Analysis of variance to test the year effect on mortality and culling of adult cows (M.S. value)

Source of variance	d.f.	Mortality	Culling	Total Loss
Year	21	0.1824**	1.1508**	4.8552
Error	4568	0.0575	0.15192	0.1643

** P < 0.01

Regarding the mortality in different years of the adults cows it was observed that the annual mortality varied from 1.3 to 12.5 percent in different years and it was observed that there was no mortality in 1973, 1974 and 1975 years among the adults cows whereas the annual culling rates varied from 2.7 to 37.8 percent (Table 1) Statistically analysis of data has shown that the effect of years was found to be highly significant on mortality and culling (Table 2) Similar results have been observed[2, 3, 4].

It was further observed that 32.29 percent of the total cows left the herd in each lactation either due to death or culling (Table 3). Out of the total loss of 32.29 percent per lactation, the mortality was observed to be 6.85 percent and culling was observed to be 25.43 percent.

Table 3 Annual mortality and culling in adult cows, heifer calvings annual replacement index

Lactation No.	No. of cows exposed	Died		Culled		Total Loss	
		%	No.	%	No.	%	No.
1	1210	3.96	48	23.96	290	27.93	338
2	872	6.19	54	25.90	226	32.11	280
3	592	7.26	43	32.93	195	40.02	238
4	354	6.77	24	22.88	81	29.66	105
5	249	11.24	28	20.08	50	31.32	78
6	171	9.94	17	19.88	34	29.82	51
7	120	10.83	13	17.50	21	28.33	34
8	86	12.79	11	20.93	18	33.72	29
9	57	15.78	9	21.05	12	36.84	21
≥ 10	36	27.77	10	72.22	26	0.00	36
Overall	**3747**	**6.85**	**257**	**25.43**	**953**	**32.29**	**1210**

Table 4 Analysis of variance for loss of cows in different lactations (M.S. value)

Source of variance	d.f.	Mortality	Culling	Total Loss
Year	9	0.4558**	1.5544**	2.3555**
Error	3737	0.6295	0.1864	0.2135

** P < 0.01

It was further observed that death losses were lower in young cows whereas the culling rates were higher among them. ANOVA (Table 4) showed that total loss (Mortality and culling) were highly significantly affected by lactation order.

Annual replacement index is the ratio of number of heifer calvings joining the herd during a particular year to the number of cows left and the herd during the particular year. The overall replacement index for Karan Fries cattle was found more than one (1.06%) during the period (1973-94) in this study. This revealed that heifer calvings were nearly equal to that of the number of adult cows left the herd during the whole period of consequently the herd size remained constant[2,3].

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