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AN OBJECTIVE METHOD OF THE EVALUATION OF DAIRY ANIMALS*

At organised state and military dairy farms, the animals are given a book value at the time of calving and that value is depreciated every year by a fixed percentage depending upon the total productive life of the animals. In these organised dairy farms, if the total number of animals and their distribution in different age groups remains unaltered, the procedure adopted does not result in serious errors for the estimation of the overall cost of production of milk.

As is well known, the animals do not depreciate uniformally, actually sometime there being an appreciation from first to the second lactation. It is for this reason that if the animals are frequently going out or coming in the herd, the procedure of depreciating at the uniform rate leads to erraneous results. It can be very well imagined that if the cost of production is worked out separately for the animals in different lactations on the basis of uniform depreciation, it will be much less in the case of the animals in third or fourth lactation as the milk yield at that time is the highest. That is why in the open market the animals are priced low when they are in third or fourth lactation period unlike in the organised farms where the value is considered to be maximum at the time of first lactation. Moreover, valuing each animal on the basis of its performance in each lactation is very laborious and unpracticable. Even if it were done, this will be subjective and liable to lot of criticism. There is, therefore, need for evolving a suitable objective method by which the animals could be appreciated or depreciated each year, or at the time of each calving. The method should be such that the cost of production of milk for a particular breed does not change from one group of animals in a certain lactation to a second group in some other lactation when these two groups of animals are kept under similar conditions of feed and management.

Let X be the average value of the animal at first calving, *i.e.*, the average cost of rearing a calf. Let the average milk yield of the animals in 1st lactation be Y_1 and average total cost on feed in the 1st lactation be Z_1.

Let (Y_2, Z_2), (Y_3, Z_3), ...be similar figures for animals in 2nd, 3rd..... .....lactations.

Assuming that feed and depreciation are the major items of cost which vary from lactation to lactation and the cost to produce a unit of milk is constant on other items, it is clear that

$$\frac{X_1 + Z_1}{Y_1} + L, \frac{X_2 + Z_2}{Y_2} + L, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

are the cost of production in different lactations where X_1, X_2, ...are the depreciations in the value of the animals in 1st, 2nd.....lactations, etc., and L is the common cost on other items.

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In case the policy of the farm is to dispose of the animals, say after mth lactation and the average sale value of the animal is t, then

$$X_1 + X_2 \ldots\ldots\ldots\ldots\ldots X_m = X - t = D.$$

The value of D in organised dairy farms can be estimated easily and is given by the difference of the average cost of rearing and the average sale price of the animals. If the per unit cost of production of milk for groups of animals in different lactations is regarded as constant, we have

$$\frac{X_1 + Z_1}{Y_1} = \frac{X_2 + Z_2}{Y_2} \ldots\ldots\ldots\ldots\ldots\ldots \frac{X_m + Z_m}{Y_m} = C$$

$$\text{Where } C = D + \frac{(Z_1 + Z_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots + Z_m)}{(Y_1 + Y_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots + Y_m)}$$

which is a known quantity.

These equations provide us with the values of X_1, X_2,..... X_m, the depreciation in animals in different lactations.

These are given by

$$X_1 = CY_1 - Z_1$$
$$X_2 = CY_2 - Z_2$$
$$\overline{X_m = CY_m - Z_m}$$

The same principle can be applied to get the depreciation and hence the value during each month of lactation. If m_1, m_2,.....are the depreciations during various months of lactations, these will be given by

$$100\ m_i = y_i\ m + (y_i - f_i).\ Z$$

where y_i and f_i are the percentages of the yield and feed cost in ith month respectively, and m and Z are the total depreciation and total feed cost for the lactation respectively. As is clear, when the cows get dry, they appreciate by an amount equal to the value of the feed fed to them. The cost on labour in this case may be taken into account but it is negligible as compared to other costs and is practically balanced by the income from dung which is used as manure.

The procedure has been illustrated with the data collected for Tharparkar breed at the National Dairy Research Institute, Karnal. The data for the last completed lactation of all the animals present in the herd in October, 1961 have been considered.

The average yields and cost on feed in different lactations have been worked out to be

LACTATION NO.	1	2	3	4	5	6 and over
Average yield in kg. (Y_1)	2237	2176	2446	2562	2401	2302
Average feed cost in Rs. (Z_1)	1055	919	1004	993	994	1006

The average cost of rearing a calf has been estimated at Rs. 1,500 and the average sale price at Rs. 300. Though a number of animals have been disposed of before the sixth lactation for some reason or the other and in other cases they have been kept after 6 lactations, for the present study it is presumed that the animals on an average have been kept in the farm upto sixth lactation, *i.e.*, m=6, so the depreciation D = 1200.

$$\text{C is, therefore, equal to } \frac{D + Z_1 + Z_2 \ldots + Z_6}{Y_1 + Y_2 \ldots + Y_6} = \frac{1200 + 5971}{14124} = .508$$

Depreciations in different lactations are, therefore, given by

$$X_1 = CY_1 - Z_1 = 81.$$

$$X_2 = 186,\ X_3 = 238,\ X_4 = 307,\ X_5 = 225 \text{ and } X_6 = 163.$$

The value of the animal which is Rs. 1500 at first calving therefore turns out to be Rs. 1419, 1233, 995, 688, 463 and 300 at the end of 1st, 2nd, 3rd, 4th, 5th, and 6th lactations. The relative depreciation in percentages in different lactations are 6.7, 15.6, 19.8, 25.6, 18.81 and 13.6.

Sometimes the animals are not there in a particular farm from the inception. One is therefore interested to get the information about the depreciation in different lactations as a percentage of the value of the animal at the beginning of that lactation. These values are given by 5.4, 13.1, 19.3, 30.9, 32.7 and 35.2 for the six lactations.

To get an idea of the distribution of the depreciation at different stages of lactation, a random sample of 18 cows belonging to different lactations, 3 for each of six lactations and calving at different times of the year was selected. The average milk yield in each of the 10 months of lactations was found out to be (in kg.) as

1st month	.. 243.8	6th month	.. 219.2
2nd month	.. 300.7	7th month	.. 192.2
3rd month	.. 302.6	8th month	.. 184.4
4th month	.. 278.8	9th month	.. 176.3
5th month	.. 251.2	10th month	.. 137.9

Total (in kg.) 2287.1

The average inter-calving period for this breed is 472 days, *i.e.*, about 15½ months. The average feed cost during ten months of lactation for these cows worked out to be Rs. 81, 88, 89, 86, 82, 78, 74, 73, 72 and 67 respectively. The cost on feed in the dry period, *i.e.*, 5½ months was Rs. 181 being Rs. 38 per month in the last two months of pregnancy and Rs. 30 per month for the rest of the period of 3½ months.

These give the percentage milk yield and percentage feed cost during each month as

Month	1	2	3	4	5	6	7	8	9	10	dry period
Percentage of milk yield..	10.6	13.1	13.2	12.2	11.0	9.5	8.4	8.0	7.7	6.3	—
Percentage of feed cost ..	8.3	9.1	9.2	8.9	8.4	8.4	7.6	7.5	7.4	6.4	18.7

If m is the total depreciation over the different lactations, which is equal to Rs. 200 in the present case, its distribution in different months will be

First month $\frac{10.6}{100}$ m + (10.6 — 8.3) $\frac{Z}{100}$ = 43

where Z = Rs. 971, the average total feed cost during the lactation. The depreciation in the subsequent 9 months works out to be Rs. 65, 65, 56, 47, 34, 25, 21, 18 and 7, there being an appreciation of Rs. 181 during the dry period at the rate of Rs. 38 per month in each of the last two months of pregnancy and Rs. 30 per month for the other dry period of 3½ months.

As the distribution of the milk yield at different stages of lactation is not expected to change for different lactations, the actual depreciation as well as the percentages of depreciation of the value at the beginning of a particular lactation for different months for six lactations have been calculated and are given in the following Appendix.

T. R. PURI*

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APPENDIX

Depreciation at Various Stages of Lactation

Month	1	2	3	4	5	6	7	8	9	10	Dry Period
Lactation No.											
I	33 (2.2)	53 (3.5)	52 (3.5)	45 (3.0)	36 (2.4)	19 (1.3)	15 (1.0)	12 (0.8)	10 (0.7)	2 (0.1)	—196 —(13.1)
II	22 (2.6)	56 (3.9)	56 (3.9)	47 (3.3)	39 (2.7	23 (1.6))	18 (1.2)	15 (1.1)	13 (0.9)	2 (0.1)	—119 —(8.3)
III	49 (4.0)	70 (5.7)	71 (5.8)	61 (4.9)	51 (4.1)	33 (2.7)	28 (2.3)	24 (1.9)	21 (1.7)	9 (0.7)	—179 —(14.5)
IV	54 (5.4)	74 (7.4)	74 (7.4)	64 (6.4)	54 (5.4)	35 (3.5)	28 (2.8)	24 (2.4)	21 (2.1)	8 (0.8)	—128 —(12.8)
V	53 (7.7)	75 (10.9)	74 (10.9)	65 (9.4)	56 (8.1)	37 (5.4)	33 (4.8)	28 (4.1)	24 (3.5)	8 (1.2)	—228 —(33.2)
VI and over	42 (9.1)	64 (13.8)	65 (14.0)	55 (11.9)	46 (9.9)	28 (6.0)	24 (5.2)	20 (4.3)	18 (3.9)	6 (1.6)	—205 —(44.3)

Note :— Figures in brackets denote depreciation as a percentage of the value at the beginning of the lactation.

This table has been prepared to give a ready reference for calculating the depreciation at various stages and therefore no other figures have been included here. Moreover the figures of depreciation for various lactations calculated on the basis of entire herd and given on page (42) have been used along with the distribution of the feed and milk yield in various months calculated on the basis of 18 animals selected at random.