

An Analysis of the Polonnaruwa Herd of Red Sindhi Cattle*

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THE PROBLEMS associated with the breeding of dairy cattle in the tropics may be divided into two parts, those arising from climate *per se*, and those arising from low productivity of native stock. Insofar as tropical breeds of cattle like the Red Sindhi are concerned, the problems are solely those arising from low productivity, as the necessary adaptability to the hot tropical climate is inherently present in these animals. The main components of low productivity are a late age at first calving, long calving intervals, short lactations and a low average daily yield. Any attempts to increase the productivity of native cattle in the tropics may therefore be viewed as being fundamentally concerned with some or all of these components.

To produce the desired improvement in each of these traits, it is necessary at the outset to subject each individual trait to a separate investigation in regard to the operational wisdom of applying breeding in preference to other methods. The analysis that has now been made of the Polonnaruwa herd of Red Sindhi cattle not only shows the possibility of improvement of these traits in tropical cattle, but also sheds considerable light on the most efficient means of achieving this goal. Perhaps the most convincing evidence for the possibility of improvement is the high variability that obtains in respect of each of these traits

in tropical cattle. The co-efficient of variation of age at first calving for instance, is 15 to 20 per cent. for most tropical cattle as compared with about 10 per cent. for temperate zone cattle. Co-efficients of variation of calving intervals, lactation lengths, average daily yields, and total lactation yields are also considerably higher in tropical cattle, being approximately 28 per cent., 24 per cent., 27 per cent. and 40 per cent. respectively in the Red Sindhi herd at Polonnaruwa Livestock Farm. With co-efficients of variation of this order it is undoubted that the progress possible would be high, provided the most efficient means of achieving the desired end are adopted.

Analyses of the repeatability of the main components of milk production in this herd yielded the following results :—

<i>Components of Milk Production</i>	<i>Repeatability</i>
Average daily yield	.. +0.46
Lactation length	.. +0.18
Calving interval	.. +0.15
Dry period	.. +0.10

* Interested readers are referred to a more comprehensive technical study of this subject which has been published under the title "Population and production characteristics of Red Sindhi cattle in Ceylon" in the Journal of Dairy Science Vol. XXXVIII, No. 11, 1955, 1231-1241.

Records of over 300 cows were used in arriving at each of the above estimates, so that the sampling errors were small. It would appear from these estimates and from other evidence published elsewhere, that whereas the improvement of some of these traits is largely a matter of better feeding and management, in others sufficient genetic variation may still exist after optimum non-hereditary conditions have been established, to warrant the application of breeding methods of improvement. Age at first calving, length of calving interval, and length of lactation may be regarded as belonging to the first category. The rapid progress that has been achieved in recent years by better management techniques in lowering the length of calving interval from 451 days to 408 days, and the results of early maturity experiments to lower the age at first calving in other tropical cattle, strongly support this conclusion that much improvement in these traits could be achieved by better feeding and management.

Average daily yield and total lactation yield on the other hand, were found to be moderately repeatable (0.46 and 0.41, respectively), with total lactation yield having a heritability of about 0.2. Selection would therefore be a useful tool in improving these characters. One might then ask to what extent selection for these characters has actually been practised in this herd. The genetic superiority of dams of cows over their contemporaries showed that the intensity of selection applied left much to be desired. As, in fact, the effective breeding period in this herd since its inception has been about 13 years, one would expect the genetic improvement to have been at least of the order of 20 to 30 gallons in lactation yield. But what has

actually been achieved is an over-all negative selection pressure for yield.

The reasons for this are not far to seek. Any attempt to improve the genetic level of a herd of dairy cattle is basically dependent on the prevailing mortality rates, rearing proportions, and reproductive rates. With high reproductive and low mortality rates and with high rearing proportions, the number of replacement stock available would be high and therefore the intensity of selection possible would also be high. In the present study, it was found that mortality, as measured by the percentage of females that die before calving averaged 23 per cent. between 1938 and 1953, with a peak of 45 per cent. during 1942-45. The average reproductive rate which was measured up to 1949 as a sum of the partial reproductive rates in the different years was 0.46. This means that, on the average, every two cows produced in their lifetime only one heifer calf that came into milk in the herd. Rearing proportions during this period were also low (0.19), and it was only once in about five calvings that a cow produced a heifer which reached a lactation. In the light of these parameters, it is not surprising that no overall genetic progress has been made by selection of cows in the Red Sindhi herd at Polonnaruwa during the first 12 to 13 years of its existence.

During the period 1951-54 however, with the decrease in mortality and with the evident increase in reproductive rates and rearing proportions, intense selection appears to have been practised, and it seems probable that when all the surviving heifers from this period become incorporated in the milking herd, the probable genetic gain would be high.

The future expansion and improvement of this herd would involve keeping down mortality rates at under 20 per cent., increasing the rearing proportion to 0.33, raising the average reproductive life to five lactations and shortening the generation interval from 6½ years to about 6 years. Current statistics suggest that these are attainable in this

herd. On this basis, the population may be expected to double in size every eight years without further resort to importations. This is a conservative estimate; nevertheless, it shows that even in tropical breeds there is a considerable reserve of fecundity, which, if utilised properly, would permit the population to expand rapidly.