ANIMAL MODEL EVALUATION OF NILI-RAVI BUFFALOES

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SUMMARY

Milk yield records on 5341 lactations of 2507 buffaloes from four institutional herds and four field recording centers, involved in progeny testing program were used to evaluate buffaloes and bulls under an animal model. Milk yield for the eight locations ranged from 1835 to 2543 kg. Breeding values for milk yield averaged 9.3 and 32.2 kg in buffaloes and bulls, respectively. Variation in the breeding values of tested bulls was lower than expected. Genetic trend in buffaloes was negative but the sires used in the recent years were better than those in the past. However, bulls with more daughters had below average breeding values for milk yield.

Keywords: Animal model, Nili-Ravi buffaloes, milk yield.

INTRODUCTION

Buffaloes are the main dairy animals in Pakistan. The current population of twenty millions is mostly owned by small farmers. Population trends indicate that their number is likely to increase at least in the near future. Progeny testing programs in buffaloes in the country are relatively new. Estimation of breeding values of animals in the past was, however, limited to some form of contemporary comparison. Evaluation of buffalo bulls, used up till 1978, was reported by Shah and McDowell (1981) using contemporary comparison. Such studies served as a base to start "Bull Mother Scheme" (Asghar *et al.* 1993) but the indexes being used for bull comparison do not take into account variation in the performance of animals over time. Definition of the contemporary groups is also vague to test the differences among bulls. The only information used in ranking bulls is the performance of daughters. The bulls and other animals are generally assumed unrelated.

With the advancement in computing and refinements in statistical techniques, dairy cattle populations in the developed countries are being evaluated more frequently and precisely using single and multiple trait animal models. These methodologies with some modifications can be adopted to the buffalo evaluation and improvement. Present study aims at estimating breeding values of Nili-Ravi animals for milk yield by taking into account important environmental effects as well as all known relationships among animals.

MATERIALS AND METHODS

Data from four institutional herds and four field data collection centers involved in progeny testing of Nili-Ravi buffaloes were used in this study. Lactations were edited for any known abnormality such as abortion and sickness. The data used comprised of 5341 lactations of 2507 buffaloes. Records having less than 60 days of lactation length were not used. Lactations for which age information was missing, population average for age at calving for the parity was used. Lactations were adjusted to 60 months of age and 305 days of lactation length using multiplicative correction factors developed from the data (Khan 1994). An animal model was used with fixed effects for herd-year-season and random effects for breeding value, permanent environment, and error. Eight different populations, four institutional herds and four data collection centers, were considered as herds. If number of observations were less than five in any herd-year-season combinations, adjacent years were pooled, especially in the earlier years of the study. Heritability of 0.18 and repeatability of 0.43 (Khan 1994) were assumed for ratios of error variance to additive and permanent environment variances. The statistical package used for breeding value estimation was JAA (Misztal 1992).

RESULTS AND DISCUSSION

A total of 5341 lactations were represented in 12 parities, distributed across eight locations. As the data were scattered over a period of 27 years, contemporaries were defined as the buffaloes calving in a season (winter or summer) within a herd in a year. Criterion of minimum of five observations was similar to Wiggans (1991). This allowed valid comparison among animals and reduced the bias in estimating breeding values. This restriction, however, reduced the HYS combinations from 133 to 110. Average number of lactations represented in a HYS class was 49 with a range from 5 to 215. An alternate of using a recording center was to use a sub-center which would have allowed more precise herd definition but was not chosen since this would have forced other compromise in the definition of season or further pooling of the years but may be a better alternate when number of lactations represented in different locations/herds increase in the future. In the absence of a precise definition of herd, as is the case in current situation, field recording center was taken as a herd.

Animal model solutions of milk yield from the eight locations were obtained from a model similar to that described in the methodology but the model had herd and year-season, instead of location-year-season. Milk yield differed among different locations with a minimum value (1835 kg) observed in one of the four institutional herds and maximum value (2543 kg) for one of the field recording centers. It may be pointed out here that number of observations among different locations were also quite different (10 to 2713). Difference in milk yield among these locations reflects that the feed resources, management practices and the genetic differences may be responsible. Also, quality of data recording itself could be partly responsible for such differences. Data recording at institutional herds is more frequent and precise, as compared to the field recording centers. The adjustments for lactation length and approximation of age from parities in case of field data are some of the additional factors that need consideration.

Breeding values of animals varied widely (from -527 to + 641 kg), average being -29 kg. Slight skewness could be attributed to smaller data set. Breeding values for buffaloes and bulls averaged 9.3 and 32.2 kg, respectively. Variation was greater in bulls as compared to buffaloes. For the calculation of genetic trend, however, breeding values form animals having birth year recorded, were used. Since most of the field recorded buffaloes did not have this information, therefore only 941 buffaloes and 66 sires were used to estimate averages for different birth years. Least squares means of breeding values for different birth years were drawn for the two sexes as shown in Figure 1.

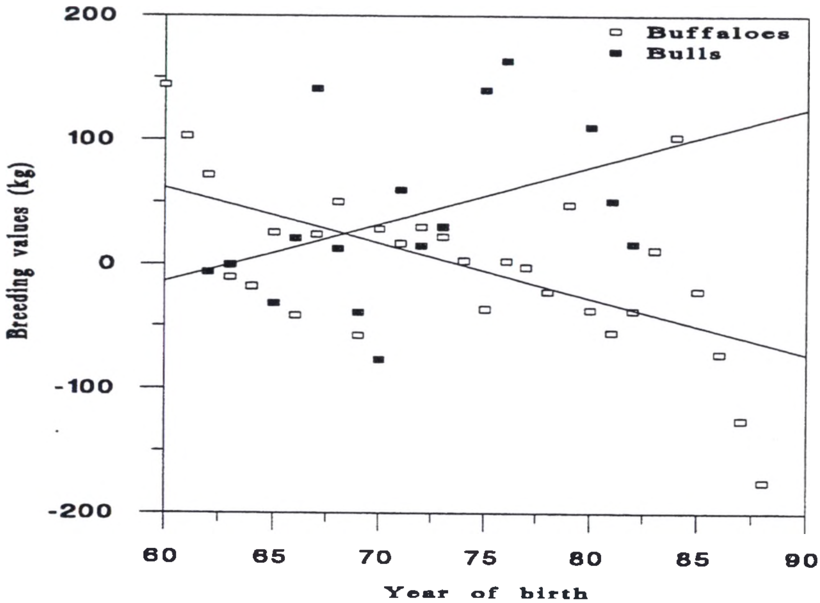

Figure 1. Average breeding values of animals for milk yield across different years.

Although, the number of buffaloes included was less than 50% of those evaluated (due to lack of information on their birth year), the genetic trend in the population was negative. Average breeding values of the bulls born in different years were also drawn to have some idea about their status for breeding values of milk yield. The genetic trend was positive. Results for both the sexes should be taken as preliminary due to limitation of the data set available and compromises in the analysis. The number of daughters for the 66 sires evaluated ranged from 1 to 65, with only three sires having 50 or more daughters. One of the main reasons for the negative genetic trend in buffaloes was that the most extensively used sires had breeding values lower than the population average. For example, of the three most extensively used sires (≥ 50 daughters), the two had breeding values less than zero while the third was also not among the top 10.

Partial results on comparative ranking of bulls in the current progeny testing program have previously been presented (Asghar *et al.* 1993). The ranking of bulls was based on an index suggested by Jain and Malhotra (1971) which employed contemporary comparison. The index was an outcome of comparison among various indexes to rank 17 Kangayam cow bulls on the first lactation records of their daughters. Contemporaries were defined as all the cows born over a period of 30 years and milk yield was assumed 30% heritable. Shortcomings of this and similar other methods have previously been discussed (Chauhan 1991).

The problem with field recording is that some of the important information otherwise needed is not available. This is in contrast to the farm situation where a lot more information is recorded and very limited is ever used. The age at calving was approximated in the present study due to non-availability of such information in the field. Although, most of such buffaloes also did not have the sire and dam identification, they were recorded for selecting the bull dams. Omitting such information would mean loosing about half the data, while including them for sire evaluation although did not add to the reliability of sire proofs, yet the estimates of the fixed effects had better degrees of freedom. The impact of the current testing program is likely to come to surface in the coming years when sire selected on the basis of their progeny (and other relatives) performance would be accurately selected and widely distributed through A.I. Current methods of data collection and evaluation need upgradation. The negative trend in the buffalo population merely depicts lack of effectiveness of the selection procedures employed in the past. Selection based on the physical condition of the bull, or the type in general, and dam's performance failed to bring any genetic improvement in the past. Current policy of choosing on the basis of genetic worth is likely to be a step in the right direction. Extensive studies are required in refining the procedures of data collection and evaluation. With millions of small farmers involved in buffalo raising, sustainable development of buffalo requires national and international strengthening of genetic improvement programs.

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