RANKING LACTATIONS IN PROGRESS

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INTRODUCTION

There are several reasons for wishing to rank cows on performance during lactation. For example, in within-herd management, selection of cows for planned mating or culling of poor producers will be of interest.

Several methods have now been developed for predicting complete lactation yield from lactations in progress, viz. multiplicative factors, regression, and use of non-linear functions.

METHODS OF EXTENDING INCOMPLETE LACTATIONS

The simplest method is to estimate adjustment factors for performance for stages of lactation for certain classes of animals. The classes used will be those deemed to have important effects on the shape of lactation curves. Examples would be breed, age of calving, number of lactations and season of calving. The necessary factors may be simply estimated from least squares analyses of test-day production. The main objection to the use of such factors is the very large number which must be stored. An example of the development of multiplicative factors is given in Keown and Van Vleck (1973).

Linear regression of individual test-day yields or cumulative yield on lactation stage may also be used. The regression factors may also be estimated by least squares. Again the factors may be estimated within classes, although in some cases they have been estimated (and thus used) on data already adjusted for these class effects. Van Vleck and Henderson (1961) used this method on North Eastern United States data. Again, especially in the case of using individual test-day records, a large number of factors must be stored in order to use this method.

Several different non-linear functions have been used to either describe the lactation curve or the relationship between complete lactation yield and last sample yield. These functions are then used to predict complete lactation yield (e.g. Wood (1974), Kellogg et al. (1977), Wiggans and Van Vleck (1979)). In general these methods require less computer storage than the other two. However, methods of estimating the required parameters using non-linear estimation procedures are generally more complex.

Few comparisons of the methods have been made on the basis of statistical efficiency. Those that have been done show small differences in the methods, thus computational ease and efficiency will be the main criterion of choice between methods.

THE N.S.W. CURRENT PRODUCTION INDEX

The non-linear method, proposed by Schaeffer et al (1977) will be used to extend lactations in the NSW DHIP. The equation to describe daily production is:

$$Y_i = A \exp(-\beta(i - t_o))\ \{[1 - \exp(-B(i - t_o))]/B\}\exp(\gamma i \sin(2\pi i/p))$$

where y_i is the production on day i of the lactation and the parameters A, β, t_o, B, γ and p describe the shape of the lactation curve in terms of peak yield, rate of increase and decrease in yield, time of peak yield and seasonal fluctations.

Estimates of β, t_o, B, γ and p have been obtained for breed, age of calving, season of calving and lactation number classes. Complete lactation yield is estimated by multiplying A by a function of these parameters, integrated over the time period 0 to 300 days. A is estimated at each sampling for each lactation and used to produce a prediction of 300-day milk yield which is then adjusted for age of calving and season effects and expressed as a ratio of herd mean. This value, called the "Current Production Index" or CPI will be returned to farmers with their monthly production reports for each cow in milk.

REFERENCES

KELLOGG, D.W., URQUHART, N.S. and ORTEGA, A.J. (1977). Use of the gamma curve to estimate lactation curves of Holstein cows. *J. Dairy Sci.* 60: 1308.

KEOWN, J.F. and VAN VLECK, L.D. (1973). Extending lactation records in progress to 305-day equivalent. *J. Dairy Sci.* 56: 1070.

SCHAEFFER, L.R., MINDER, C.E., McMILLAN, I. and BURNSIDE, E.B. (1977) Nonlinear techniques for predicting 305-day lactation production of Holsteins and Jerseys. *J. Dairy Sci.* 60: 1636

VAN VLECK, L.D. and HENDERSON, C.R. (1961). Regression factors for extending part lactation milk records. *J. Dairy Sci.* 44: 1085

WIGGANS, G.R. and VAN VLECK, L.D. (1979). Extending partial lactation milk and fat records with a function of last-sample production *J. Dairy Sci.* 62: 316.

WOOD, P.D.P. (1974). A note on the estimation of total lactation yield from production on a single day. *Anim. Prod.* 19: 393.

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