CALVING INTERVAL AND MILK PER DAY OF LIFE IN NEW SOUTH WALES HOLSTEINS

K.R. PHILLIPS

Wollongbar Agricultural Institute
Wollongbar, NSW

SUMMARY

Herd recording data were used to estimate the effect of extended calving intervals on milk per day of life in NSW Holsteins. The 28980 cows in the study had a mean calving interval of 56.9 weeks during the average 199.7 weeks between first calving and culling, and averaged 12.05 litres of milk per day. Optimum calving intervals were in the range 50 - 58 weeks, although specific optima were dependent on herd production level. Penalties for a one week deviation from the optimum were between 0.71 and 0.40 litres per cow per day of life. This is equivalent to between 560 and 1000 litres over the cow's lifetime or $140 - $250 per head at 25 cents per litre.

INTRODUCTION

The effects of days dry and days open on milk production have been studied and their economic effects described (Schaeffer and Henderson, 1972; James and Esslemont 1979; Holmann et al 1984). Generally such studies have examined production in the current and next lactation assuming that optimum calving interval for one pair of lactations maximizes lifetime milk production and lifetime profitability.

Absolute calving intervals are set by heat detection efficiency, calving to first service interval policy and conception rate (Bozworth et al, 1972; Pedron et al 1989). Conception rate, and to a lesser extent heat detection rate, is dependent on nutrition, health and bull fertility (or AB factors).

NSW Dairy Herd Improvement (DHI) records report a Holstein average calving interval of 13.5 months and mature cow lactation yields of 5117 kg (Heptonstall, 1990). This paper is based on field records from the NSW DHI database to determine the effect of average lifetime calving interval on milk production per day, between first calving and departure from the farm, at different herd milk production levels.

MATERIALS AND METHODS

Milk records were obtained from the NSW DHI database for the period 1974 to 1989. Relevant variables available for each record were cow ID, herd, shire, breed, age at first calving, parity, calving and termination dates, and milk, milk fat and protein yields. Records from herds that ceased using DHI during the period were excluded.

Milk per day of working life was calculated from the final data set of 28980 Holstein cows in 739 herds.

Herd average first lactation milk yield, including cows with only a first lactation record, was calculated as a measure of herd management level. Herd averages were subsequently classified in 500 liter categories to facilitate more straightforward extension material preparation.

A multiple linear regression model [1] was fitted to the data using the SAS general linear model (SAS,

1985) procedure. It partitions variation in milk per day of life (MPD) attributable to shire (S), farm management level (M), age at first calving (A) and average calving interval(C) within each of the farm management levels.

$$MPD_{sam} = \beta_0 + \beta_1 S_s + \beta_2 A_a + \beta_3 M_m + \beta_4 C(M_m) + \beta_5 C^2(M_m) \beta_6 C^3(M_m) + e_{sam} \quad [1]$$

RESULTS

The data set is described in Table 1. Herd first lactation average is biased upward from the mean of all first calf records by deletion of records for cows without a second lactation.

Table 1. Mean, standard error and range of variables associated with production and time between calvings.

Variable	Mean[1]	SE	Range
C[2]	398.26	.2311	322.00 - 510.95
MPD[3]	2.05	.0162	1.49 - 25.86
A[4]	31.42	.0243	23.00 - 39.00
M[5]	3285.83	3.3032	2005.25 - 4980.40
WKSPLIFE[6]	199.73	.5823	49.17 - 573.82

[1] N = 28980.
[2] Calving interval (days).
[3] Milk per day of working life (litres).
[4] Age at first calving (months).
[5] Average first lactation milk yield (litres).
[6] Weeks of productive lifetime.

The distribution of cow lifetime average calving interval (Figure 1) is consistent with calving interval distributions presented annually for individual herds by the herd recording service. Figure 2 shows the distribution of milk per day of life.

Figure 1. Distribution of lifetime average calving interval

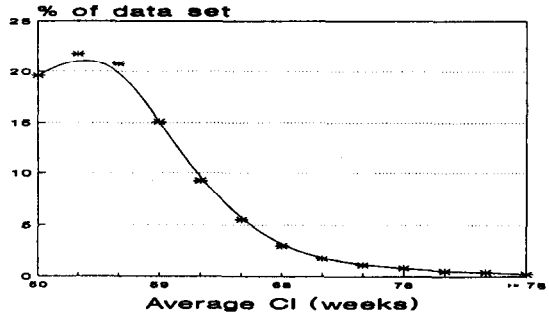
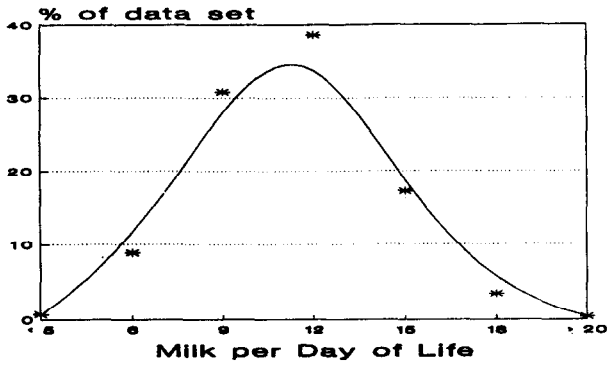
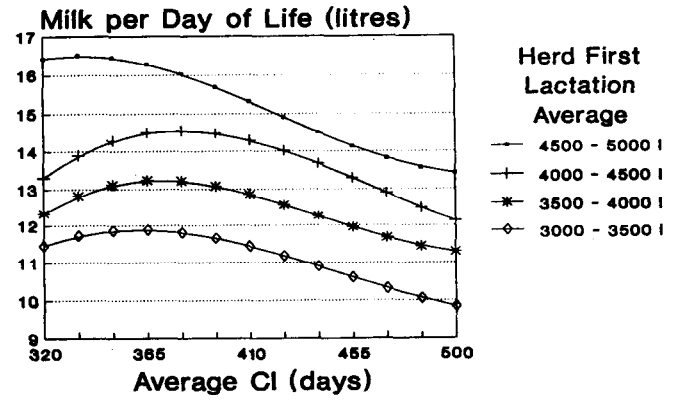


Figure 2. Distribution of milk per day of working life



The model accounted for 40.08% of variation in milk per day of working life. Relationships between the variables are presented graphicaly in Figure 3.

Figure 3. Relationship between average calving interval, herd first lactation milk yield and milk per day of working life



DISCUSSION

The relationship between average calving interval and milk per day of working life is essentially the same for different levels of management, with the exception of very high management herds. Optimum calving intervals were in the range 365 - 380 days for the three lower production herd levels. This is slightly shorter than industry practice, but milk per day of life was relatively insensitive to changes in calving interval in the range 350 - 395 days.

It appears that dry cow nutrition and early lactation nutrition may be inadequate in the middle categories which showed a more rapid decline in milk per day with both shorter and extended calving intervals relative to herds at either the highest or lowest production levels.

Herds with over 5,000 litre first lactation averages are unusual in NSW's pasture-based dairy industry. Feed management for milking cows in these herds must be superior to lower production herds, and dry cow nutrition would also be expected to be superior. If so, it appears that these practices are overcoming the need evident in lower production herds for a longer dry period to build body reserves.

A reduction of calving interval to 365 days for cows with 420 day mean CI in the lowest production herds results in about 1 litre per day per cow more milk production, or 1,400 litres for the cow's lifetime.

Herds with heifer production between 3500 and 4500 litres have a longer optimum CI, and the benefit from reducing CI to the optimum from 420 days is about 0.6 litre per cow per day, or 840 litres for lifetime.

High production herds benefit by 1.5 litres per cow per day, or 2,100 litres over lifetime by reducing CI from 420 days to the optimum. Difficulty may be encountered with fertility in such herds as cows need to conceive at 55 days after calving if a CI of 335 days is to be achieved. More realistic improvements of one week in calving interval result in production improvement of 0.40 - 0.71 litres per cow per day of life. At 25 cents per litre this is equivalent to $140 - $250 per head over a cow's lifetime.

Model construction had the effect of isolating the effects of age at first calving and feed level. Interpretation of the results within each herd level are restricted to management practice. Heat detection efficiency, first service deferral period, semen handling and conception rate are the main reasons for movement along each response curve.

CONCLUSIONS

Gains in herd productivity up to $250 per cow are possible in NSW dairy herds by reducing calving interval. These gains are influenced by herd first lactation production and mating management.

There is a need to further examine the management systems in each group of herds to determine "best" practice for a given level of herd production.

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