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# CALVING PATTERNS AND HERD PRODUCTION IN SEASONAL DAIRY HERDS

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## SUMMARY

Calving patterns, mean calving dates and production of milk fat were compared in three groups of identical twins of differing productivity. Within-set differences in calving date were used to assess differences in production which may arise because of variations in the calving patterns. For cows producing an average of 0.84 kg milk fat per cow per day during October, the 12-day difference in mean calving date resulting from the "first" or earlier calving members of each set having a more concentrated calving pattern than the "second" calvers was associated with a 12 kg milk-fat difference in favour of the group of "first" calvers (163 kg *vs.* 151 kg). This production difference arose in early lactation. Production differences in the other two groups of identical twins in favour of the "first" calvers also arose largely in early lactation, but this difference was influenced by the productive ability of the cows.

These results are discussed in terms of the effect which aspects of herd fertility may have on the subsequent season's calving pattern and production.

## INTRODUCTION

A seasonally concentrated calving pattern is a feature of dairy cattle husbandry under the grassland farming methods practised in New Zealand. Concern has been expressed recently in some quarters about the processing problems associated with short seasonal peaks in milk supply. It has been inferred that these supply peaks are being caused by seasonally concentrated calving patterns (McGilvary, 1978); yet few attempts have been made to measure herd calving patterns (Macmillan and Curnow, 1976; Moller, 1978) and to estimate the effects of different calving patterns on either herd or cow performance.

Because of between-farm differences in a variety of factors which influence cow production, assessing the effects of calving pattern on production using field data is difficult. Therefore, records from herds of identical twins where cows were grazed together and where experimental treatment effects were small and did not approach statistical significance can be useful in estimating possible effects of a factor such as calving pattern on seasonal production (Hancock, 1954).

## MATERIALS AND METHODS

Production records from sets of identical twins run together during the 1977-8 season at Ruakura's No. 1 and No. 3 Dairies were used in analyses of calving pattern and milk fat (m. fat) output. At the No. 1 Dairy the animals had been used in trials comparing different degrees of pre-milking preparation, but these treatments had not resulted in significant production differences (Phillips, 1978). Two types of milking machines had been compared at the No. 3 Dairy, but again production differences due to the machine type were not significant.

The 36 sets of twins included in the trial at the No. 1 Dairy varied in productive ability (51 to 180 kg m. fat) and were divided into two groups: sets averaging more than 110 kg m. fat per cow (Herd 1; Table 1), or less than 110 kg m. fat per cow (Herd 2; Table 1). There were 20 sets of twins included in the trial at the No. 3 Dairy (Herd 3; Table 1).

The within-set differences in calving date were used to create groups of "first" calvers or "second" calvers. Simple parameters describing the calving pattern were calculated and herd production characteristics ("first" calvers vs. "second" calvers) compared using analyses of variance (Table 1).

## RESULTS AND DISCUSSION

In any herd the first cow to calve will almost invariably be one which calves earlier than expected and the last cow to calve may be one which either conceived later than expected or did not respond to induction therapy. This overall spread in calving need not have a large effect on either the mean calving date or the concentration in calving pattern. Although the first cow to calve in the group designated "first" calvers (Herd 3) calved 4 days earlier than its twin mate in the group of "second" calvers, the 12-day difference in mean calving date arose because of the greater concentration of cows calving in the subsequent 3 weeks in the group of "first" calvers (Fig. 1 and Table 1). The planned or expected commencement of calving (*i.e.*, 282 days after the bulls were introduced into the herd) would have been the same for both groups. This 12-day difference in mean calving date due to the difference in calving pattern (11/8 vs. 23/8) was associated with a 12 kg difference in m. fat production (163 vs. 151 kg;  $P < 0.5\%$ ). The difference in average lactation length (232 vs. 220 days) was a little artificial to the extent that cows tended to be dried-off in twin pairs. The graph of each group's weekly

TABLE 1: CALVING PATTERN AND PRODUCTION FIGURES ASSOCIATED WITH THE WITHIN-SET DIFFERENCES IN CALVING DATE IN THREE GROUPS OF MONOZYGOUS TWINS

	<i>Herd 1</i>		<i>Herd 2</i>		<i>Herd 3</i>	
	<i>1st</i> <sup>1</sup>	<i>Diff.</i>	<i>1st</i>	<i>Diff.</i>	<i>1st</i>	<i>Diff.</i>
No. of twin sets	26	—	10	—	20	—
Date 1st cow calved	28/7	+2	6/8	+9	16/7	+4
Largest within-set difference	27/8-24/9	+28	10/8-31/8	+21	5/8-4/9	+30
Calving spread (days)	31	+26	46	-2	54	-1
Mean calving date	14/8	+8	16/8	+11	11/8	+12
Lactation length (days)	212	-8 (1.3) <sup>2</sup>	213	-11 (1.8)	232	-12 (2.1)
Milk fat/cow (kg)	137	-7 (2.1)	99	-4 (2.5)	163	-12 (3.4)
Oct. production (kg m. fat/cow/day)	0.75	-0.02 (0.02)	0.53	0 (0.02)	0.85	-0.01 (0.02)

<sup>1</sup> Results for first cows to calve within each twin set.

<sup>2</sup> Standard error.

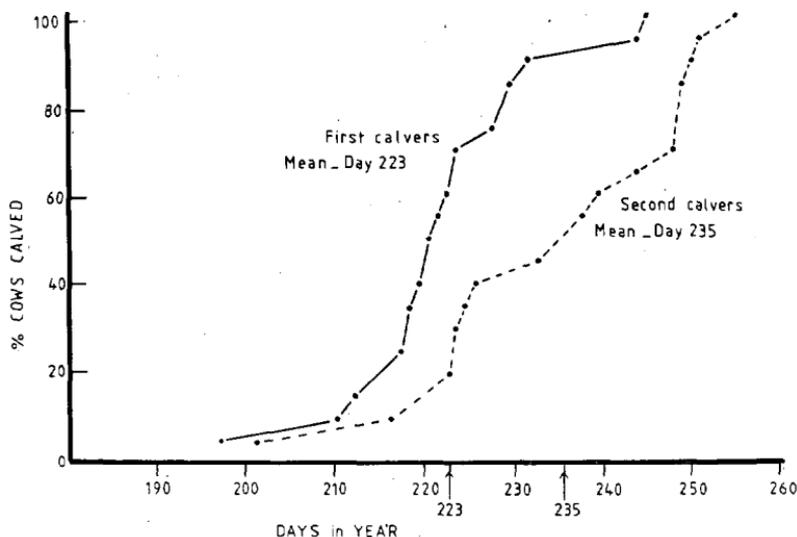


FIG. 1: Calving patterns in 20 sets of identical twins (Herd 3) divided into groups of "first" calvers and "second" calvers.

production (Fig. 2c) shows that the 12 kg production difference arose in early lactation, and by October the daily production of the "first" calvers was very similar to the daily production of the "second" calvers (0.85 vs. 0.84 kg m. fat/cow/day; Table 1) even though the within-set differences in calving date varied from zero to 30 days. The "second" calvers would have had to be milked for considerably longer than 12 days after the "first" calvers had been dried off if they were to eliminate the production difference.

The 26 higher-producing twin sets at the No. 1 Dairy (Herd 1; Table 1) had a similar mean calving date to Herd 3 but a shorter average lactation length and a lower average daily production per cow during October (208 vs. 226 days, and 0.72 vs. 0.84 kg m. fat/cow/day). Nonetheless, the 8-day difference in mean calving date and average lactation length between the groups of "first" calvers and "second" calvers in Herd 1 was associated with a 7 kg difference in m. fat/cow (137 vs. 130 kg;  $P < 1\%$ ). As with Herd 3, this production difference was established in early lactation and only slightly reduced in mid-lactation.

With the 10 sets of lower-producing twins from No. 1 Dairy (Herd 2; Table 1), the 11-day difference in mean calving date

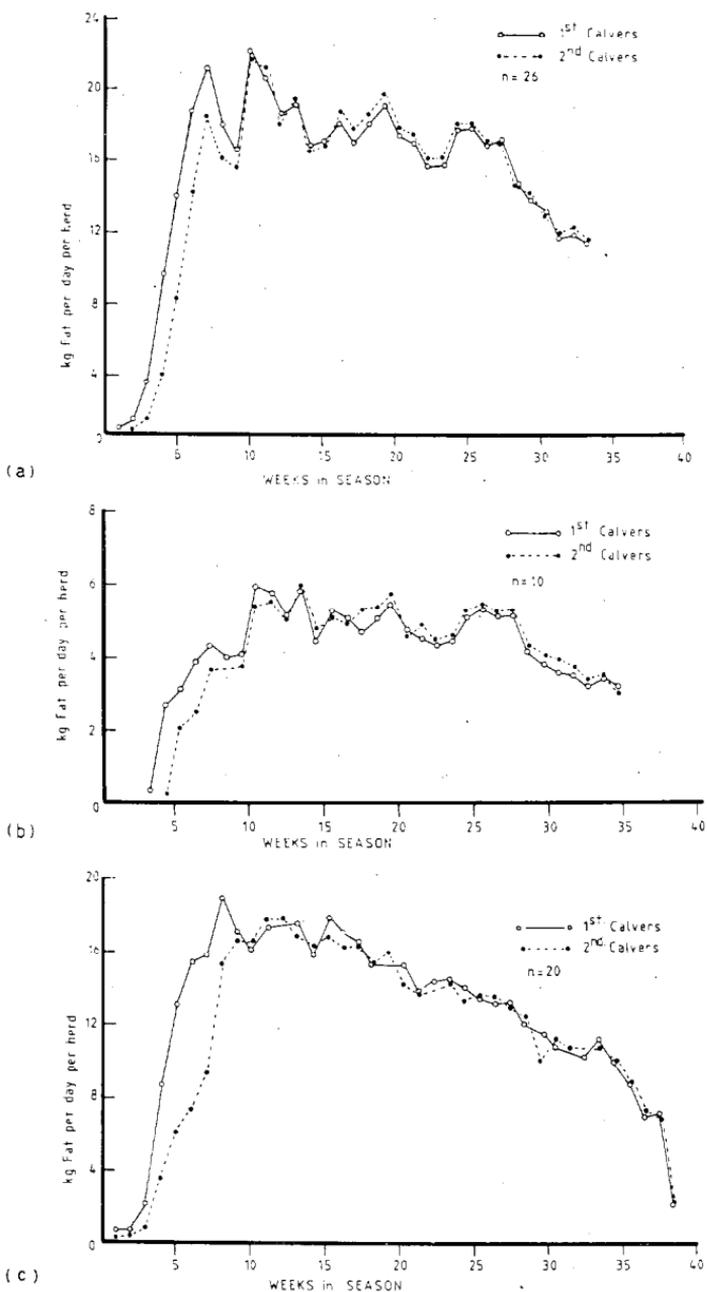


FIG. 2: Weekly herd milk-fat production figures for groups of "first" and "second" calvers involving (a) sets of higher-producing twins at the No. 1 Dairy, (b) 10 sets of lower-producing twins at the No. 1 Dairy, and (c) 20 sets of twins at the No. 3 Dairy, during the 1977-8 season.

ated with only a 4 kg difference in m. fat (99 vs. 95 kg). Since these cows produced only 0.53 kg m. fat/cow/day during October, a greater difference could hardly be expected. Even so, this difference was largely established in early lactation (Fig. 2b) and was associated with a difference in calving pattern.

The results obtained in Herds 1 and 3 show that in groups of animals of reasonable productive ability the difference in mean calving date between the groups of "first" and "second" calvers arising from normal conception variation resulted in an extra 0.8 to 1 kg m. fat/cow/day of difference in favour of the "first" calvers. If during the 1976 breeding season in these herds an oestrous cow had not been served by the bulls, then that cow's chances of conceiving would have been delayed by 21 days and her subsequent calving date by the same time. Under the management conditions operating at the No. 1 and No. 3 Dairies in the 1977-8 season, this later calving date could have resulted in a loss in production of from 16 to 20 kg. Therefore, if artificial breeding had been used in these herds, and some oestrous cows had not been detected, the "cost" of the loss in production from each of these cows could have been as much as 20 kg of m. fat, or \$36 at present m. fat prices.

This figure is the first estimate of the possible cost of the factors which contribute to a cow having a greater or lesser chance of conceiving during a particular oestrous period. These factors could include effective oestrus detection, a technician's ability to inseminate cows, the relative fertility of the semen used for the insemination and other management factors which may influence cow fertility.

The production differences associated with calving patterns in these herds may not be the same as those occurring in other dairy herds. If the "second" calvers had been grazed separately and had been managed to try and compensate for their later mean calving dates, the differences might have been reduced. In most herds such preferential treatment of later calvers would be unusual. Where substantial areas of pasture are closed for hay or silage their production may be penalized to an even greater extent than that observed in the cows in the Ruakura herds. The value of the induction process in terms of extra m. fat production (provided that induced cows have normal production patterns) can also be estimated using the results obtained from the groups of twins included in this study.

It must be emphasized that these data specifically relate to calving pattern and not to when calving should start. Nonethe-

less, Fig. 2 indicates that the differences in calving patterns between groups of "first" and "second" calvers in these three groups in the 1977-8 season *did not* result in a higher peak in milk production during late October. Rather, the groups of "first" calvers had longer periods of high production, but October production was essentially identical to that obtained from the groups of "second" calvers.

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