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EFFECT OF NUTRITION AND MATING MANAGEMENT ON CALVING PATTERNS

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SUMMARY

A high calving percentage and a controlled calving pattern are essential to optimise economic returns from a dairy or beef enterprise. High stocking rates have been shown to have a major influence on production but there is insufficient evidence on the effects of stocking rate or nutrition on calving performance.

It is known that nutrition, through its effect on post-partum anoestrous, start of mating, oestrous detection, conception rate, duration of mating, and artificial induction of calving, will affect calving pattern, but the quantitative effects of each of these and the interactions between them, cannot readily be assessed by the farmer or his adviser.

A simulation model has been developed to do this. The results indicate that poor oestrous detection and poor nutrition are the most likely causes of poor calving patterns but that these factors can be largely offset by extended duration of mating and artificial induction of calving.

Experiments in Australia and New Zealand have consistently shown higher levels of biological and economic efficiency in the conversion of pasture to milk as stocking rates have increased and production per cow has decreased. Despite the very important implications of these results the dairy industries in both Australia and New Zealand have been very reluctant to adopt these findings.

Some reasons for this have been socio-psychological but a technical reason put forward for not adopting stocking rates which result in lower levels of feeding for the cow is that although production per hectare may increase, the adverse effects of low nutrition on reproduction may be even more important.

Because of the limitations in numbers in stocking rate experiments and the implications of binomial probabilities, it has not been possible to derive useful data on calving percentages and concentration of calving from stocking rate experiments. It has been possible however, to measure with adequate sensitivity the effects of level of nutrition on the post-partum anoestrous interval (PPAI). PPAI will affect reproduction, as the later a cow starts to cycle after calving, the later is she likely to get in calf.

Experiments at the Dairy Research Institute Ellinbank have related PPAI to body condition at calving and feeding level after calving, or alternatively, level of milk production during the first five weeks of lactation (Tables 1 and 2).

TABLE 1: EFFECT OF PERI-PARTUM NUTRITION ON POST-PARTUM ANOESTROUS INTERVAL

Feeding level days 0-35 (kg DM/d)*	*PPAI (d) Condition score at calving*			
	3	*4*	*5*	*6*
6	56	50	44	39
9	52	47	41	35
12	49	43	38	32
15	46	40	34	28

* Cows well fed after the first 35 days of lactation.

TABLE 2: EFFECT OF LEVEL OF NUTRITION, AS REFLECTED IN MILKFAT PRODUCTION, ON POST-PARTUM ANOESTROUS INTERVAL.

Milkfat production kg/d	*PPAI (d)*
0.4	51
0.6	45
0.8	38
1.0	32

Although we know PPAI will affect calving pattern, it is not possible to calculate in one's head or on a pocket calculator how big this effect will be or what is the maximum PPAI that will maintain an average calving interval of 365 days. There are also a number of other factors which affect calving patterns and which will also modify the effect of PPAI on calving pattern (Fig. 1).

With the aid of a simple micro-computer we have developed a simulation model which will allow each of these eight mating management practices to be modified and to calculate the calving pattern as described by the four parameters shown.

Using the set of management practices shown in Table 3, the model calculated the calving pattern over a range of PPAI values from 20 to 70 days. This simulation showed that with a PPAI of

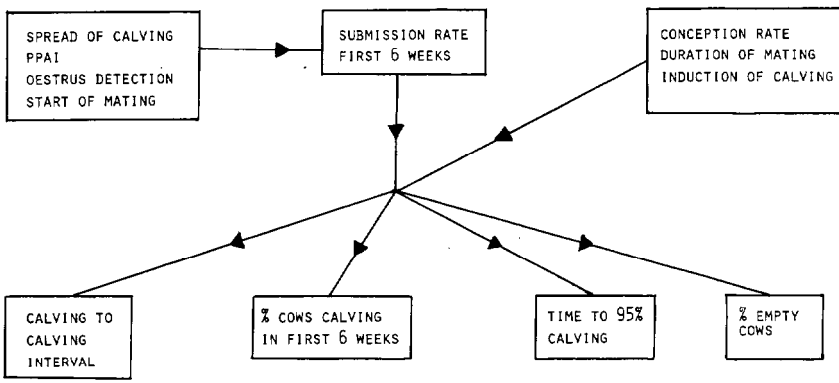

FIG. 1: *Components of mating management which affect calving pattern and the parameters which describe it.*

about 50 days, an average calving to calving interval of 365 days could be maintained with 71% of cows calving in the first 6 weeks of calving and only 2% empty cows.

TABLE 3: EFFECT OF POST-PARTUM ANOESTROUS INTERVAL ON CALVING PATTERN

PPAI (d)	*Submission rate in 21 days*	*Av. calving date next*	*% calved in 6 weeks*	*weeks to 95% calving*	*% Empty cows*
20	89.4	23/7	83.1	9	1.2
30	85.8	25/7	83.6	10	2.0
40	81.6	27/7	77.2	11	1.9
50	72.2	31/7	70.7	12	1.6
60	63.8	3/8	66.5	12	3.2
70	51.2	8/8	61.1	13	6.4

Average calving date last year : 1/8
Start of mating : 21/9
Duration of mating : 14 weeks
No cows deliberately withheld from mating
Conception rate at first oestrous 37%, at subsequent oestrous 67%
Spread of calving last year : 12 weeks
Oestrous detection : 90%
Proportion of induced calving : 0%

Space does not permit a presentation and discussion of the outcome of the numerous other systems of mating management possible and the interaction between the various components of mating management. Table 4, however, illustrates the order of magnitude of the effects of each of the components of mating management on calving pattern, when the other components are held as in Table 3.

The higher PPAI resulted in a more concentrated calving (11%) and a reduced calving to calving interval (5 days). It had only small effects on the proportion of empty cows or on the overall spread of calving.

The most important factor was the duration of mating. An extended mating period reduced the number of empty cows but increased calving to calving interval and spread of calving.

TABLE 4: EFFECT OF INDIVIDUAL COMPONENTS OF MATING MANAGEMENT ON CALVING PATTERN. OTHER COMPONENTS OF MANAGEMENT HELD AS IN TABLE 3 AND PPAI AT 50 DAYS

Component of Management	*Submission rate in first 3 weeks (%)*	*Calving to calving interval (d)*	*% calving in first 6 weeks*	*% empty cows*	*Weeks to 95% calving*
PPAI 35d (0.9)	81.0	361	79.0	1.6	11
(kg milkfat/cow/d) 55d (0.4)	68.2	365	69.0	2.1	12
Oestrous detection 60%	51.0	369	66.6	10.0	13
90%	72.3	364	70.5	2.1	11
Spread of calving 8 weeks	75.5	360	78.7	1.6	10
16 weeks	69.2	365	70.7	1.3	12
Start of mating 1/9	52.1	351	63.4	6.4	13
21/9	72.3	364	70.5	2.1	11
Restricted mating* No	72.3	364	70.5	2.1	11
Yes	41.3	367	68.4	1.3	12
Conception rate 50%	73.0	368	65.5	7.5	13
70%	72.2	364	73.2	2.0	11
Duration of mating 8 weeks	73.3	356	84.3	17.5	8
16 weeks	72.4	364	72.1	1.2	12
Induction of calving 0%	72.3	364	70.5	2.1	11
20%	72.1	359	72.1	2.1	8
Oestrous detection 60%; induced calving 20%; duration of mating 20 weeks	50.4	368	60.9	1.6	10
PPAI 60 days; induced calving 20%; duration of calving 20 weeks	63.3	364	63.5	1.0	9

* Withholding cows on their first cycle during the first three weeks of mating.

Poorer oestrous detection increased the proportion of empty cows and the calving interval and decreased by 11% the proportion of cows calving in the first six weeks.

Reducing conception rate from 70% to 50% at second and subsequent oestrous increased the number of empty cows by 7% but had only a small effect on concentration of calving. As would be expected, induction of calving reduced the overall spread of calving.

In practice, a high proportion of empty cows can be readily reduced by extending the mating season and the consequent increase in spread of calving can be reduced by inducing the tail-enders to calve early (Table 4).

This study shows that concern for poor reproductive performance should not be a reason for rejecting the use of higher stocking rates to increase the efficiency of producing milk from pastures.