

# Effect of early calving of Simmentaler heifers under an extensive management system

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Received 16 August 1994; accepted 16 May 1995

Productivity of Simmentaler heifers, first mated at 14 months of age (2 M) compared to the traditional system of mating at 26 months of age (3 M), was investigated under extensive farming conditions. Both first calving (60.8 vs. 79.5%) and recalving rates (42.4 vs. 71.2%) differed ( $P < 0.01$ ) between 2 M and 3 M heifers, respectively. Although total number of calves born (4.0 vs. 3.2) and weaned (3.3 vs. 3.1) over seven years differed ( $P \leq 0.05$ ) between 2 M and 3 M, total weaning weight (669 vs. 645 kg) was not significantly ( $P > 0.05$ ) influenced. Also, 18.6% of all calves born in 2 M, died at birth. It is concluded that improved productivity is unlikely in an early mating system without additional inputs.

Produktiwiteit van Simmentalerverse wat vir die eerste maal op 14 maande (2 M), vergeleke met die tradisionele stelsel van paring op 26 maande (3 M), gepaar is, is onder ekstensiewe veldtoestande ondersoek. Sowel eerste kalwings- (60.8 vs. 79.5%) as herkalwingspersentasies (42.2 vs. 71.2%) het onderskeidelik tussen 2 M en 3 M verskil ( $P \leq 0.01$ ). Alhoewel die totale aantal kalwers oor sewe jaar gebore (4.0 vs. 3.2) en gespeen (3.3 vs. 3.1) ook verskil het, is die totale speengewig (669 vs. 645 kg) nie betekenisvol beïnvloed nie ( $P > 0.05$ ). Verder is 18.6% van die totale aantal kalwers in 2 M gebore, tydens geboorte dood. Daar is tot die gevolgtrekking gekom dat dit onwaarskynlik is dat vroeë paring sonder addisionele insette produktiwiteit sal kan verhoog.

**Keywords:** Beef cattle, early mating, productivity, Simmentaler.

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## Introduction

Reducing the age at first calving is one of only a few ways of improving lifetime efficiency in the beef cow. In general, beef heifers are managed to calve for the first time at three years of age. However, in many studies first-year mating of heifers were advocated (Fahmy *et al.*, 1971; Meaker *et al.*, 1980; Nunez-Dominguez *et al.*, 1991). The advantage of mating them one year earlier, lies in the potential increase in lifetime productivity and the theoretical expectation of an extra calf (Meaker *et al.*, 1980). Morris (1980), in a comprehensive review, reported an average of 0.7 number of calves and 113 kg of calf weaned in lifetime performance in favour of heifers first mated at 14 months of age.

Since early times (McC Campbell, 1920), this possibility became an important field of interest among researchers. However, only limited information has been reported on the effect of age at first calving on lifetime performance in South Africa. The performance of female offspring of early calving dams has also not been investigated. In several studies (Meaker *et al.*, 1980; Lepen *et al.*, 1993), early mated heifers received preferential nutritional treatment.

The present study was therefore conducted to study the effect of early mating of Simmentaler heifers under extensive veld conditions on their own calving performances, that of their offspring, growth of their calves, calving difficulties and the cumulative performance over seven years.

## Materials and methods

The study was conducted between 1972 and 1981 at the Neudamm Experimental Farm (Namibia) on homogenous extensive natural veld (Highland Savanna Sweet Veld) regarding species composition and grazing capacity (8 ha/Large Stock Unit).

Initially 60 12-month-old Simmentaler heifers were randomly divided into two initial groups. This was repeated for another two years. One group was first mated at 14 months of age to calve at two years (2 M), and the other group at 26 months of age to calve at three years of age (3 M). Heifers from the 2 M group that failed to conceive were transferred to the 3 M group. The original intention was to study a self-contained system where heifers born in the 2 M system would then be mated in the 2 M system, and 3 M heifers in the 3 M system. However, owing to the lower calving and recalving rates and higher mortality rate in the 2 M group, heifer calves born in the 3 M group were consequently randomly allocated to either the 2 M or 3 M groups, so that young heifers in the 2 M group originated from either the 2 M group itself (referring to 2 M<sub>1</sub>) or from the 3 M group (referring to 2 M<sub>2</sub>).

All animals were kept in the same camps and were supplemented with a summer dicalcium-phosphate lick and a winter urea lick only. Multiple sire mating took place and the mating season was from 15 January to 15 April. Pelvic sizes were also measured with a pelvimeter at both 12 and 24 months of age (Wiltbank & Le Fever, 1961).

During the calving season cows were kept under close observation to ensure calving assistance where necessary. Cows were removed from the herds when they failed to calve two years in succession as well as for age after eight years.

Birth weights of calves were recorded within one day after birth. Weaning took place at approximately seven month age and weaning weights were adjusted to 205 days of age. Cow weights were also recorded at one month after parturition and again at weaning of their calves.

Data were analysed by procedures of the Statistical Analysis Systems (SAS, 1985). For body weight traits, the fixed

effects of year, cow age, previous productive status, sex of calf and mating system were included into the models. Interactions were ignored due to their small contribution to total variance. The CATMOD procedure was used for categorical traits to test whether the frequencies were associated with the mating system. A Probit Analysis was carried out to obtain the probability of a calving success at various body weights. Significance was tested using Chi-square or *t*-tests, as appropriate.

### Result and discussion

Performance of early-mated (2 M) heifers compared to heifers which produced their first calves as three year olds (3 M) is presented in Table 1.

Heifers of the 3 M group produced at first parity 30.8% more calves than those of the 2 M group ( $P \leq 0.01$ ). The heifer calving rates were in both cases fairly high, compared to some other studies (Scholtz *et al.*, 1991). The difference in weaning rate (calves weaned/heifers mated) was 56%. Recalving rate (cows calved/those also calved the previous year) in the 2 M group (42.4%) was, however, low compared to the 3 M group (71.2%). It is expected that lactational stress in the young heifer would reduce recalving percentage compared to those of the 3 M group.

**Table 1** Performance of 2 M and 3 M Simmentaler heifers and of their calves (LS Means SE)

Trait	Groups		Levels of significance
	2 M	3 M	
Number of heifers	97	83	
<i>Reproductive traits</i>			
Heifer calving rate (%)	60.8	79.5	**
Calving difficulties (%)	30.5	6.1	**
Weaning % of first calves	40.2	62.7	**
Recalving of first-calvers (%)	42.4	71.2	**
<i>Body weight of dams</i>			
Weight at start of mating season (kg)	267 ± 4.9	372 ± 3.7	**
Adult cow weight (kg)	476 ± 2.7	486 ± 11.7	NS
<i>Performance of calves</i>			
Birth weight: first calves (kg)	35 ± 0.78	37 ± 0.62	*
Weaning weight: first calves (kg)	167 ± 2.7	217 ± 3.1	**
Weight at 14 months of age (2 M <sub>1</sub> & 2 M <sub>2</sub> ) (kg)	237 ± 5.4	274 ± 5.7	**
<i>Total performance (7 years)</i>			
Number of calves born per cow	4.0	3.2	**
Number of calves weaned per cow	3.3	3.1	*
Calf losses: birth to weaning (%)	16.1	3.3	**
Total weaning weight per cow	669	645	NS

NS  $P > 0.05$

\*  $P \leq 0.05$

\*\*  $P \leq 0.01$

**Table 2** Effect of various factors on first calving and subsequent recalving success rates in early mated (2 M) Simmentaler heifers (LS Means ± SE)

Trait/Factors	Heifers which		Levels of significance
	calved	failed to	
<i>Birth to first mating</i>			
<sup>1</sup> ADG: birth to weaning (g/day)	858 ± 9.7	790 ± 11.8	**
<sup>1</sup> ADG: birth to year (g/day)	585 ± 7.4	528 ± 6.8	**
Weight: start of mating season (kg)	281 ± 4.7	247 ± 4.9	**
Origin (% calved)			**
2M <sub>1</sub>	34.5	65.5	
2M <sub>2</sub>	72.1	27.9	
<i>Recalving</i>			
<sup>1</sup> ADG: birth to weaning of previous calf (g/day)	916 ± 11.4	827 ± 12.3	**
Weight: start of mating season (kg)	290 ± 5.2	266 ± 4.7	**
Age of heifers (% recalved)			**
Eldest	51.7	48.3	
Intermediate	36.2	63.8	
Youngest	12.1	87.9	
Origin (% recalved)			**
2M <sub>1</sub>	17.2	82.8	
2M <sub>2</sub>	52.2	47.8	
Previous productive status (% recalved)			**
Parous	51.0	49.0	
Dry	75.9	24.1	

\*\*  $P \leq 0.01$

<sup>1</sup> Average daily gain

Heifers of the 3 M group weighed 39% more than those of the 2 M group at the start of their first mating seasons ( $P \leq 0.01$ ). Adult cow weights were, however, not different ( $P > 0.05$ ) between the 2 M and 3 M groups.

Although the birth weights of the first calves differed by only 2 kg between the 2 M and 3 M groups, weaning weights, probably due to lower milk production, differed by 30% (or 50 kg) ( $P \leq 0.01$ ). Morris (1980), in his review, also indicated that in nearly all trials studied by him weaning weights of first calves were reduced in early mated heifers. The same applied to the weight at 14 months of age, where the 2 M<sub>2</sub> heifers were 15.6% heavier than the 2 M<sub>1</sub> heifers, indicating a stunted influence in the offspring of early mated heifers.

Differences in performance within the 2 M group between those which calved and those which failed to calve are presented in Table 2.

Growth rates from birth to weaning and from birth to one year differed ( $P \leq 0.01$ ) and were higher in those heifers which calved. The same applied to the weight of the heifers at the start of the first mating season. Those heifers which calved were 13.5% and those which recalved in the subsequent season were 9.0% heavier than those which failed to calve. The importance of both a fast pre- and post-weaning growth rate in early mated heifers is illustrated. This importance was also stressed by other authors (Ellis, 1974). Donaldson *et al.* (1967) also reported significant differences among the two-year-old joining weights of heifers subsequently pregnant vs. those non-pregnant, while results obtained by Young (1967) suggested no such correlation. The probability of a calving success, as influenced by body weight at first mating in early mated heifers, is illustrated in Figure 1.

To achieve a calving probability of say 70%, Simmentaler heifers should reach an average body weight at first mating of 283 kg, which is 60% of cow mature weight. Morris (1980) also concluded that a critical body weight, in relation to pregnancy success rates, should be identified separately for each breed and farm. Ellis (1974) suggested as an example that a target of an 80% calf crop corresponds to a mean weight of 270 kg in early mated Hereford heifers.

Only 34.5% of the heifers in the 2 M group which were also born in this group (2 M<sub>1</sub>) calved, compared to the 72.1% of the 2 M<sub>2</sub> group (Table 2). The successful remating percentage of the 2 M<sub>1</sub> group was only 17.2 compared to 52.2 of the 2 M<sub>2</sub> group. This strongly suggested that a 2 M heifer, also born to a 2 M heifer, is seriously affected as far as both first mating and remating success is concerned. Heifer calves produced by early mated heifers should therefore either be culled or first mated at 2 years of age. They will not be able to reach a target weight for successful breeding. The system of early calving therefore was incapable of maintaining itself.

Within the 2 M group, age of the heifer was also important for recalving ( $P \leq 0.01$ ). Only 12.1% of the youngest group was successfully remated, compared to 51.7% of the eldest group (Table 2).

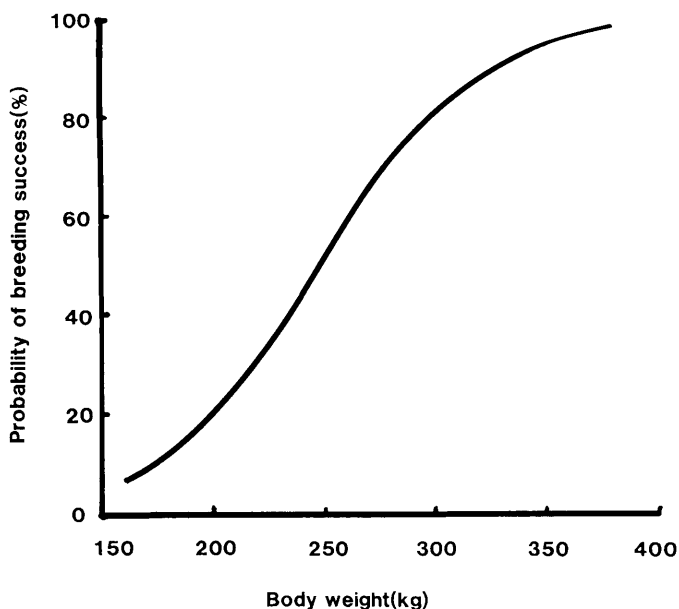


Figure 1 Probability of breeding success at different body weights in early bred Simmentaler heifers

Previous productive status (parous or dry during the first season) also affected ( $P \leq 0.01$ ) subsequent calving success (Table 2). Of those which were non-pregnant during the first season, 75.9% calved in the subsequent year, compared to 51.0% of those which were pregnant during the first season.

In general, it has been shown that heifers calving first at two years of age produced fewer calves and less calf weight at first calving than cows calving at three years of age (Bellows, 1968; Brinks *et al.*, 1971; Singleton & Nelson, 1972; Laster *et al.*, 1973).

In this study, calving difficulties (dystocia and assisted births) also differed ( $P \leq 0.01$ ) between the 2 M and 3 M groups (Table 1). A high incidence of calving difficulties and dystocia in early calving heifers were also reported by Pinney *et al.* (1972) and Laster *et al.* (1973). In indigenous breeds, however, calving problems in early calving heifers is of less concern (Penzhorn *et al.*, 1968; Scholtz *et al.*, 1991; Lepen *et al.*, 1993).

The influence of certain factors which contributed towards calving difficulties in the early calving heifer group, is presented in Table 3.

Birth weight and sex of the calf and body weight of the heifer at mating contributed to calving difficulties. Pelvic size in the heifers was, however, not important ( $P > 0.05$ ). Heifers that experienced calving difficulty weighed on average 8.7% less and gave birth to calves which weighed on average 8.9% more than those which did not. The calf birth weight:heifer weight ratios at parturition were 10.7% and 8.7% between those which experienced calving difficulties and those which did not, respectively. In births where calving difficulties were experienced, 72.2% bull calves were involved and 27.8% heifer calves. Similarly, 43.4% of all bull calves experienced calving difficulty, compared to only 17.2% of all heifer calves. This is partly due to the higher birth weights of bull calves. Corresponding differences between sexes were obtained by Bellows *et al.* (1971), Brinks *et al.* (1971) and Laster *et al.* (1973). Also, 18.6% of all calves born in the 2 M group died at birth.

Table 3 Effect of various factors on calving difficulty in early mated (2 M) Simmentaler heifers (LS Means  $\pm$  SE)

Factors	Heifers with or without calving problems		Levels of significance
	With	Without	
Pelvic size (cm <sup>2</sup> )	239 $\pm$ 8.3	249 $\pm$ 7.8	NS
Birth weight of calf (kg)	36.7 $\pm$ 0.78	33.7 $\pm$ 0.64	**
Sex of calf (% with calving difficulty)			*
Bulls	43.4	56.6	
Heifers	17.2	82.8	
Body weight at start of mating season (kg)	263 $\pm$ 9.4	288 $\pm$ 8.2	*

NS  $P > 0.05$

\*  $P \leq 0.05$

\*\*  $P \leq 0.01$

Although the early mated heifer group (2 M) produced 25% more calves at birth ( $P \leq 0.01$ ) and only 6.5% more at weaning ( $P \leq 0.05$ ), total weaning weight per cow over seven years was not different ( $P > 0.05$ ). This was mainly due to the higher calf losses ( $P \leq 0.01$ ) and lower weaning weights ( $P \leq 0.01$ ) in the 2 M group than in the 3 M group (Table 1).

### Conclusions

Although early mating of Simmentaler heifers resulted in an increased number of calves born and weaned, lifetime productivity was not significantly influenced. It seems that early calving had a serious detrimental effect on calving ease and survival rate. It should therefore not be considered as a standard management practice in Simmentaler cattle under extensive farming conditions. It seems unlikely that such a system can improve on the traditional system on natural pasture. The system was not even self-maintaining. Instead, the possibility of two mating seasons per year and mating for the first time at 20 months of age should be investigated as a possibility to increase overall output and to decrease costs of replacement females.

The success of implementing mating heifers at one year of age depends on nutritional and management levels. Under extensive farming conditions it will require additional supplementary input. In most studies of this nature, there is a positive correlation between early and subsequent reproduction (Morris, 1980), but the sign of this correlation (positive or negative) depends entirely on nutritional and management levels and on breed.

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