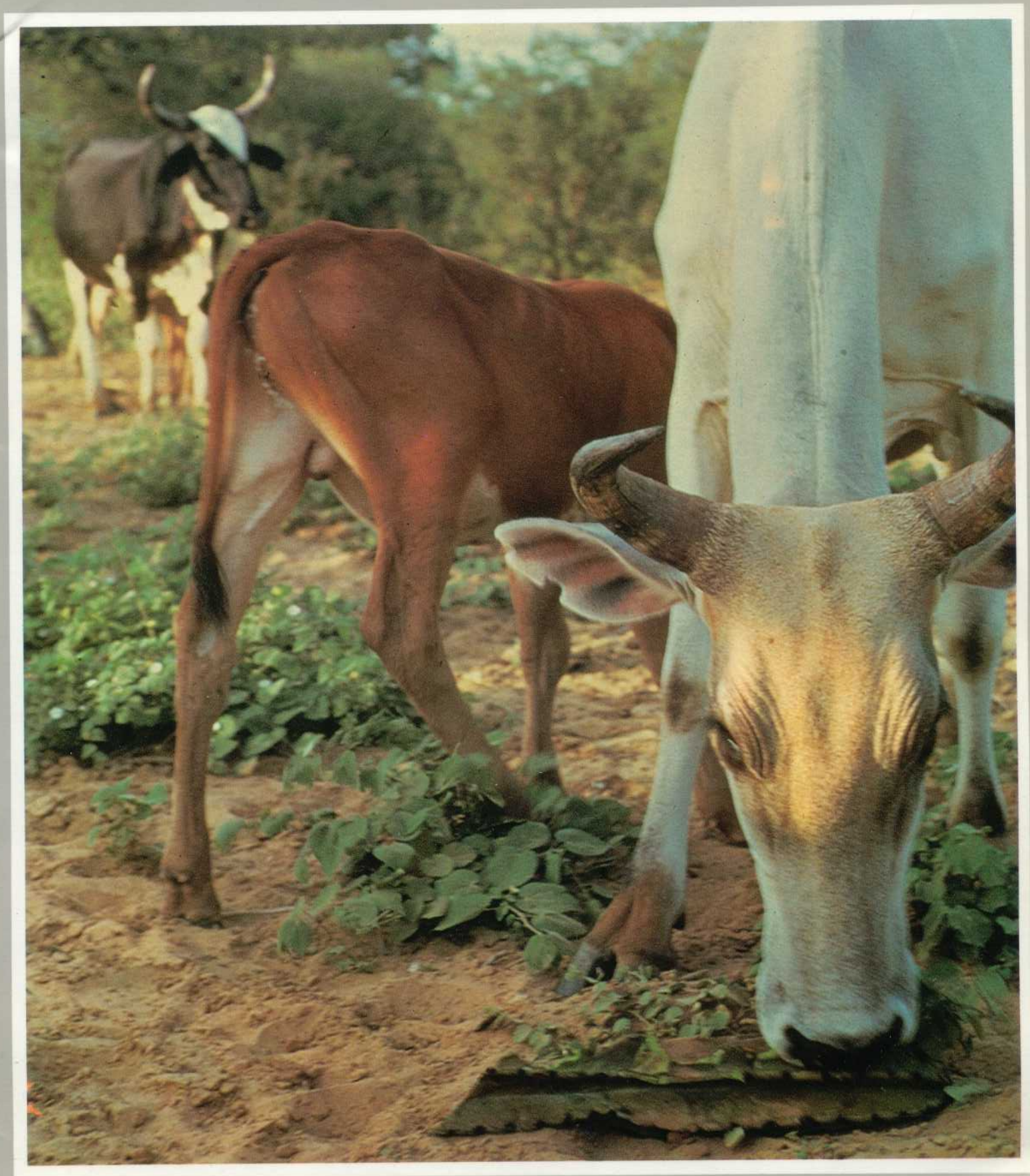
World Review of Animal Production

Volume seventeen
Number four
October
December 1981



Duration of Farrowing and Birth and Nursing Order in Relation to Piglet Growth and Survival

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Contribution no. 120

Introduction

Most of the studies concerned with ways to increase piglet performance have centered around methods to increase growth rate and decrease early mortality (reviewed recently by Backström 1973). Although the problem of slow growth rate and piglet mortality have been often related to inefficient management and/or poor condition of the newborn, in few studies has the problem been approached from the point of view of studying the effect of farrowing itself and that of piglets' birth and nursing order.

It is important to realize that understanding the farrowing behavior of sows enables producers to find means for reducing mortality at birth and during the preweaning period. Studying nursing patterns helps in the interpretation of the observed differences in growth rate and thus helps in finding reasons for the occurrence of runt animals, which could lead to finding ways to prevent their occurrence.

Since the present knowledge on the subject is rather inconclusive this study was conducted to provide more information on: (1) the influence of the duration of farrowing on piglet and litter performance; (2) the relation between birth order and birth weight, growth rate, and preweaning piglet survival; and (3) the effect of the teat suckled on preweaning growth.

Materials and methods

This study was initiated in the summer of 1978 at the Agriculture Canada, Research Station, Lennoxville, Quebec. Landrace gilts and sows were weighed at about 109 days of gestation and then moved into individual farrowing crates measuring approximately 2 x 3 meters. Each pen was equipped with an automatic water supplier and a dry feed trough located directly in front of the dams. Piglets had access to an isolated area supplied with a heat lamp and creep feed. The farrowing pens were well bedded with wood shavings which were normally replaced daily. Sows were fed a commercial nursing sow ration containing 16 percent protein beginning with 3.0 kg/day during the first week and increasing this amount by 1 kg/day each consecutive week until weaning at 4 weeks. The area where the experiment was conducted is insulated and heated in the winter to maintain a comfortable temperature of about 18°C.

Data collection began for each litter with the birth of the first piglet. Birth order, the interval from one birth to the next and from the first to the last piglet (the duration of farrowing) were recorded on 19 litters. At birth each piglet was dried with a cloth and temporarily identified by numbering them on their backs with a felt-tipped marker. Within 12 hours after

birth each piglet had its ears notched for permanent identification, was weighed to the nearest 100 g and had its tail and eye-teeth removed. The piglets received an iron injection during the first day of life and again 10 days later. Several piglets showed signs of stiff hind legs, and these were injected with "Lincomycin". Beginning on the 7th day after birth the piglets were provided with an unmedicated 18 percent protein creep feed, *ad libitum*.

The teat pairs on the sow were numbered from anterior to posterior (usually up to 7). Continuous observations were made on each litter during the first week to determine teat choice by each individual piglet. If a piglet regularly suckled more than one teat, the choice on day 3 was the one included in the analysis. Donald (1937) stated that by day 4 the litter usually distributes itself into positions that are retained for the most part until weaning. Several piglets were eliminated from the analysis of growth when pertinent data were not available, such as missing weights due to death. Individual piglet weights were obtained weekly until weaning at 4 week of age.

The data were analyzed by the least-squares method of fitting constants. The model used to analyze the duration of farrowing included effects for parity and the partial regression of litter size and average piglet birth weight both linear and quadratic. The factors included in studying the growth rate were sex, parity, birth weight, litter size and teat choice.

Results and discussion

The least-squares mean (±SE) for the duration of farrowing corrected for litter size, average piglet birth weight and parity was 140.5 ± 14 minutes. This average is similar to that reported by English *et al* (1977) but smaller than those reported by Jones (1966), Randall (1972) and De Roth and Downie (1976) at 173, 156 and 186 minutes respectively. Friend *et al* (1962) reporting on 212 farrowings by 38 Yorkshire sows estimated the duration of farrowing at 296 minutes which is considerably higher than the other estimates reported. It must be mentioned however, that no valid comparisons can be drawn from these reports

(Below) each piglet fights for its teat, but once the order is established, suckling proceeds smoothly. (Right) less chances for survival for piglets no. 1 & 3 if they keep on missing their meals.

because many other factors were involved and in most cases were not corrected for. These factors include genetic groups, litter size, parity, management among others. It is also worth noting that the findings of Friend *et al* (1962) and Randall (1972) which were based on a relatively large sample indicated that the distribution of the duration of farrowing may not be normal but rather skewed to the right, and hence, the mean is a biased estimate of the central tendency. However, the present data and those of Jones (1966) both relatively small in size, gave close estimates for the means and modes (137 minutes in the present study) which may roughly indicate that the distribution of the sample was close enough to normality to make the mean an unbiased estimate.

The reason for the short farrowing duration observed in the present data was that all the sows farrowed in less than 300 minutes. The longest farrowing recorded was 288 minutes for a litter of 7 piglets, whereas the shortest was 62 minutes for a litter of 9 piglets. Seventy-four percent of the farrowings were completed in less than 3 hours, 10% within 3 to 4 hours and 16% within 4 to 5 hours. Randall (1972) showed that farrowing can be as short as 30 minutes (litter of 3) or as long as 630 minutes (litter of 18). The corresponding figures in the studies of Jones (1966) and de Roth an Downie (1976) were 28 and 625 and 87 and 340 minutes respectively.

The duration of farrowing in the present study was found to be weakly associated with litter size (r = .13). The relation is rather curvelinear with the shortest farrowing interval occuring in sows farrowing average size litters. The same trend was also reported by Friend *et al* (1962). The prolonged delivery in small litters may be attributed partly to the heavier birth weights associated with small litters (Friend and Cunningham 1966, Fahmy *et al* 1978). Schafer (1941) reported that piglets weighing over 1 kg required on the average 21.2 minutes for birth compared to 10.5 minutes for piglets weighing less than 1 kg. On the

Sow with its teats numbered from anterior to posterior. The former are those preferred by the piglets.

TABLE 1 - The influence of birth order on birth weight, average daily gain and number weaned from birth to 28 days in litters of different sizes.

	Litters of 6 piglets or less					Litters of 7-9 piglets					Litters of 10 piglets or more				
Birth Order	No Born	No Born Alive	No Weaned	Birth Weight (kg)*	Average Daily Gain (gm)	No Born	No Born Alive	No Weaned	Birth Weight (kg)*	Average Daily Gain (gm)	No Born	No Born Alive	No Weaned	Birth Weight (kg)*	Average Daily Gain (gm)
1	3	2	2	1.76±.06	257	6	6	6	1.60±.11	231	10	10	9	1.50±.07	180
2	3	3	3	1.85±.16	305	6	6	5	1.60±.06	201	10	10	7	1.59±.06	194
3	3	2	1	1.90±.05	298	6	6	5	1.51±.05	230	10	9	7	1.56±.10	182
4	3	3	3	1.68±.19	198	6	5	4	1.33±.23	220	10	10	9	1.44±.08	192
5	2	2	2	1.65±.02	267	6	6	5	1.57±.06	234	10	10	8	1.49±.07	193
6	1	1	1	1.60±.00	214	6	5	5	1.54±.13	200	10	10	7	1.49±.08	178
7	15	13	12			6	6	6	1.53±.11	194	10	9	8	1.28±.11	170
8						3	3	3	1.55±.00	224	10	9	8	1.61±.05	178
9						2	2	2	1.62±.17	204	10	10	9	1.47±.11	184
10						47	44	41			10	9	8	1.43±.09	187
11											6	4	4	1.41±.11	153
12-13											4	2	2	1.18±.18	225
											110	103	86		

* ± Standard error

other hand, large litters tend to put considerable strain upon the sow as time progresses and the force of her contractions may become weaker resulting in increased total farrowing time and often death to some late born piglets. In the present study the correlation between the average birth weight of the piglets and the duration of farrowing was 0.32.

To eliminate the effect of number of pigs born on the duration of farrowing, the average farrowing time for each piglet is often reported; in the present study it was 15.7 minutes. Jones (1966), Randall (1972) and De Roth and Downie (1976) reported mean interval between piglets at birth of 15.3, 16.0 and 16.5 minutes respectively. Of the 154 intervals recorded, 10 (6.5%, from 8 sows) lasted 60 or more minutes, 6 of which were before either second or last piglets and 2 were before third or second to last, which agrees with the observations made by Jones (1966). Seventeen piglets (11%) were expelled in 30 to 50 minutes and 38 (24.7%) in 10 to 29 minutes. The majority (57.9%) of the piglets were born in less than 10 minutes. The mode for the duration between birth of individual piglets was 8 minutes.

No difference in the duration of farrowing was observed between sows farrowing first or second litters contrary to the findings of English *et al* (1977) who reported that gilts had a farrowing duration 94 minutes shorter than sows in their 2nd to 4th parity. The relation between birth order of the piglet and each of birth weight and preweaning average daily gain is presented in Table 1 for litters of different sizes. Generally the piglets born early in the sequence tended to be heavier than those born late which agrees with the findings of Friend and Cunningham (1966).

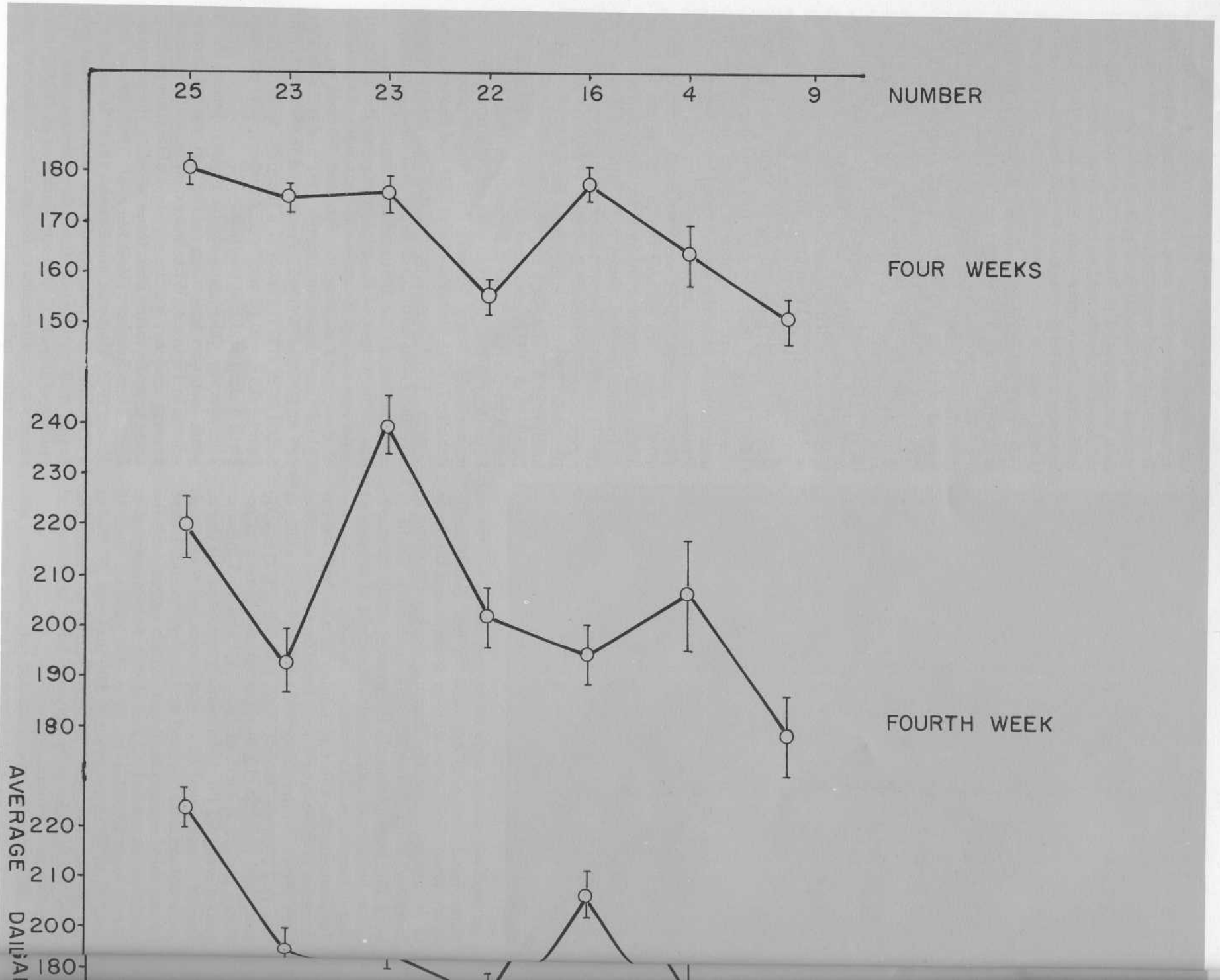
The −0.22 correlation coefficient between birth order and weight found in the present study is larger than the −0.07 reported by Scheel *et al* (1977) but smaller than the −0.58 and −0.41 estimates reported by Harmon *et al* (1972) and Hartsock and Graves (1976) respectively and the − 0.80 estimate calculated by these latter from the data of Arganosa and Penalba (1971). The present results and those of Arganoza and Penalba (1971) showed a tendency for piglets born halfway in the sequence to be heavier than those born before and after them. This observation motivated Arganoza and Penalba (1971) to suggest that pigs from one horn of the uterus may be first farrowed followed by pigs from the other horn. However, Dziuk and Harmon (1969) showed that although this may happen in few cases, piglets are born more or less at random, so that uterine horn does not empty completely before some fetuses come from the other horn.

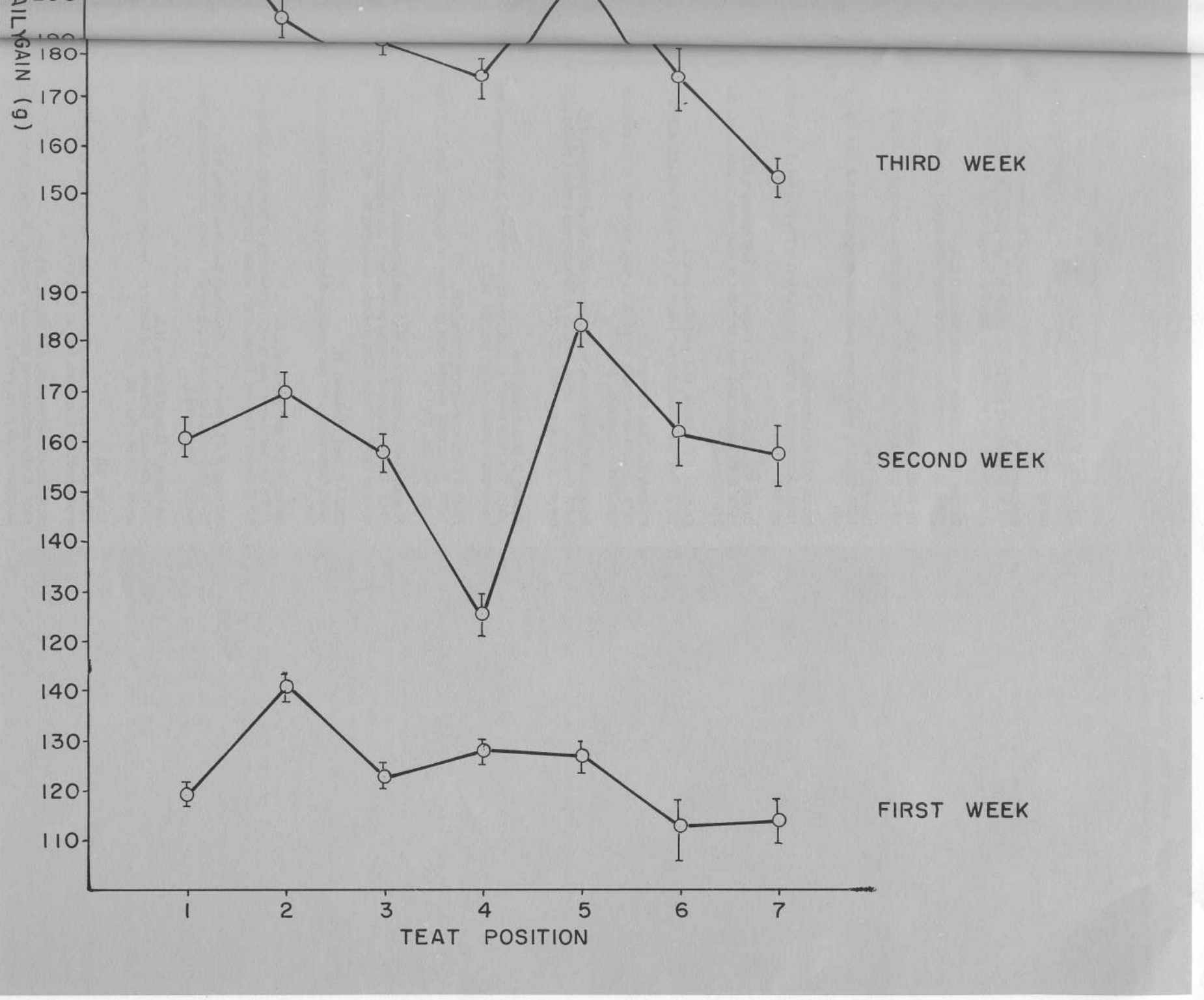
Twelve piglets (7.0%) were stillborn, eight of them (67%) were born among the last 3 piglets in large litters. The farrowing interval for these stillborn was 33 minutes (ranged from 1 to 97 minutes). Dziuk *et al* (1972) estimated the incidence of stillborn piglets to range from 5 to 10%, Friend *et al* (1962) De Roth and Doownie (1976) and Fahmy and Bernard (1971) calculated it at 5.7 and 7.2% respectively.

Dziuk *et al* (1972) also reported that the interval between births was 57 and 34 minutes longer in stillborn than in live piglets in gilts and multiparous sows respectively. Many workers including Arganoza and Penalba (1971), Harmon *et al* (1972) and Hartsock and Graves (1976) have reported that mortality percentage increased with birth order and gave significant correlations of 0.60, 0.61 and 0.77 respectively.

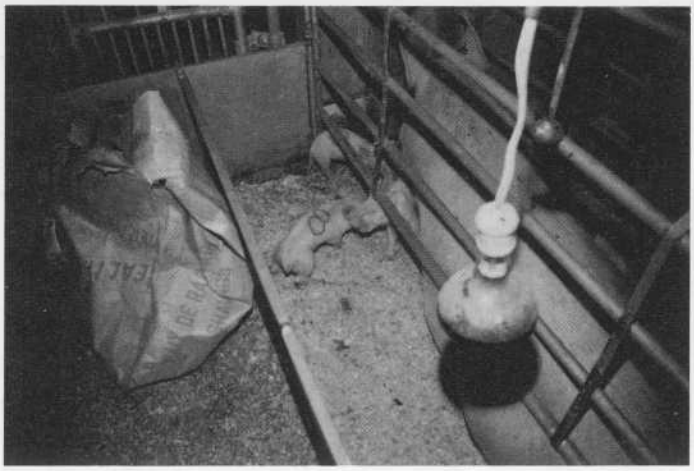
The birth weight of the piglets nursing the different teats was not significantly different, with the weights of the piglets nursing the 6th and 7th teat slightly lighter than those nursing the first five (1.25 vs 1.31 kg). McBride *et al* (1965), Fraser and Jones (1975) and Schell *et al* (1977) reported a negative weak correlation (− 0.13, − 0.16 and − 0.24 respectively) between birth weight and teat position.

The average daily gain of the piglets during the 4 week lactation according to the teat sucked is presented in Figure 1. With few exceptions, there was a general tendency for the piglets suckling the anterior teats to grow faster than those suckling the posterior ones. Many workers (McBride *et al.*, 1965; Fraser and Jones, 1975; Hartsock and Graves, 1976; Scheel *et al.*, 1977) obtained similar results and attributed that to a better milk production from the anterior teats. The studies of Donald (1937) and Barber *et al.* (1955) indicated an overall tendency for the anterior teats to produce more milk, both however, emphasized that,


25
23
23
22
16
4
9
NUMBER
180
170
160
150
FOUR WEEKS
240
230
220
210
200
190
180
FOURTH WEEK
220
210
200
180
AVERAGE DAILY


DAILY GAIN (g)
180
170
160
150
THIRD WEEK
190
180
170
160
150
140
130
120
SECOND WEEK
140
130
120
110
FIRST WEEK
1
2
3
4
5
6
7
TEAT POSITION

while they found some correlation between teat number and milk yield, there was clearly no uniform graduation from front to rear. Gill and Thomson (1956) reported that the piglets which suckled the 3 pairs of anterior teats got 84% more milk than those which suckled the posterior 3 or 4 pairs of teats. McBride *et al* (1965) stated that since there is a tendency for piglets which are heavier at birth to obtain anterior teats, the effect of teat position increased the growth advantage of piglets with high birth weights. Of the 160 piglets which were alive at birth 139 were weaned. Most of the deaths occured in newly born piglets before they had a chance to suckle their dams. Only 5 piglets which later died, suckled and none of them suckled the 3 most anterior teats.



Fighting away from the udder is very common in the first few days after farrowing.

The results of the present study which agree in general with those reported before indicate that farrowing can be an inefficient process which result in deaths of unborn piglets through suffocation at a rate of about half a piglet per litter. The prolonged farrowing has many drawbacks which include the increased likelihood of later born piglets being suffocated in the uterus, also decrease the chances for survival of later born piglets. The later born piglets are also at a disadvantage since their earlier born litter-mates will have had greater opportunities for suckling the colostrum, also later born litter-mates are faced with greater competition in getting a favourable teat.
In general, research is needed to understand the reason for the prolonged farrowing interval which could include the genetic component of this trait. Also needed are, methods to reduce the interval such as by using drugs to help stimulate more effective uterine contraction during farrowing. More studies are also needed in the management of the newly born piglets to insure their survival and growth during nursing.

Acknowledgements

The authors wish to acknowledge work contributed by M. Morrissette, D. Bailey, L. Letourneau, J. P. Bourque.

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