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FACTORS AFFECTING LITTERSIZE IN RABBITS WITH POST-PARTUM INSEMINATION

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The number of young weaned per doe and year is one of the most important factors for the economics of rabbit production. It is therefore of interest to investigate the effects of various management factors on this trait. Whilst e.g. Perry (1983) investigated the effect of various lengths of the parturition - remate interval on productivity, in the present paper factors were investigated which are of importance in post-partum insemination.

Material and Methods

All the data were collected on one farm from 1977 to 1982. In the investigation two closed lines (line N and line Z) were included. The line N was developed essentially out of the New Zealand White breed, whereas for the formation of the Z line various local strains were utilized.
During the whole period of investigation the does were kept in single tier cages with wire floor. The nesting boxes were attached to the cage. Food and water were given ad lib. The food contained 580 GN (TDN), 18 % crude protein and 13.5 % crude fibre. The minimal temperature in the stable was around 15° C. The does were inseminated within the first few days after parturition. Ovulation was stimulated by intramuscular injection of Receptal^{R*}. Does which did not conceive were not remated

*Product of Höchst
Application was according to the prescription of the producer

before 33 days after the last insemination. The young were weaned at 22 to 28 days after parturition.

For the investigation there were the following data available:

From line N
360 does with
1753 inseminations and
1158 litters

From line Z
343 does with
1673 inseminations and
989 litters

The observations were statistically analysed by linear model techniques (Analysis of variance and Regression).

Results and Discussion

Using all observations the effects of the day of insemination and of the number of insemination (first, second etc.) were investigated. In this material day of insemination is equivalent to week of insemination, since usually insemination is carried out only once a week. Therefore all factors changing with time are accounted for by day of insemination. The number of insemination indicates, whether it is the first or second etc. insemination. This is not identical to the insemination leading to the first or second (etc.) litter but reflects much more the age of the animal. In both lines the effects of the two factors were highly significant ($p < 0.01$). With regard to number of insemination (Fig. 1) there was a difference between the two lines. In line N the litter size was slightly increasing up to the 5 th insemination, whereas in line Z only the first litter was markedly smaller than the others. The results of line N are in agreement with results obtained by Rouvier et al. (1973), Broeck a. Lampo (1976) and Hattenhauer (1975).

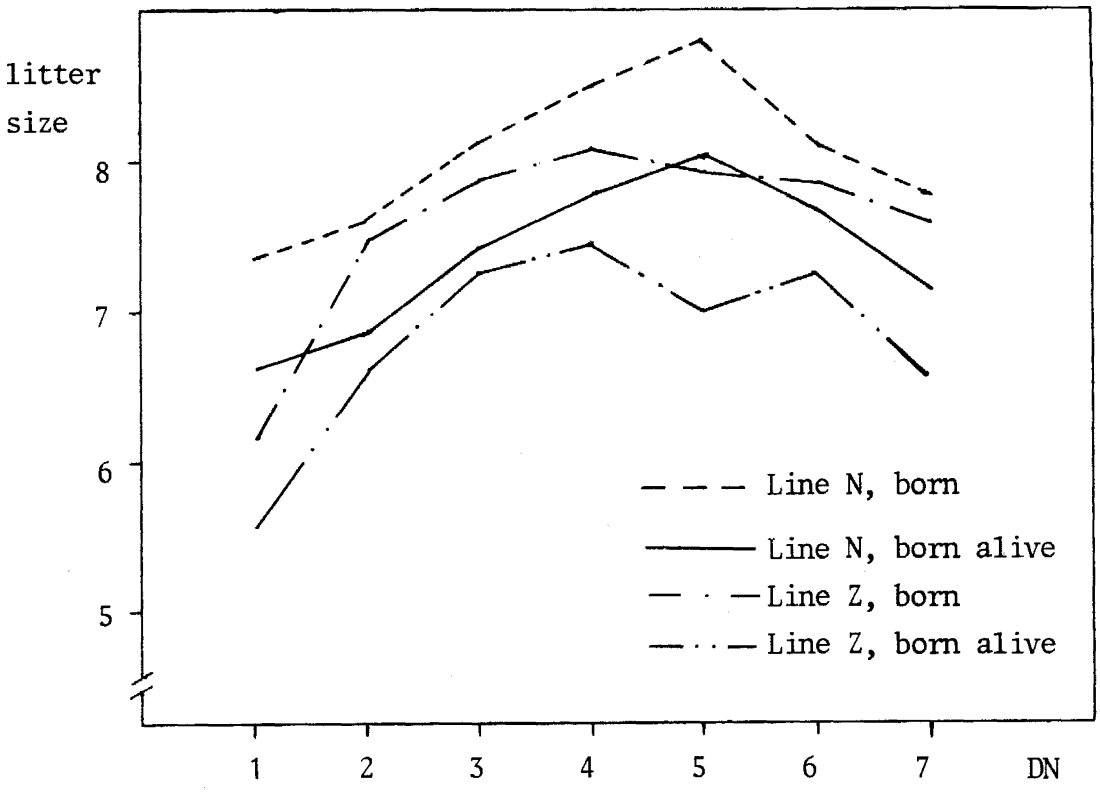

Fig. 1 Effects of the number of insemination (DN) on litter size.

In order to investigate, whether the rate of conception and the litter-size are affected by the size of the last litter and by the length of the interval between parturition and insemination, only those does could be utilized which had had a previously successful litter. Therefore only second and higher litters could be considered.
The statistical analysis was carried out separately for the two lines with the following linear models

$$y_{ijk} = \mu + DD_i + DN_j + DA_k + b_2 (WTV-\overline{WTV}) + e_{ijkl}$$

or

$$y_{ijkl} = \mu + DD_i + DN_j + b_1 (DA_k-\overline{DA}) + b_2 (WTV-\overline{WTV}) + e_{ijkl}$$

y_{ijkl} dependent variable
- conceptionrate (KR)
- number born (WT)
- number born alive (WL)

DD_i Effect of the day of insemination

DN_j Effect of the number of insemination

DA_k Effect of the interval (in days) between parturition and insemination

WTV Effect of the previous litter size (number born)

e residual effect; Effect which is not accounted for by the other factors.

The interval between parturition and insemination only varied in the region between 0 and 5 days. This factor largely affected the dependent variables in a linear manner. This is the reason we present only the results from the second statistical model.

Between the factors previous litter size (WTV) and length of the interval parturition - insemination (DA) there is a positive correlation, because the day of insemination is fixed in advance and does with large litters have a shorter gestation period ($\rho = -0.37$). Because of this correlation the two factors WTV and DA must always be considered simultanously in the statistical analysis.

The results of the analysis with regard to conception rate (KR) is given in Fig. 2. There it can be seen that the conception rate diminishes when the previous littersize is large and also when the interval between parturition and insemination is large. The two lines react differently. In line N the previous littersize seems to be more important whereas in line Z the interval parturition - insemination has the larger effect. Altogether, the effects on the conception rate are quite large. For the two lines, the following regression equations were obtained for conception rate

Line N $\hat{KR} = 0.63 - 0.033\ (DA-2) - 0.030\ (WTV-7)$

Line Z $\hat{KR} = 0.53 - 0.072\ (DA-2) - 0.015\ (WTV-7)$

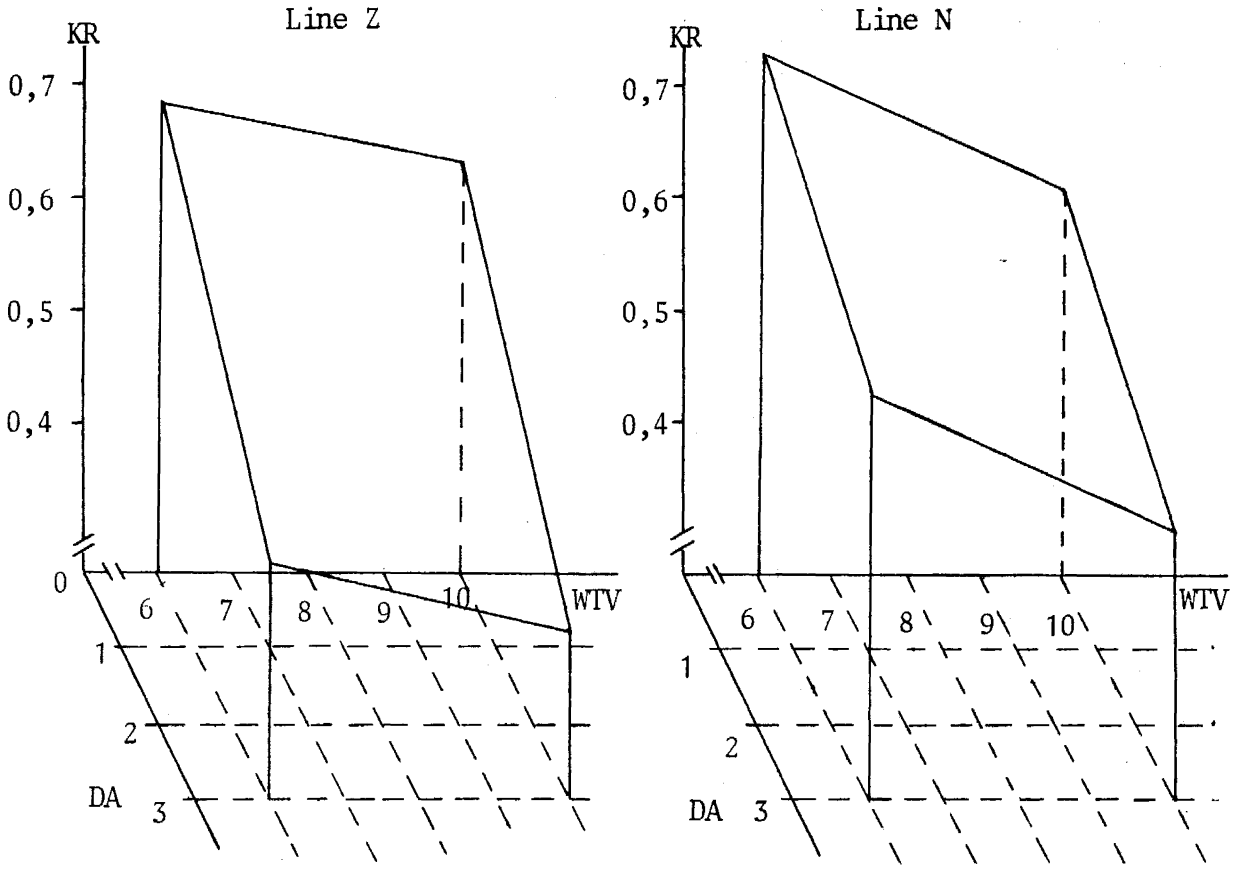

Fig. 2 Effects of the length of the interval between parturition and insemination (DA) and of the previous littersize (WTV) on the conception rate (KR)

The trait number born (given that there was a litter) was also affected by the two factors WTV and DA

The following regression equations were obtained:

Line N: $\hat{WT} = 7.61 - 0.021\ (DA-2) - 0.20\ (WTV-7)$

$\hat{WL} = 6.79 - 0.034\ (DA-2) - 0.15\ (WTV-7)$

Line Z: $\hat{WT} = 7.59 - 0.377\ (DA-2) - 0.08\ (WTV-7)$

$\hat{WL} = 6.67 - 0.297\ (DA-2) - 0.07\ (WTV-7)$

WT number of young born

WL number of young born alive

In Fig. 3 these results are shown graphically.

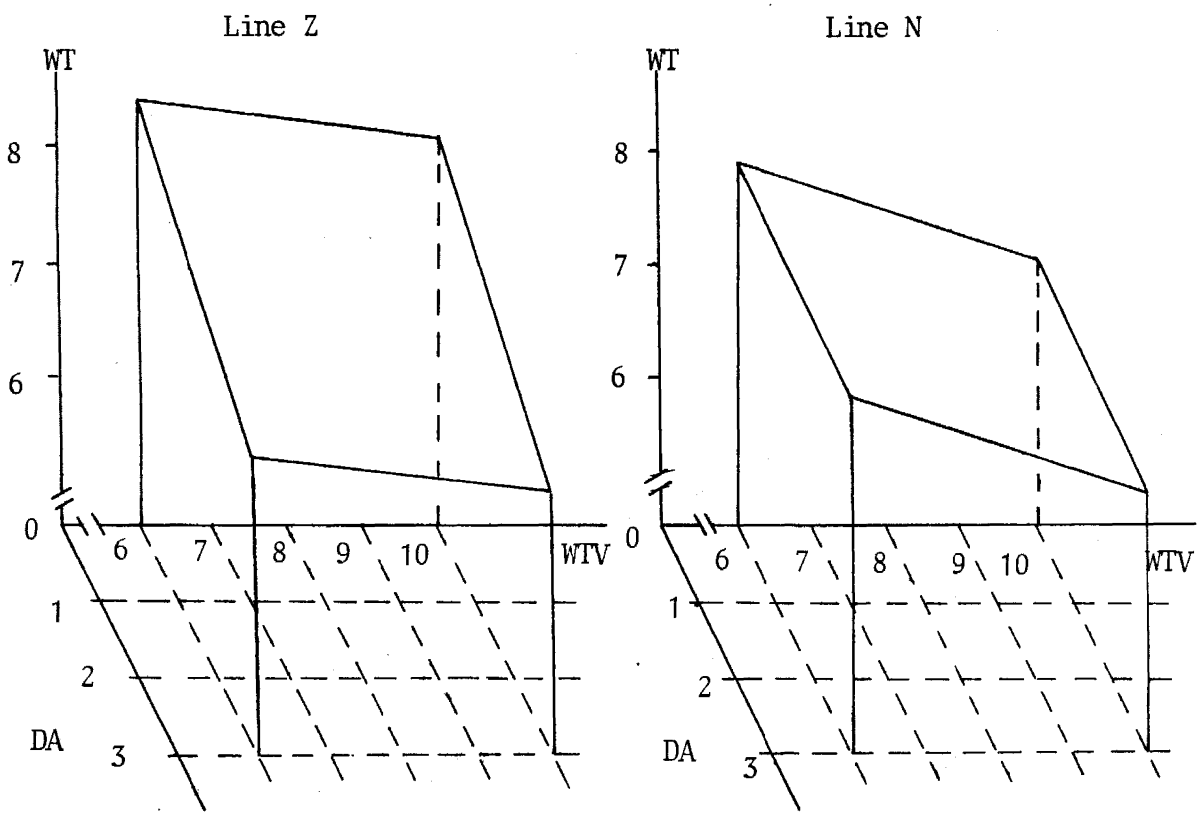

Fig. 3 Effect of the interval parturition - insemination (DA) and of the previous litter size (WTV) on the number born (given that there was a litter).

Even more pronounced are the effects on the trait number born per insemination which is shown graphically in Fig. 4

In discussing these results it should be remembered that this is an observational study. Since the day of insemination was fixed in advance the interval parturition-insemination was not so much determined by the experimenter but by the doe through the length of the previous gestation period. Nevertheless for a husbandry system like the one used here it seems obvious that the insemination should be carried out as soon as possible after parturition, since then both conception rate and number born are increased. The relation between the previous litter size and the following litter size is interesting but it can be hardly used for practical purposes, except in selection for breeding stock. There it points to the necessity of considering not only one litter but the average of several litters.

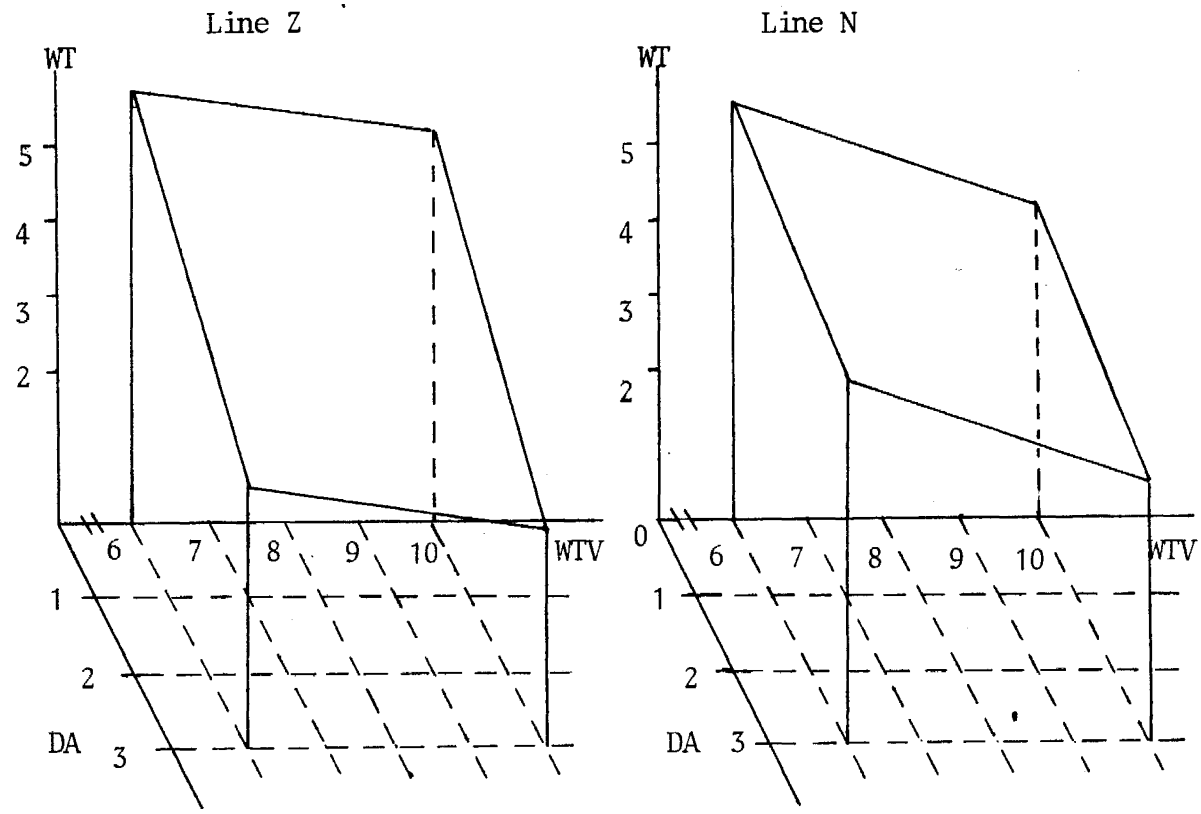

Fig. 4 Effect of the interval parturition - insemination (DA) and of the previous litter size (WTV) on the number born per insemination.

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Data from a large commercial rabbit farm including two different lines were analysed with regard to conception rate and littersize. In the statistical analysis the effects of the day of insemination (season effect), number of insemination (age of the animal), the previous litter size and the length of the interval between parturition and insemination were taken into account. As expected the day of insemination and the number of insemination had a highly significant effect on litter size. For previous litter size an inverse effect was found on the following litter size. For the length of the interval between parturition and insemination it was found that the shorter the interval the higher is the conception rate and the litter size under the husbandry system used. In addition some differences between the two lines were found.