

the breeding program. Records included breeding, weight changes and productivity of all cattle. Calves were weighed at birth and all animals were weighed at 28-day intervals. The data included records on 673 calves obtained from 254 cows from this herd.

Weaning weights of calves were adjusted to a mean weaning age of 180 days, based on a regression coefficient of 1.5 pounds per day determined from the data. Approximate correction for sex difference was made by adding 28.3 pounds to the weaning weight of heifers. This difference in weight due to sex was obtained from within sub-group averages and was in close agreement with results reported by Koger and Knox (14), who found a sex difference of 30 pounds in their data. Since the influence of age of dam was of small magnitude in these data, no correction was made for this factor. The remaining sources of variability involved year-to-year effects, sire effects, seasonal effects and breeding of dam.

The mathematical model assumed for the analysis was:

$$Y_{ijklm} = m + y_i + s_j + t_k + d_l + e_{ijklm};$$

where:

Y_{ijklm} is the weight of the $ijklm^{\text{th}}$ calf;

m is the general mean;

Y_i is the i^{th} year effect;

s_j is the effect of the j^{th} sire;

t_k is the effect of the k^{th} time;

d_l is the effect of the l^{th} breeding of dam;

e_{ijklm} is the error for the m^{th} individual in the $ijkl^{\text{th}}$ group.

Each observation was assumed to be the sum of the influences of effects of the variables as follows: Weaning weight = general mean + year differences + sire differences + time of calving + breeding of dam + error. This linear combination of effects is similar to that used by Koch (12).

The least squares solution for disproportionate frequency distribution was employed for these data. Based on the mathematical model given above, 21 simultaneous equations evolved from these data. The method of analysis employed was the Abbreviated Doolittle method from which estimates of treatment effects were obtained and analysis of variance for the treatment effects were determined (Anderson and Bancroft, 1952) (1).