RELATIONSHIP OF WEIGHT AND AGE AT BREEDING AND BODY WEIGHT
GAIN WITH EWE-LAMB FERTILITY IN FOUR BREEDS

C.T. Gaskins¹, G.D. Snowder², M.K. Westman³ and M.A. Evans¹

¹Washington State University, Pullman, Washington 99164 USA
²USDA-ARS U.S. Sheep Experiment Station, Dubois, Idaho 83423 USA
³Acme, Alberta T0M 0A0 Canada

INTRODUCTION
The percentage of gross receipts from lamb sales has significantly increased relative to wool in recent years. Therefore, increasing the level and efficiency of lamb production is economically important. One alternative is to breed ewes to lamb at one year of age. Successfully breeding ewe-lambs can be profitable when fertility and prolificacy rates are sufficient to offset costs associated with managing ewe-lambs (Knight and Snowder, 1995). Physiological and management factors associated with fertility success of ewe-lambs are not clearly defined. Therefore, the objectives of this study were to determine if breeding weight, breeding age, and total body weight gain from weaning to breeding affect the fertility in ewe-lambs bred at 8 mo of age in Columbia, Polypay, Rambouillet, and Targhee breeds.

MATERIALS AND METHODS
Data were collected on ewe-lambs born at the U.S. Sheep Experiment Station at Dubois, ID from 1984 through 1988. Lambs were born in April under shed lambing conditions. At approximately 28 post partum ewes and lamb(s) were managed as a large herded flock and openly grazed in spring ranges of sagebrush and bunchgrass. From June through the first week of September, the flock grazed amid high mountain meadows. Weaning occurred at approximately 120 days of age. After weaning, ewe-lambs grazed fall pastures of sagebrush and bunchgrass for approximately 45 days. The ewe-lambs were then placed in a large open pen with ad libitum access to a mixed ration of 40 % whole barley and 60 % alfalfa pellets. Body weight gain was defined as the total gain from weaning to breeding. Ewe-lambs were exposed to multiple sires at approximately 8 months of age for 49 days.

Growth and reproductive performance of ewe-lambs were measured on 2,055 lambs representing Columbia, Polypay, Rambouillet, and Targhee breeds. Type of birth and rearing of ewe-lambs included 3 categories, which were: born and raised as a single, born and raised as a twin, and born as a twin and raised as a single.

Fertility was analyzed as a dichotomous trait: not pregnant or pregnant, as observed by the number of lambs born. Data were analyzed by maximum likelihood procedures of a log-linear model using PROC CATMOD in SAS (2000). Breeds were analyzed independently. Statistical models included the fixed effects of year born, type of birth and rearing, the year born by type of birth and rearing interaction and one of three covariates (weight or age at breeding, and average daily gain from weaning to breeding). Probabilities of pregnancy were computed over the actual range of values for each covariate using the estimated intercept and regression coefficient from the log linear model.
RESULTS AND DISCUSSION
The numbers of ewe-lambs and means for weight and age at breeding, and average daily gain are summarized by breed in table 1. Targhee ewes were the youngest at breeding, while Columbia, Polypay, and Rambouillet ewes were similar in age and about 16 days older than Targhees. Body weight at breeding was highly variable but did not differ among the breeds. Body weight gains from weaning to breeding were greater for the Columbia and Targhee than the Polypay, with Rambouillet having the lowest weight gained.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number</th>
<th>Age, days</th>
<th>Weight, kg</th>
<th>Gain, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>635</td>
<td>210 ± 6.0</td>
<td>53.4 ± 5.7</td>
<td>14.6 ± 3.40</td>
</tr>
<tr>
<td>Polypay</td>
<td>415</td>
<td>214 ± 5.1</td>
<td>50.4 ± 5.0</td>
<td>13.8 ± 3.18</td>
</tr>
<tr>
<td>Rambouillet</td>
<td>626</td>
<td>209 ± 6.0</td>
<td>47.3 ± 5.6</td>
<td>12.9 ± 2.99</td>
</tr>
<tr>
<td>Targhee</td>
<td>379</td>
<td>195 ± 6.7</td>
<td>49.3 ± 5.7</td>
<td>15.1 ± 3.50</td>
</tr>
</tbody>
</table>

The relationships of age at breeding with the probability of pregnancy within breed are shown in figure 1. The line slopes for the Polypay, Rambouillet and Targhee breeds did not differ from zero (P > 0.05). In the Polypay breed, the probability of pregnancy is consistently high over a very narrow range of breeding ages.

Figure 1. Probabilities of pregnancy of ewe-lambs for different breeding ages

Whereas, in the Rambouillet breed, the probability of pregnancy at younger ages is low and unacceptable, but increases rapidly between 185 and 220 days of age and surpasses that of Columbia and Targhee at about 211 and 218 days of age, respectively. Weight at breeding has a positive influence on increasing the probability of pregnancy (figure 2) in the Columbia, Rambouillet, and Targhee breeds. In the Polypay breed, the line slope did
not differ from zero (P > 0.05). Developing management and feeding regimes to increase body weight of ewe-lambs in the Columbia, Rambouillet, and Targhee breeds will be beneficial to increasing pregnancy rates.

Figure 2. Probabilities of pregnancy of ewe-lambs for different breeding weights

Figure 3. Probabilities of pregnancy of ewe-lambs as influenced by total weight gained from weaning to breeding

Increasing body weight gain from weaning to breeding (figure 3) does not have a significant positive effect on increasing the probability of pregnancy in the Polypay, Rambouillet, and Targhee breeds because the line slopes did not differ from zero (P > 0.05). However, in the
Columbia breed the probability of pregnancy significantly decreases with increased weight gained. No plausible explanation can be offered for the discrepancy between the Columbia and the other breeds.

CONCLUSIONS
Polypay ewe-lambs achieved the highest levels of pregnancy (> 90%) and the probabilities of increasing pregnancy were not affected by age and weight breeding, and weight gained from weaning to breeding under the conditions of this study. Breeding Rambouillet ewe-lambs at an older age will increase the probability of pregnancy and it appears possible to achieve over 70% pregnancy in Rambouillet ewe-lambs bred at 210 days of age or older. Management systems that increase the weight of ewe-lambs at breeding in the Columbia, Rambouillet, and Targhee breeds will significantly increase the probability of them being pregnant. Gain in body weight from weaning to breeding has little effect on pregnancy rates in the Polypay, Rambouillet and Targhee breeds. Further investigation is needed to explain the negative relationship between body weight gain and the probability of pregnancy in the Columbia breed.

REFERENCES