FACTORs COVERING FIRST-SERVICE
CONCEPTION AND OVERALL PREGNANCY RATES
IN COMMERCIAL BEEF HEIFERS 1

S. D. Utter, P. L. Houghton, L. R. Corah,
D. D. Simms, M. F. Spir,e, and M. D. Butine 4

Summary

Commercial beef heifers (n=1863) from
16 different sources were used to evaluate
the influence of management practices and
biological traits on first-service conception
and overall pregnancy rates. Frame score,
initial weight, overall ADG, body condition
score, reproductive tract score, source, AI
technician, and AI sire significantly influenced
first-service conception. Overall pregnancy
rates were influenced by frame score, body
weight, and ADG.

(Key Words: Beef Heifers, First-Service
Conception, Pregnancy Rates.)

Introduction

Proper evaluation, selection, and manage-
ment of replacement heifers are critical to the
production and longevity of females in the
cow herd. Heifers that conceive early in their
first breeding season have a greater potential
to rebreed as cows, ensuring continued
production in the herd. Our objective was to
evaluate the influence of management and
biological parameters on first-service con-
ception and overall pregnancy rates in heifers.

Experimental Procedures

To evaluate the effect of various manage-
ment practices and biological traits on first-
service conception and overall pregnancy
rates, 1,863 heifers from six states and 16
sources were developed postweaning at a
commercial heifer development facility in
Southwest Nebraska. Initial body weight was
measured when heifers entered the facility in
early to mid-winter. A high roughage ration
was limit-fed at a level so heifers would reach
65% of their projected mature body weight
before the breeding season began. Pro-
duction data collected 35 to 40 days pre-
breeding included frame score, reproductive
tract score (1=highly developed, 6=infantile),
and body condition score (1=thin, 9=obese).

The heifers were placed on a higher plane
of nutrition 33 days before breeding. That
plane was maintained through the first 21
days of the breeding season. Heifers were
synchronized by feeding .5 mg/hd/day melen-
gesterol acetate (MGA) for 14 days, followed
by a subcutaneous injection of prostaglandin
(Bovilene®) 14 days after MGA withdrawal.
A breeding body weight was measured at the
time of injection. Heifers were inseminated
artificially approximately 12 hours after
estrus was first detected. Nonresponders
were reinjected 9 days after the first injection.
If no estrus was observed after a third prosta-
glandin injection, heifers were inseminated at

1Sincere appreciation is expressed to Heartland Cattle Company for providing the data set
used in this analysis.
2Heartland Cattle Co., McCook, NE.
3Department of Clinical Sciences.
4Department of Statistics.
72 hours post injection. First-service conception and overall pregnancy rates were determined by ultrasonography 35 to 45 days after the end of the 45-day breeding season. A final body weight was measured at that time. The difference between initial weight and final weight was used to calculate overall average daily gain (ADG).

A specialized statistical analysis (contingency tables) was used that allowed us to examine the influence of a single management factor or biological trait, while others were held constant. Because of the significant influence of heifer source, a separate analysis of heifers from a single source (n=507) was performed. A second statistical approach (mixed-model analysis) was used for the entire population (n=1863) to reduce the influence of source, technician, and sire.

Results and Discussion

As frame score increased, first-service conception (P=.16) and overall pregnancy rates (P<.10) tended to decrease (Figure 1). The contingency table analysis showed that heifers that gained 1 to 1.5 lbs/day had the highest first-service conception rates (Figure 2) and overall pregnancy rates (Figure 3). Daily gains above and below this range produced lower (P<.01) pregnancy rates. A quadratic response was observed as body condition score increased (P<.10), with a decline in first-service conception in either extremely thin or fat heifers (Figure 5). Reproductive tract score tended (P=.17) to influence first-service conception but not overall pregnancy rates (Figure 4). Heifers with infantile tracts, designated by a score of 6, had the lowest first-service conception rates when compared to those with scores of 1 through 5. The mixed model analysis found the fixed effects of body condition score (P<.01; Figure 4) and reproductive tract score (P<.01; Figure 5) to be significant. Interactions among ADG, frame score, breeding wt, prebreeding wt, body condition score, and reproductive tract score were significant, illustrating the impact of numerous factors on first-service conception.

Overall, heifers with frame score, body wt, body condition score, and ADG in the “moderate” range were more reproducively efficient. In addition, several factors interact to influence reproductive efficiency, demonstrating the importance of managing all contributing factors, rather than focusing on very few.

Figure 1. Influence of Frame Score on First-Service Conception
**Figure 2.** Influence of Overall Average Daily Gain on First-Service Conception

**Figure 3.** Influence of Overall Average Daily Gain on Overall Pregnancy Rate

---

**First-service Conception (%)**

<table>
<thead>
<tr>
<th>Overall ADG (lb)</th>
<th>0-1</th>
<th>1.1-1.5</th>
<th>1.6-2.0</th>
<th>2.1-2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63.3</td>
<td>70.6</td>
<td>68.1</td>
<td>62.9</td>
</tr>
<tr>
<td>Values</td>
<td>30</td>
<td>643</td>
<td>1012</td>
<td>178</td>
</tr>
</tbody>
</table>

- **a** $P < .18$
- **b** Number of heifers within each ADG classification.

---

**Overall Pregnancy Rate (%)**

<table>
<thead>
<tr>
<th>Overall ADG (lb)</th>
<th>0-1</th>
<th>1.1-1.5</th>
<th>1.6-2.0</th>
<th>2.1-2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80</td>
<td>91.9</td>
<td>87.5</td>
<td>83.7</td>
</tr>
<tr>
<td>Values</td>
<td>30</td>
<td>643</td>
<td>1012</td>
<td>178</td>
</tr>
</tbody>
</table>

- **a** $P < .01$
- **b** Number of heifers within each ADG classification.

---

Figure 2. Influence of Overall Average Daily Gain on First-Service Conception

Figure 3. Influence of Overall Average Daily Gain on Overall Pregnancy Rate
Figure 4. Influence of Body Condition Score on First-Service Conception

Figure 5. Influence of Reproductive Tract Score on First-Service Conception