Effects of Feed Efficiency Ranking and Indexing on Reproductive Performance in Growing Beef Heifers

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While feed typically represents the highest operating cost for cow-calf producers, cow longevity and reproductive success are the primary factors affecting economic profitability. Reproductive success is largely dependent on age at which puberty is attained.

Monitoring fat composition has proven to be a useful tool in predicting the onset of puberty. Beef heifers receiving a lower plane of nutrition and lacking adequate fat reserves are less likely to reach puberty by their first breeding season. Furthermore, heifers with decreased body condition scores (BCS) leading up to their first breeding season are more likely to be removed from the herd earlier in life.

It has been reported that feed-efficient heifers contain 2–5% decreased fat reserves and will reach puberty 5–6 days later, on average, compared to inefficient herd mates. Recent findings indicate that heifers selected for low residual feed intake (RFI) values—these are high feed-efficient animals—had a 10% lower conception rate compared to high RFI (low feed efficiency) heifers between days 12 and 37 of the breeding season. Therefore, heavy selection based on feed efficiency may result in leaner, later-maturing replacement heifers that calve later in the calving season.

Objectives

The overall objective of this study was to evaluate effects of RFI on reproductive efficiency. Specific goals were to evaluate the effects of RFI on body weight (BW), BCS, conception rate, pregnancy rate, and age at first calving (AFC). Additionally, we wanted to create an equally weighted index incorporating RFI and growth.

Material and Methods

Seventy-five Angus x Hereford heifers were utilized for this study. Following weaning (average age=217 days±2.88 days), all heifer progeny were managed as a common group.

Following breeding, all heifers had ad libitum access to a GrowSafe system where a high-fiber pelleted ration was offered for 42 days to determine individual intake. Residual feed intake was calculated as actual dry matter intake (DMI) minus predicted DMI. An index was created with equally weighted RFI, average daily gain (ADG), and gain:feed (G:F). The groups were sorted into the top 20% indexing, which represents the likely percentage to be kept by cattle producers, and then the remaining heifers were sorted into two groups based on the index. All animal procedures were approved by the University of Wyoming Institutional Animal Care and Use Committee.

Results and Discussion

As expected, heifers sired by high RFI bulls had a greater RFI than heifers sired by low RFI bulls (Table 1). As has been reported in the literature, there was no difference in DMI, ADG, or conception rate due to feed efficiency ranking. Therefore, it appears that selecting for heifers

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with a low RFI could result in feed savings without compromising growth parameters. But in an arid region such as Wyoming, where cattle spend much of the year on low-quality ranges, it could be argued that selection of heifers that eat large quantities of food is essential to be able to consume enough low-quality forage to meet their requirements. It may seem like semantics, but why select for animals that eat below average and perform to the population average, when you could select for animals that eat about average, but perform well above average? In most years and systems, animal weight drives profitability, so why not select for higher growth animals?

The second portion of this study was to create an index equally weighted between efficiency and growth. For this example, we selected the top 20% indexing heifers to keep as potential replacements. Our top indexing heifers still had a decreased DMI, still had a negative RFI, had significantly greater ADG, and had almost a 15% increase in AI conception rate (Table 1). The conception rate is not statistically different, but that large of a difference certainly is worth monitoring as the project increases observations.

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**Keywords:** beef, feed efficiency, reproduction

**PARP:** V:1,4,7,8

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Table 1. Effects of RFI and INDEX on reproductive performance.

<table>
<thead>
<tr>
<th>Item</th>
<th>RFI Ranking*</th>
<th>LOW</th>
<th>MED</th>
<th>HIGH</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFI</td>
<td>-1.26 c</td>
<td>0.04 b</td>
<td>1.26 a</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>ADG, lb/day</td>
<td>2.89</td>
<td>3.04</td>
<td>3.02</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Conception, %</td>
<td>72.0</td>
<td>58.3</td>
<td>66.7</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Pregnancy, %</td>
<td>96.0</td>
<td>91.7</td>
<td>87.5</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>INDEX</td>
<td>RFI</td>
<td>-1.18 c</td>
<td>-0.08 b</td>
<td>0.65 a</td>
<td>0.01</td>
</tr>
<tr>
<td>ADG, lb/day</td>
<td>3.61 a</td>
<td>3.06 b</td>
<td>2.22 c</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>AI Conception, %</td>
<td>72</td>
<td>69</td>
<td>58</td>
<td>0.08</td>
<td></td>
</tr>
</tbody>
</table>

*Means with different letters (a,b,c) differ (p<0.05). The INDEX was created with equally weighted RFI, ADG, and G:F. The groups were High (top 20%), with the remaining into MED and LOW groups.