Artificial insemination has been promoted for a number of years as being one management tool available to cattlemen that desire more rapid genetic advancement. Semen is available from a variety of artificial breeding organizations and private breeders. Superior sires can be selected from a large number of animals on the basis of their expected progeny difference as measured in the National Sire Evaluation Program.

Crossbreeding has been shown to be an effective method for increasing total pounds of calf weaned through the effects of hybrid vigor.

The economics of current beef cattle production leaves very little margin for error, particularly for the young producer. Therefore, management methods must be analyzed to identify those which will be the most profitable.

Crossbreeding, of course, means many things to many people. While a large number of breeds and combinations are available, our interest in this study was to evaluate overall production and economics among the most common breeds in southwestern North Dakota, namely, Hereford and Angus. In 1976 a five year study was designed to compare crossbred and straightbred breeding management systems using both natural service and artificial insemination.

In the trial Hereford cows from the Dickinson Station herd were randomly divided by age and date of calving into three breeding groups during the period from 1976 to 1980. Group I contained an average 56 cows per year which were inseminated each season with either Polled or Horned Hereford semen. Following a 25-day artificial breeding period, A.I. was terminated and Angus clean-up bulls were turned in. Groups II and III were the natural service Hereford and Angus treatments. The number of cows used in Groups II and III ranged from 25-32 head per year.

Heat detection in the A.I. group was done visually in 1976. In all subsequent years epididectomized bulls were used in addition to observation. To insure a short calving interval, breeding was discontinued after 60 days. The cows were pregnancy tested in September of each year, and all cows identified as open, old or otherwise poor producers following performance testing were culled. Cows selected for A.I. breeding in 1976 received two pounds dry rolled oats per head per day during the 25-day breeding season. Since no breeding facility was available in the pastures grazed, the A.I. cows were trailed one-half mile each morning to a holding area where the supplemental grain was fed and those cows that had been detected in standing heat were sorted out. Breeding was done on a twice a day basis. When the cows were no longer in standing heat, they were turned in with an Angus clean-up bull.
The following changes were made in 1977. Prior to the beginning of the breeding season, a handling facility and holding area for grain feeding was constructed adjacent to the water supply in the breeding pasture. This crested wheatgrass pasture was sub-divided into uniform pie shaped units around the water supply. With this arrangement the cows had to pass through the breeding facility for water and supplemental feed. Eight pounds of a mixture of equal parts of grain and chopped hay was fed per head per day. This and the provision for adequate bunk space eliminated competition for grain between older and younger cows. Twice a day breeding was discontinued in favor of once a day breeding at 8:00 AM each morning. All groups grazed separate crested wheatgrass pastures until approximately July 1st each year, depending on pasture condition, and were then moved to native pastures. Minerals were fed free choice in a 2:1 salt-di-calcium phosphate mixture to insure adequate phosphorus intake. During May and early June, a level of 15% magnesium oxide was added to the mineral mixture as a grass tetany preventative.

Breeding and calving summaries for 1980 and the combined period from 1976-1980 are shown in Tables 1 and 2. Combined actual and 205-day adjusted weaning weights are summarized in Table 3. An economic evaluation of each management system is shown in Table 4 for the 1980 calf crop; economics for the combined calf crops has been summarized in Table 5.

Summary:

Artificial breeding conception rate registered in this study ranged from a low of 37% to a high of 91% and averaged 48%. Changes in cow handling and facilities resulted in significant increases in AI breeding success, as well as a significant reduction in labor.

Angus X Hereford (BWF) steer calves sired naturally were 10 pounds heavier than the artificially sired Herford steers and were 28 pounds heavier than the naturally sired straightbred Hereford steers. Comparing the heifers, no difference existed in weaning weight between the straightbred Hereford females sired artificially and the naturally sired BWF heifers. In contrast, however, the naturally sired Hereford heifers were 16 pounds lighter than the artificially sired females.

Lighter weaning weights among calves sired by clean-up Angus bulls in the A.I. system was significant. Calves from clean-up bulls were 46 pounds lighter than the other BWF crossbred calves produced in the natural service crossbreeding group.

Genetic improvement among artificially sired calves was significant compared to the naturally sired Hereford calves. However, improvement in the artificial breeding system was not great enough to offset the loss in weaning weight among cows that didn’t settle on the first service. Major factors contributing to reduced profitability when breeding artificially are: 1) conception rate; 2) facility, equipment, semen, and flushing feed expenses; and 3) labor.

Crossbreeding naturally, under the conditions of this experiment, has resulted in heavier weaning weights and higher gross and net return per cow.
Table 1. Breeding and Calving Summary, 1980 Calf Crop

<table>
<thead>
<tr>
<th></th>
<th>A.I. System</th>
<th>Natural Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A.I. (HxH)</td>
<td>Angus Clean-up (AxH)</td>
</tr>
<tr>
<td>Total No. Cows</td>
<td>46</td>
<td>24</td>
</tr>
<tr>
<td>Total No. Cows inseminated</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>No. sold for mgmt. reasons</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No. having A.I. calves</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>1st service conception rate, %</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>No. calves from Angus clean-up bull</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>No. dead calves</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No. of calves:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steers</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Heifers</td>
<td>16</td>
<td>1</td>
</tr>
</tbody>
</table>

1/ Once a day breeding at 8:00 AM.

Table 2. Five Calf Crop Combined Breeding and Calving Summary 1976-1980

<table>
<thead>
<tr>
<th></th>
<th>A.I. System</th>
<th>Natural Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A.I. (HxH)</td>
<td>Angus Clean-up (AxH)</td>
</tr>
<tr>
<td>Total No. Cows</td>
<td>283</td>
<td>137</td>
</tr>
<tr>
<td>Total No. Cows inseminated</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td>No. sold for mgmt. reasons</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>No. having A.I. calves</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>1st service conception rate, % (range, %)</td>
<td>48(37%-91%)</td>
<td></td>
</tr>
<tr>
<td>No. cows having (AxH) calves from Angus clean-up bull</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>No. dead calves</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>No. and sex of calves obtained:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steers</td>
<td>71</td>
<td>61</td>
</tr>
<tr>
<td>Heifers</td>
<td>56</td>
<td>44</td>
</tr>
</tbody>
</table>
Table 3. Combined Actual and 205-day Adjusted Weaning Weights
From Five Calf Crops Born from 1976-1980 in a Three Breeding Management System Comparison

<table>
<thead>
<tr>
<th>Systems:</th>
<th>A.I. Hereford With Angus Clean-up</th>
<th>Natural Service Hereford</th>
<th>Natural Service Angus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Hd.</td>
<td>(HxH)</td>
<td>No. Hd.</td>
</tr>
<tr>
<td>Steers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual weight</td>
<td>71</td>
<td>462</td>
<td>61</td>
</tr>
<tr>
<td>Adjusted weight&lt;sup&gt;1&lt;/sup&gt;</td>
<td>477</td>
<td>478</td>
<td>471</td>
</tr>
<tr>
<td>Heifers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual weight</td>
<td>56</td>
<td>427</td>
<td>44</td>
</tr>
<tr>
<td>Adjusted weight&lt;sup&gt;1&lt;/sup&gt;</td>
<td>469</td>
<td>470</td>
<td>459</td>
</tr>
</tbody>
</table>

<sup>1</sup> Adjusted according to the guidelines of the North Dakota Beef Cattle Improvement Association.

Table 4. Economic Comparison – Systems of Breeding, 1980

<table>
<thead>
<tr>
<th>Systems:</th>
<th>A.I. With Angus Clean-up</th>
<th>Natural Service Hereford</th>
<th>Natural Service Crossbred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steers @ 85¢/cwt</td>
<td>24</td>
<td>515</td>
<td>10,506</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>753</td>
</tr>
<tr>
<td>Heifers @ 80¢/cwt</td>
<td>16</td>
<td>475</td>
<td>6,080</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>336</td>
</tr>
<tr>
<td>Total, $</td>
<td>16,586</td>
<td>1,089</td>
<td>8,662</td>
</tr>
<tr>
<td>Gross return/system, $</td>
<td>17,675</td>
<td></td>
<td>8,662</td>
</tr>
<tr>
<td>No. Cows Calved</td>
<td>46</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Avg. return/cow calved</td>
<td>$ 384.23</td>
<td></td>
<td>$ 360.93</td>
</tr>
<tr>
<td>Less Breeding Expense</td>
<td>-17.00</td>
<td></td>
<td>-11.50</td>
</tr>
<tr>
<td></td>
<td>$ 367.23</td>
<td></td>
<td>$ 349.43</td>
</tr>
<tr>
<td>Less est., annual expense/cow&lt;sup&gt;1&lt;/sup&gt;</td>
<td>310.50</td>
<td>310.50</td>
<td>310.50</td>
</tr>
<tr>
<td>Net return/cow, $</td>
<td>$ 56.73</td>
<td></td>
<td>$ 38.93</td>
</tr>
</tbody>
</table>

<sup>1</sup> Annual expense per cow taken from the North Dakota Farm Management Planning Guide, Section V: 11, entitled, Determining Beef-Cow Costs by Billy Rice and Norm Toman.
Table 5. Economic Analysis of 5-Year Combined Calf Crop When Comparing Three Breeding Management Systems

<table>
<thead>
<tr>
<th>Systems:</th>
<th>A.I. Hereford With Angus Clean-up</th>
<th>Natural Service Hereford</th>
<th>Natural Service Angus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steers @ 85¢/cwt</td>
<td>71 462</td>
<td>$27,882</td>
<td>44 444</td>
</tr>
<tr>
<td>Heifers @ 80¢/cwt</td>
<td>56 427</td>
<td>$19,130</td>
<td>47 411</td>
</tr>
<tr>
<td>Total, $</td>
<td>47,012</td>
<td>35,886</td>
<td>32,060</td>
</tr>
<tr>
<td>Gross return/system, $</td>
<td>82,898</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. Cows Calved</td>
<td>247 104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. return/cow calved</td>
<td>$335.62</td>
<td>$308.27</td>
<td>$357.23</td>
</tr>
<tr>
<td>Less breeding expense</td>
<td>$-17.00</td>
<td>$-11.50</td>
<td>$-11.50</td>
</tr>
<tr>
<td>$318.62</td>
<td>$296.77</td>
<td>$345.73</td>
<td></td>
</tr>
<tr>
<td>Less est. annual expense/cow(^1)</td>
<td>310.50</td>
<td>310.50</td>
<td>310.50</td>
</tr>
<tr>
<td>Net return/cow, $</td>
<td>$8.12</td>
<td>$-13.73</td>
<td>$35.23</td>
</tr>
</tbody>
</table>

\(^1\) Annual estimated expense per cow was taken from the North Dakota Farm Management Planning Guide, Section V: 11, entitled, Determining Beef-Cow Costs by Billy Rice and Norm Toman.