Natural Service vs. Artificial Insemination: A System Comparison

Philip L. Steichen and Carl R. Dahlen, NDSU Department of Animal Sciences
Bryan W. Neville, NDSU Central Grasslands Research Extension Center

Introduction

The area of production most critical in terms of profit potential in beef cow-calf operations is the ability of a cow to give birth and raise a healthy calf until weaning. Reproductive performance is variable among herds and estimates indicate the US beef industry losses exceed $1 billion in revenue as a result of infertility. Identifying reproductive techniques or management practices that enhance reproductive performance could provide producers opportunities to recapture nearly $66 million lost annually to infertility in North Dakota.

Incorporating estrous synchronization and artificial insemination (AI) into beef operations may result in improved reproductive performance, calf performance, and herd genetics, in addition to reduced calving difficulty. However, specific research trials proving these heavily touted theories do not exist. Modern estrous synchronization protocols allow cows the opportunity to become pregnant on the first days of the breeding season, after being handled though the working facility three times. In addition, these protocols do not require heat detection, and have the ability to synchronize cows that are cycling at the beginning of the breeding season, as well as those that are not cycling.

A majority of research used to develop modern estrous synchronization protocols compares one type of protocol with another, with studies concluded upon collection of final pregnancy data. This type of research offers little insight for commercial cattle producers. To maximize the value of reproductive research a control group of natural service should be used. In addition, research data on calving and weaning characteristics as well as performance beyond weaning need to be collected. The breeding system found to be superior in this project can subsequently be implemented to optimize management on any of the nearly 10,000 beef operations in North Dakota.

Materials and Methods

Five hundred sixty-six beef cows were used at two locations: Central Grasslands Research Extension Center (n = 485) and Hettinger Research Extension Center (n = 81). Cows were stratified by age, body condition score (BCS), and days postpartum; heifers were stratified by age and BCS. Then, all females were assigned to one of two treatments: Natural service (NS) or artificial insemination (AI) (Figure 1).

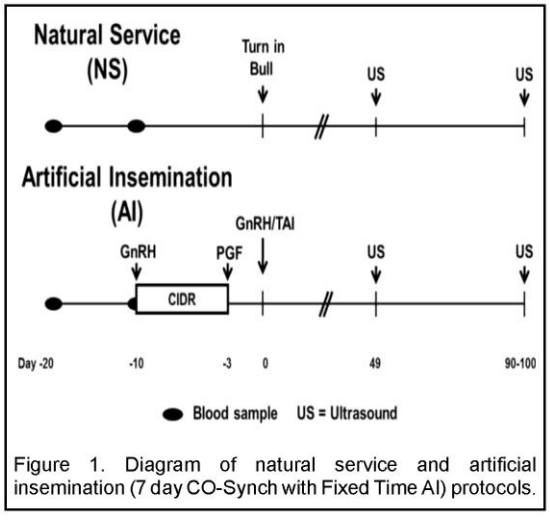

Figure 1. Diagram of natural service and artificial insemination (7 day CO-Synch with Fixed Time AI) protocols.

All animals in AI were synchronized using a 7-day CO-Synch protocol and inseminated 60 hours after CIDR removal. Blood samples on day −20 and −10 were collected to determine whether cows were cycling at beginning of the breeding season.

Graduate students Sharnae Klein and Philip Steichen collecting a blood sample for progesterone analysis from a heifer.

All cattle were managed on common pastures with cows in AI treatment bred on the first day of the breeding season and natural service bulls turned in one day after AI. Pregnancy status and fetal age was determined by ultrasound on day 49 after AI (Figure 2) and again at least 40 days after the conclusion of each breeding season to determine pregnancy status.

At the time of calving (spring 2012), date, body weight, calf vigor, and calving ease will be determined. Cattle will again be managed on common pastures and bred via the same breeding season as during year one. At the time of weaning, body weight, hip height, ribeye area, rib and rump fat, and percent intramuscular fat measurements will be taken on each calf. Calves will then be assigned to replicate pens based on treatment to perform a sales price simulation. Buyers from local livestock markets will be asked to assign values to calves based on market dynamics.

Results

Table 1 (page 3) shows that the AI treatment group of cattle had an increase in number of cattle bred in the first ten days of the breeding season and a decrease in average days to conception of as compared to natural service ($P < 0.05$). However, there was not an effect of treatment on the number of cattle bred within the first cycle or final pregnancy rates.

Implications

There are many models that theorize on the advantages of artificial insemination. The expected progeny differences of the AI treatment bulls compared to the natural service treatment bulls, in this experiment, indicate that there should be an increase of 4 lbs of additional weaning weight, with AI treatment calves having earlier birthdates than natural service treatment calves, equating to additional pounds gained at weaning. Artificial insemination models also suggest that implementing AI should decrease the labor needs at calving by shortening the calving season, and reducing incidence of dystocia. In this study, calving season, birth weights, calving ease, weaning weights, and labor needs will be collected

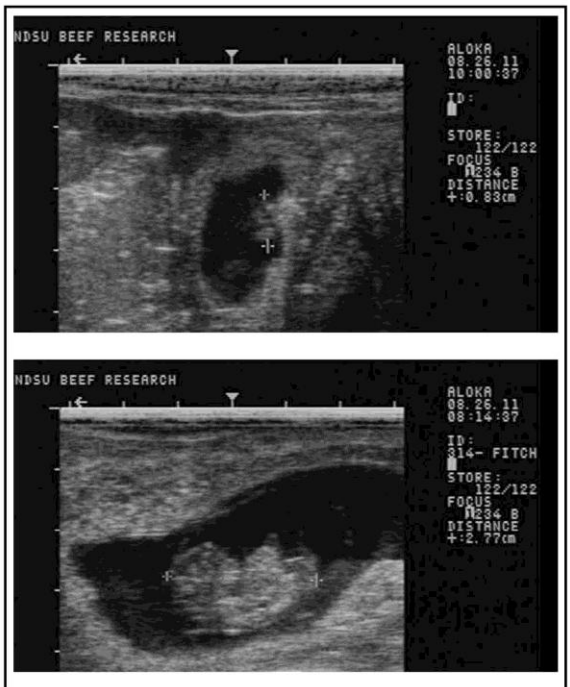

Figure 2. Ultrasound pictures demonstrating the difference in size of a bovine fetus at 28 days and 49 days of gestation. Ultrasound measurements can be used to determine calf age.

and analyzed to determine the impact of implementing artificial insemination on cow-calf operations.

This study was initiated during the breeding season of 2011 and will continue for the foreseeable future. Results will be provided in future publications.

Table 1. Comparison of pregnancy rates and days to conception for cattle exposed to artificial insemination and natural service.

Item	Treatment	
	Artificial Insemination	Natural Service
Number of Cows	282	284
Pregnancy Rate, first 10 days (%)	55.3[a]	36.6[b]
Pregnancy Rate, first 21 days (%)	55.3	61.9
Pregnancy Rate, final (%)	87.0	89.0
Average Days to Conception[1]	6.4 ± 0.79[a]	13.2 ±0.84[b]

[a,b] Means differ $P < 0.01$.

[1] Days to conception based on ultrasound determination on d 49 of breeding season.