

# Animal Sciences

## Using Estrous Synchronization and Artificial Insemination to Increase Profitability in Your Beef Herd

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By using estrous synchronization and artificial insemination (AI), you can improve reproductive efficiency and productivity—and profits—in your beef cow/calf operation.

### Improving Reproductive Efficiency

Reproductive efficiency (pounds of calf weaned per cow exposed), dramatically affects profitability in a beef cow/calf operation. The reason is simple: producers market total pounds (number of calves x weight/calf), and this sets the stage for increasing profitability.

Each cow/calf producer should try to achieve three goals in relation to reproductive performance and efficiency of the cow herd.

- A 90% calf crop per cow exposed  
If fewer than 90% of the cows exposed to breeding wean a calf each year (95% conception rate x 95% calf survival) profitability could be compromised.
- Each cow calving every 365 days  
This is difficult to achieve, but critical for profitability. To meet this goal, cows must be cycling and must conceive by approximately 80 days after calving.
- A calving season 45 to 60 days in length  
A short calving season improves calf crop uniformity, thus increasing weaning weights to a single weaning date, and improves the subsequent reproductive performance of the cows.

Many factors affect the reproductive efficiency of the cow herd. These include:

- Nutrition and body condition of cows and bulls
- Herd health and vaccination program
- Herd genetics, heifer selection and management
- Bull health and conducting yearly breeding soundness exams (BSE)
- Identification of pregnant and non-pregnant females after the breeding season
- **Use of reproductive management tools to improve reproductive performance**

By focusing on this last factor and using estrous synchronization and artificial insemination (AI), you can improve the reproductive efficiency and productivity of your cow herd.



## Advantages of AI

By itself, artificial insemination offers numerous advantages over natural service. Some of these include:

- Use of genetically superior sires
  - Availability of proven genetics and proven performance sires
  - Quickest means to improve the genetic merit of the herd
- Facilitation of specific matings and crossbred mating programs
  - Targeted breedings to optimize breed composition
  - Maintained heterosis in crossbred systems or reduced inbreeding in purebred systems.
- Control of venereal diseases
- Value-added: desirable and marketable calves
  - Use of sires that have traits desirable for your operation and your market
  - Larger number of uniform calves
- Easier importation of foreign genetics
- Availability and use of proven calving ease sires
  - Major advantage when breeding heifers

## Combining AI with Estrous Synchronization

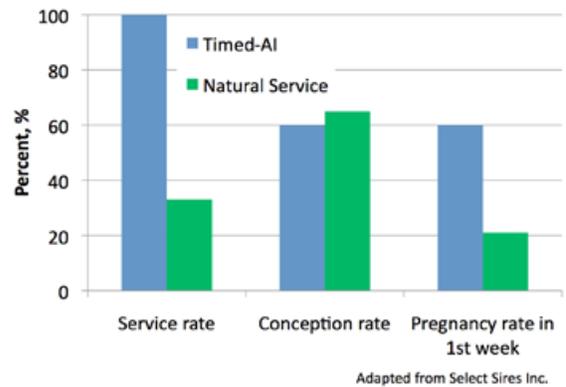
Although artificial insemination is a valuable reproductive management tool, combining AI with estrous synchronization offers additional economic and managerial advantages.

Three major advantages of using estrous synchronization are listed below.

### 1) More cows bred in the first week of the breeding season

This advantage is demonstrated in Figure 1, which depicts the predicted proportion of females bred in the first week of the breeding season with either natural service (using a bull) or with estrous synchronization and timed-AI. With natural service the number of cows in heat in one week determines the number of cows that can conceive in that week. The estrous cycle in a beef cow is approximately 21 days; therefore, in any given week approximately 33% of the cow herd would be in heat (7 days / 21 days) and have the opportunity to conceive. This assumes that all cows are having normal estrous cycles (cyclic). Several large studies across several states have clearly shown that often about 50% of cows are not cyclic when the breeding season starts, and will have their first heat sometime later in the season. Furthermore, the bull is not always successful in settling a cow. In fact, only about 65% of the cows serviced by the bull will conceive the first time. Since pregnancy rate is **service rate x conception rate**, the expected proportion of cows pregnant in one week of natural service is only 21% (33% service rate x 65% conception rate) in the best case

**Figure 1: Anticipated pregnancy rate in first week of breeding season with either natural service or timed-AI**

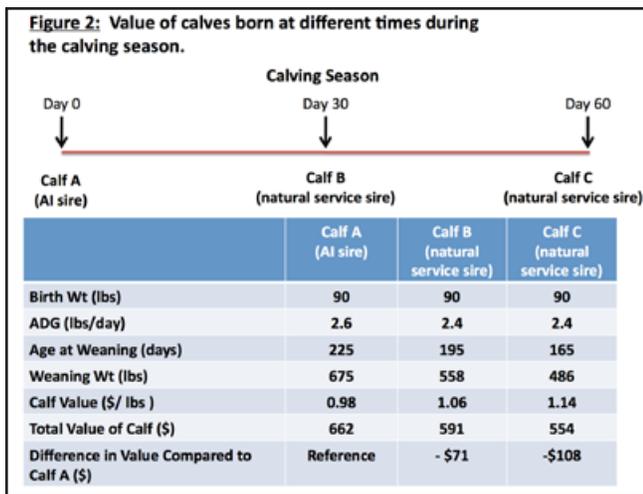


scenario when all cows are having normal estrous cycles. If a proportion of the herd is not cyclic at the start of the breeding season, this number is reduced. For example, if 50% of the herd is not cyclic, then only 50% of the cows have the opportunity to show heat and conceive. In this scenario, pregnancy rate to natural service in the first week may be as low as 11% (21% x 50%). With estrous synchronization programs that use timed-AI, all cows are inseminated in one day without heat detection. In this case, the service rate with a timed-AI program is 100%.

With many of the timed-AI programs now available, conception rates to a single service averages 60%, REGARDLESS of whether cows are cyclic or not at the outset of the breeding season. Hence, pregnancy rate for the first week in a timed-AI program is 60% (100% service rate x 60% conception rate), which is far greater than the 21% that would conceive with natural service. The real advantage of getting more cows pregnant early in the breeding season is that more cows calve early in the calving season creating a more uniform calf crop, and older and heavier calves at weaning. It also allows cows more time between calving and the beginning of the next breeding season (i.e., more time to recover and return to estrus).

### 2) More uniform and heavier calves at weaning

Calves born earlier in the calving season will be older and heavier at weaning than calves born later in the calving season as age of calf at weaning is the single largest factor that affects weaning weight. The economic advantage of having calves born early in the calving season is presented in Figure 2. In this figure, the values of three calves are compared: an AI-sired calf born the first day of the calving season (Calf A); a natural-service-sired calf born the 30th day of the calving season (Calf B); and a natural-service-sired calf born the 60th day of



the calving season (Calf C). Due to the ability to select improved genetics, the AI-sired calf (Calf A) was given a 0.2 lb/day advantage in weight gain. Overall, Calf A was worth \$71 more than Calf B and \$108 more than Calf C at weaning when an \$8/cwt price slide was used. This demonstrates the value of AI sired calves as well as the value of having calves born early in the calving season.

### 3) Induced estrous cycles in cows and heifers not having normal estrous cycles

Not all females in a herd will be cycling at the start of the breeding season. Non-cycling females in the herd typically fall into one of the following categories: pre-pubertal heifers that have not obtained a target of 65% of their mature weight because of age or plane of nutrition; thin cows, especially first- and second-calf heifers that have a longer post-partum anestrus period; and late-calving cows. A post-partum anestrus period of 40 to over 80 days is not uncommon. If females are not cycling, they will not ovulate and they cannot conceive even if they are with a bull. Research has demonstrated that it is not uncommon for over 50% of beef cows and 40% of beef heifers to be anestrus at the beginning of the breeding season. One advantage of using progesterone-based estrous synchronization programs (i.e., using melengestrol acetate or an intravaginal progesterone releasing insert-CIDR) is that these

programs can stimulate (“jump start”) some anestrus cows and pre-pubertal heifers into having estrous cycles. Therefore, these females have an increased probability of either conceiving to an AI mating, or start having estrous cycles sooner in the breeding season so they breed sooner to natural service sires. This can help meet the goal of having one calf every 365 days.

Several estrous synchronization protocols are available to beef producers who want to incorporate these technologies into their management system. Remember that the best pregnancy rates occur in cattle that are properly managed. At the initiation of the synchronization program, cows should be in good body condition (BCS 5-6; 1 = thin, 9 = obese) and should have calved at least 30 days prior to starting the synchronization protocol. Heifers should be properly developed and should have achieved at least 65% of their estimated mature body weight (BCS 5+ to 6-) prior to the start of the breeding season. Additionally, females should be handled appropriately during the estrous synchronization protocol to reduce stress. The variety of protocols available allows producers the flexibility to incorporate estrous synchronization and AI into their herds, as well as the opportunity to take advantage of both the genetic improvements and economic benefits that can be realized from these technologies.

### References and Additional Materials

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