

What does it Take to Start an AI Program?

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Introduction

Artificial insemination (AI) is one of the most effective tools available to cattle producers to improve productivity and profitability of their cattle operations. This reproductive technology has been commercially available for more than 65 years and utilized very effectively in the dairy industry, with more than 70% of all dairy cows in the United States inseminated by AI. However, AI tends to be somewhat underutilized in the beef industry, especially in the SE United States. However, in recent years development of estrus synchronization systems that allow cattlemen opportunities to inseminate all females on the same day, at a predetermined time, has enhanced the opportunities for AI to be used by more beef producers. Traditionally, the majority of producers utilizing AI were those producers raising seedstock offspring; however, technology improvements have continued to make the use of AI in commercial operations more attractive.

The primary reason U.S. beef producers cite for the lack of widespread AI use to breed heifers and cows is limited time and labor (NAHMS, 1998). Development and methods of implementation of timed artificial insemination (TAI) protocols are essential for producers, because they reduce the “hassle” factors associate with estrous synchronization and AI. Unless, owners of commercial cowherds aggressively implement reproductive and genetic improvement, the U.S. will lose its competitive advantage in high-quality beef production. International players that are more technically astute and competitively advantaged will position themselves to dominate the production and sale of beef worldwide. For example, the adoption of TAI systems in Brazil has increased exponentially (592%) during the past 17 years, whereas as the increase in beef semen available for use in the United States has only increased moderately during the same time period. Most of the cattle operations in Brazil implanting estrous synchronization systems and TAI are large, extensive commercial operations using *Bos indicus* (mainly Nelore cattle) breeds. Which is quite similar to operations in Florida. Brazilian cattle producers have realized: 1) the value of estrous synchronization to overall fertility of beef herd; and 2) the increased value of a calf sired by a bull with enhanced performance and carcass characteristics.

The use of AI also has become more attractive to commercial producers with changes in the current cattle market in the Unites States. The cost of herd sires has increased by more than 50% in the last three years, yet the cost of semen, labor, and pharmaceuticals has not increased at the same rate. Therefore, the cost per pregnancy with AI tends to be less than that with natural service. Nonetheless, the obstacles of time and labor, facilities, skill to administer products and perform AI, and confusion associated with bull and estrus synchronization system selection need to be taken into account. Most producers use these reasons as reasons not to AI their heifers and cows; however, the economic outlook for AI should stimulate the consideration for AI as a potential reproductive management tool.

What are the Advantages of AI?

- 1) The ability to use sires of superior genetic merit (the best bulls of the breed). In most cases producers have access to semen from the most genetically superior sires in a given breed at a cost far below what they would be required to pay if they were to purchase the natural service sire.
- 2) Use of proven sires with high accuracy. From a commercial standpoint, highly proven sires allows commercial cattlemen the opportunity to obtain genetics that is repeatable and provides a

high degree of accuracy for traits that they find desirable. This is especially important when using AI in replacement heifers. Selecting semen from highly proven sires allows producers to identify matings that reduce calving difficulty.

- 3) Producers have the ability to mate specific sires to individual cows. This way producers may match desirable traits of cows and bulls for genetically superior calves.
- 4) AI provides an opportunity to reduce the number of herd bulls needed in cattle operation. One of the largest expenses that the average beef cattle operation incurs is the cost of maintaining a bull and repairing damage done by bulls to existing pastures and facilities. Reducing the need for herd sires reduces these maintenance costs.
- 5) Improved genetics of offspring. The offspring from cows that became pregnant to AI are usually genetically superior to natural service. These offspring are later maintained in the herd as replacement females and will transmit improved genetics to their offspring.
- 6) Improved reproductive performance of the cow herd. When used in conjunction with estrus synchronization the impact on reproductive performance of the cow herd is extensive. Producers can have a reduced calving season, cows become pregnant earlier in the breeding season, and offspring are healthier and larger at weaning.

How do I Determine Whether AI will be Cost Effective in My Operation?

Recently we performed an experiment using partial budget analysis to determine the economic outcome of estrus synchronization and TAI in commercial cow/calf production (Rodgers et al., 2012). Suckled beef cows (n = 1,197) from 8 locations were assigned randomly within each location to 1 of 2 treatment groups: 1) cows were inseminated artificially after synchronization of ovulation using the 7-day CO-Synch + CIDR protocol (TAI; n = 582); and 2) cows were exposed to natural service (NS) without estrous synchronization (Control; n = 615). Within each herd, cows from both treatments were maintained together in similar pastures and were exposed to bulls 12 h after the last cow in the TAI treatment was inseminated. Overall, the percentage of cows exposed to treatments that subsequently weaned a calf was greater for TAI (84%) than Control (78%) cows. Weaning weights per cow exposed to treatments were greater for cows in the TAI treatment (425 lb) than those cows in the Control treatment (387 lb). Overall, increased returns plus decreased costs (\$82.32), minus decreased returns plus increased costs (\$33.18) resulted in a \$49.14 advantage per exposed cow in the TAI treatment compared to the Control treatment. Location greatly influenced weaned calf weights, which may have been a result of differing management, nutrition, genetic selection, production goals, and environment. We concluded that estrus synchronization and TAI had a positive economic impact on subsequent weaning weights of exposed cows.

In the process of developing the model in the study above, utilizing a partial budget analysis, we developed a model that may be useful to beef producers to incorporate their own costs and determine the value of estrous synchronization in their own operations. This model has been converted into a smartphone application for Android and iPhone/iPad users and is called the ‘**AI Cowculator**’ (Figure 1). The **AI Cowculator** may be downloaded free of charge and is a decision aid tool to assist producers to determine whether they should consider TAI rather than purchasing herd sires for their cow herds. We encourage producers and members of the allied industry to download the **AI Cowculator** and utilize this tool to assist in making bull buying and breeding season decisions. In addition, the application contains a locator to determine where products may be purchased and technicians who can provide the service, along with additional resources and a link to the **AI Cowculator** social media. For users who do not have an Android or iPhone/iPad Smartphone device or would prefer to use a personal computer, an Excel-based version (Figure 2) is available and can be

downloaded. For more information on the **AI Cowculator**, including a guide on how to use it, visit the webpage at <http://nfre.ifas.ufl.edu/programs/AICowculator.shtml>.

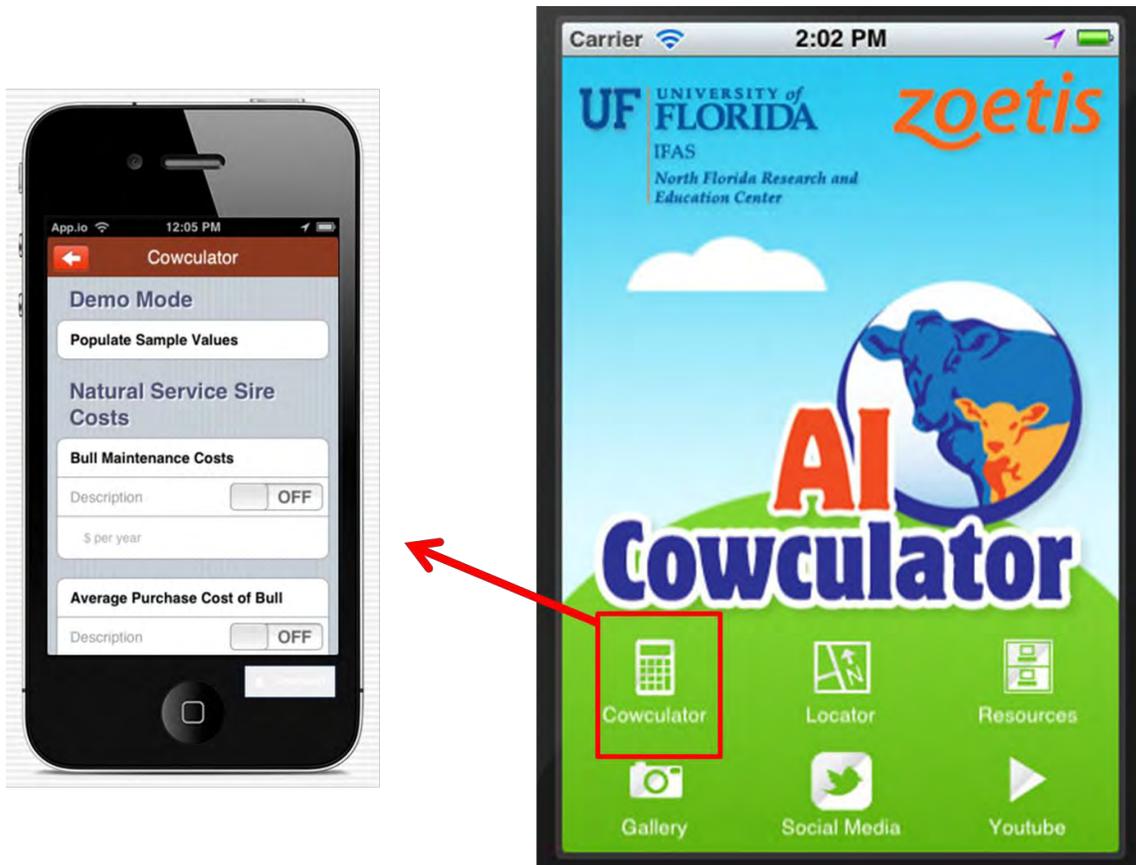


Figure 1. The **AI Cowculator** Smartphone Application front page.

Bull Investment - Annual Bull and Per Cow Cost Calculator

Natural Service Sire Costs

Bull Maintenance Costs	\$600.00
Average Purchase Cost of Bull	\$4,000.00
Useful Life	4
Salvage Value	\$105.00
Salvage Weight, Lb.	1,800
Interest Rate Used, %	6.0

Cowherd Related Costs

Number Of Cows In The Herd	34
Number Of Natural Service Bulls	2
Expected Bulls For Clean-Up To AI	1
Weaned Calf Crop, %	87.5
Average Expected Weaning Weight, Lb.	500
Expected Price Of Weaned Calf, Per Cw	\$165.00

Increased costs

Additional Labor	\$4.10
Facilities & Equipment	\$0.00
Estrous Synch Products	\$13.08
Semen	\$18.00
Artificial Insemination Technician	\$5.00

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Partial Budget

Decision Rule

Gain/Loss Per Exposed Cow **\$69.17**

Gain/Loss Per Herd **\$2,351.78**

Derived Inputs

Increased Returns	\$64.17	Decreased Returns	\$0.00
Decreased Costs	\$45.18	Increased Costs	\$40.18



Resources



Figure 2. The AI Cowculator Excel version front page.

Items that are NOT Necessary for Establishing an AI Program

- 1) You do not need to be proficient at AI. There are currently experts in the field available with the ability to inseminate all cows at a predetermined date and time.
- 2) There is no need to own a nitrogen tank for storing semen. With experts in the field available they can provide short-term semen storage and also work with individual producers on only ordering the required number of units of semen.
- 3) It is not necessary to have AI supplies, such as an AI kit with sheaths, AI guns, and sleeves available. In most cases the AI technicians will provide all supplies.

What are Some Important Requirements to Developing a Sound AI Program?

- 1) Have an established breeding season. Without an established breeding season it is difficult to incorporate estrus synchronization and AI with a high degree of success.
- 2) Ensure that the nutritional status (including mineral nutrition) of the herd targets for cows to reinitiate estrous cycles soon after birth, or ensures that heifers have the capability of obtaining puberty prior to the breeding season
- 3) Facilities that allows producers to restrain cattle in such a way that they can administer pharmaceutical products and AI cows. In some cases, experts have portable facilities to assist with cattle handling. Producers should be aware of these opportunities and take advantage when available.
- 4) Know which traits are important for your herd and, with the help of an expert, identify proven AI sires to purchase at least one month prior to initiating the AI program. With the increased use of AI there is also a greater demand on proven sires. In many cases, semen from desired bulls is not available or back ordered. Planning ahead will allow producers to find alternatives.

- 5) Utilize semen from a major semen company rather than using custom collected semen. Pregnancy rates of semen from the major genetics companies tends to be more strictly evaluated and provides more consistent, desirable results.
- 6) Familiarize yourself with the pharmaceutical products used in the estrus synchronization protocol and be sure that the correct product is administered at the correct time. This is one of the largest causes of failure in many AI programs.
- 7) Utilize good animal handling techniques, since stress has negative effects on fertility. Reducing female stress around the time of AI will enhance the response to the program.
- 8) Use good Beef Quality Assurance techniques. Use the correct syringe and needle size and length for each product. Inject these products in the muscle according to the best BQA techniques. There is no evidence that administering products in the neck muscle is less desirable than other muscles, such as the thigh, or rump.

Conclusion

Incorporating an AI program into a beef operation has numerous benefits, especially in today's beef market climate. The use of AI is an attractive tool to decrease some of the input costs associated with breeding cattle, especially since the two largest factors that affect the cost of pregnancy are the bull:cow ratio and the cost of natural service sires. Using AI reduces the bull:cow ratio and decreases the number of bulls that a producer needs to own. In addition, the development of estrus synchronization systems that allow producers to plan to inseminate all females on a single day at a predetermined time eliminates the need for the producer to have the skill to AI or to require semen storage. Producers may now work with independent experts or experts from genetics companies to plan and implement an AI program that was not possible in the past.

When trying to understand more about AI and familiarizing yourself with reproductive management techniques it is a good idea to bookmark the Beef Reproduction Task Force website (<http://beefrepro.unl.edu/>). This website provide significant resources for beef cattle producers who need additional information on reproduction in beef cattle. The primary objectives of this group are: 1) to improve the understanding of the physiological processes of the estrous cycle, the procedures available to synchronize estrus and ovulation and the proper application of these systems; and, 2) to improve the understanding of methods to assess male fertility and how it affects the success of AI programs.

Literature Cited

NAHMS. 1998. Part IV. National Animal Health Monitoring Service, USDA, APHIS. Changes in U.S. beef cow-calf producers. USDA-APHIS Center for Epidemiology and Animal Health, Fort Collins, CO. Pp. 1-48.

Rodgers, J. C., S. L. Bird, J. E. Larson, N. DiLorenzo, A. DiCostanzo, G. C. Lamb. 2012. An Economic Evaluation of Estrus Synchronization and Timed Artificial Insemination in Beef Cows. *J. Anim. Sci.* (published ahead of print May 14, 2012, doi:10.2527/jas.2011-4836).