



## Artificial insemination for beef cattle — Costs and Benefits<sup>1</sup>

Daniel J. Drake, PhD. PAS  
Cooperative Extension, UC Davis<sup>2</sup>

Favorable beef cattle prices have softened the blow of rising input costs but incentives to expand are still low. Increasing regulatory costs and restrictions in land, water and labor continue to dampen expansion efforts. Artificial insemination (AI) may provide a cost effective method to increase output of beef. AI has been used in the cattle industry since the 1940s but for the beef herd it remains little used at an estimated 6 percent of the herd, and mostly in the purebred sector. For the commercial beef producer AI has been perceived as too costly, too labor intensive and requires a high degree of technical knowledge. These perceptions along with changing costs may be wrong.

Costs for natural service breeding continue to rise. The major factors involved are original purchase price, annual costs of feeding and maintaining bulls, often high injury and death rates, along with potential facility repairs associated with bulls. Fortunately, salvage value for bulls has been historically high. Nonetheless, the cost of natural service breeding is likely about \$75 to \$90 per calf born. A range or matrix of potential cost per calf can be estimated for either a 10 or 20% death loss rate, purchase price ranging from \$3,000 to \$6,000 and annual costs of \$500 to \$900 per bull (Table 1). A bull costing \$4,500 with annual costs of \$700 and 15% death loss siring 20 calves per year results in a cost per calf born of \$92.

Table 1. Cost of natural service breeding based on 20 calves per bull, yearling bulls used once annually, 4 seasons of use.

		Annual costs per bull				
		\$500	\$600	\$700	\$800	\$900
Purchase Price	\$3,000	\$48 <sup>2</sup>	\$53	\$58	\$63	\$69
	\$4,000	\$65	\$71	\$76	\$81	\$86
	\$5,000	\$83	\$88	\$93	\$98	\$104
	\$6,000	\$100	\$106	\$111	\$116	\$121

<sup>1</sup> Presented at Yreka, Feb 23, Willows, Feb 24, Cottonwood, Feb 24 and Eureka, CA Feb 25, 2012.

<sup>2</sup> 1655 So. Main St. Yreka, CA 96097. 530/842-2711, 530/598-9037.

**20% Death Loss<sup>1</sup>**

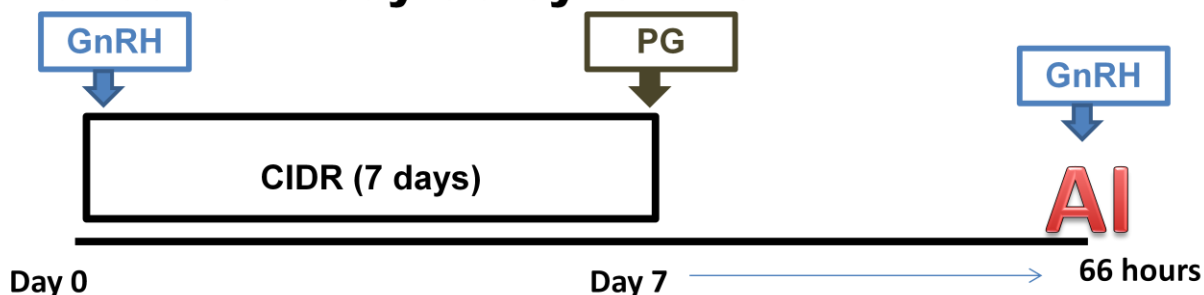
Purchase Price	Annual costs per bull				
	\$500	\$600	\$700	\$800	\$900
\$3,000	\$63	\$68	\$73	\$78	\$83
\$4,000	\$80	\$85	\$91	\$96	\$101
\$5,000	\$98	\$103	\$108	\$113	\$118
\$6,000	\$115	\$120	\$126	\$131	\$136

<sup>1</sup> Death loss is (price+salvage)/2 x death rate

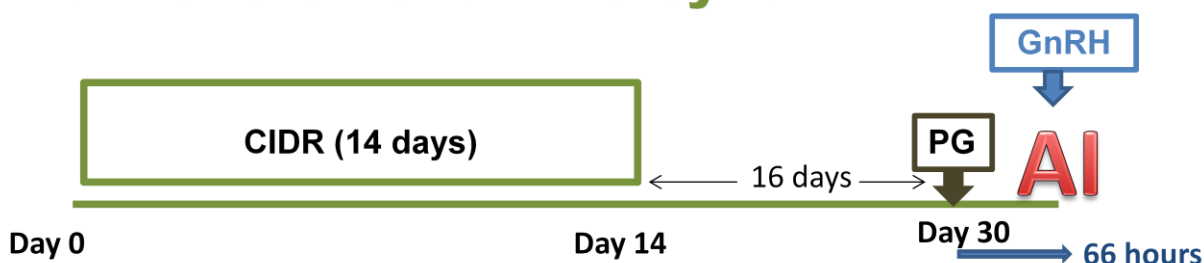
<sup>2</sup> Costs include death loss, annual costs plus annual ownership costs (price-salvage)/life

The work and skills for successful AI have been reduced in recent years with the use of timed AI. Timed AI involves synchronizing cows or heifers so all of the candidates are inseminated at the same time on a schedule. Specialization in the industry allows commercial producers to hire professional in AI that perform the actual inseminations. Ranch labor does the preparatory work for the scheduled breeding. A variety of synchronization protocols have been developed with an example provided for cows and heifers.

**For cows: 7-day CO-Synch + CIDR**



**For heifers: Show-Me-Synch**



Adapted from Patterson, et al. 2011. Applied Repro. Strategies in Beef Cattle. Joplin, Missouri, pg 34 & 59

Costs will vary but costs to AI for cows are estimated at \$37 for materials and \$13 for labor. This includes \$20 for semen and ranch labor at \$20 per hour. Heifers are about the same total cost at \$24 for materials and \$15 for labor. The total cost per insemination is just under \$50 per

female. Anticipated conception rates should be at least 50% but could range up to 60 or 70%. But even at 50% the cost is about \$100 per calf, competitive with natural service breeding.

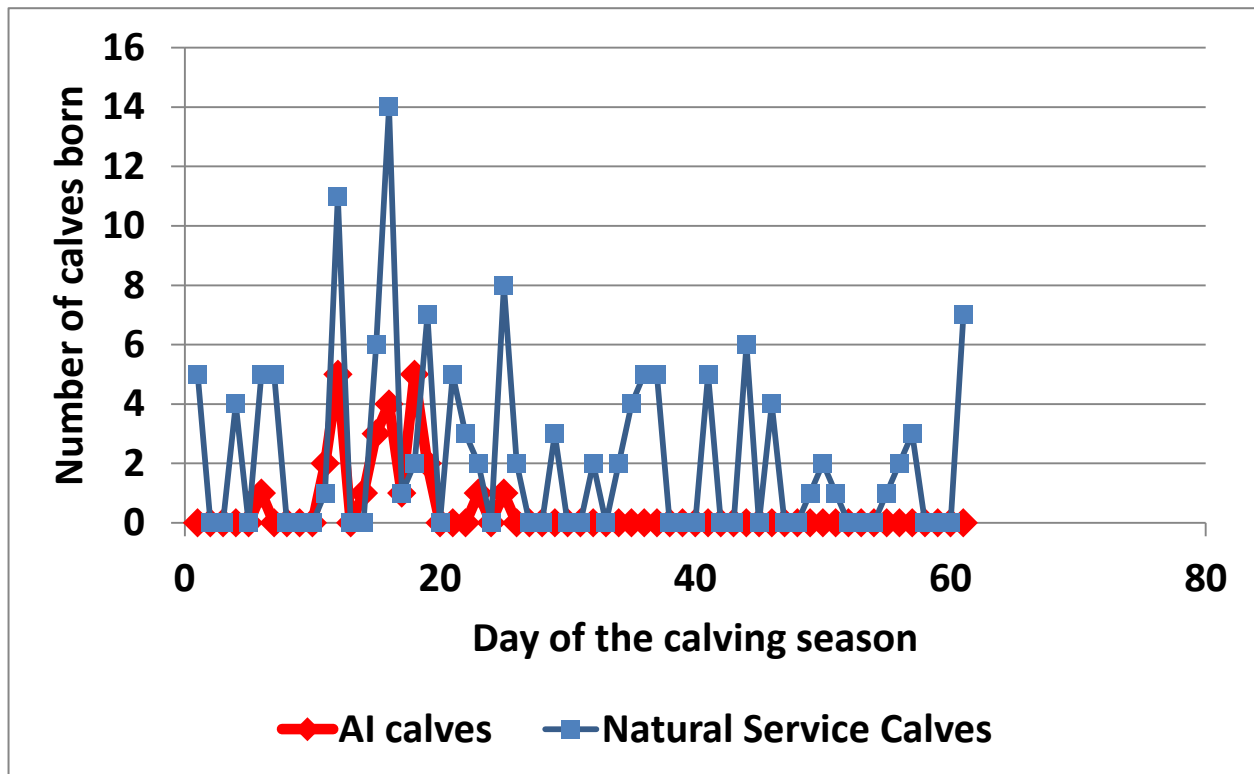
### Advantages of AI

AI compared to natural service breeding offers superior bulls that are highly accurate in their traits, wider access to bulls and breeds, easier implementation of crossbreeding, increased uniformity of calves, older and heavier calves and focused labor at calving. A small demonstration was conducted with a commercial rancher in Siskiyou County evaluating AI for crossbreeding in a predominantly black cow herd. Fifty-two adult cows were bred by timed AI by a hired AI professional to Polled Hereford semen selected for maternal traits. The primary goal was quality crossbred black white faced replacements. Twenty-six (50% conception rate) calves from the single timed insemination (determined by DNA paternity analysis) were compared to 135 Angus sired herd mates. Weights were taken at about 200 days of age for the calves and adjusted to a same sex basis. AI calves were older by 10 days and weighed 60 pounds more, with nearly two tenths of a pound per day weight gain advantage for the AI calves. AI calves were expressing both superior gain as well as hybrid vigor (heterosis). When the weights were adjusted to the same age the AI calves still outgained the natural service calves by 30 pounds. For this demonstration AI costs were estimated at \$97 per calf (total AI costs divided by 26 calves) compared to \$79 for natural service. Using a sale price of \$1.25 per pound for the calves and including the breeding costs, AI calves returned \$57 more than natural service calves at the time of weighing. The calves were actually sold at a later date (weights unavailable) and if the weight gain advantage continued the AI-sired calves would have been even more advantageous, perhaps in the area of another 20 pounds (\$25) more.

Table 2. Results of spring calving timed single insemination and natural service on predominantly black cows.

	No. of calves	Age at wean	Actual wean wt	Adj. 205d wt	WDA	Value at \$1.25	Breeding cost/calf	Income – Breed \$
<b>AI Polled Hereford sired calves</b>	<b>26</b>	<b>189</b>	<b>556</b>	<b>606</b>	<b>2.95</b>	<b>\$695</b>	<b>97</b>	<b>\$598</b>
<b>Angus sired calves</b>	<b>135</b>	<b>179</b>	<b>496</b>	<b>576</b>	<b>2.78</b>	<b>\$620</b>	<b>79</b>	<b>\$541</b>
<b>Advantage for AI</b>		<b>10</b>	<b>60</b>	<b>30</b>	<b>0.17</b>	<b>\$75</b>	<b>-\$18</b>	<b>\$57</b>
P value		0.001	<.001	0.009	0.003	<.001		<.0001

Producers often are concerned that timed AI with all females inseminated on the same day will result in a big headache with too many calves born at one time. Typically calves are born from a single insemination over a 20 to 25 day period with most calves during a 10 day period. In this demonstration most AI calves were born on day 10 to 20 of the calving season.



The demonstration’s primary goal was not AI for superior growth but rather quality crossbred replacements, which occurred. But it demonstrates the superior performance due to a variety of reasons stemming from using AI. The replacement heifers raised from the AI breeding should be superior mother cows for many years to come, positively impacting the ranches’ bottom line. There are few alternatives to make a major change in cattle production that require relatively small changes in practices. New AI techniques allow ranch labor to be maximized without large increases in labor while utilizing a new cadre of professional breeders to perform the actual inseminations. Semen is selected to satisfy the specific needs of the ranch, whether it is for crossbreeding, enhanced growth or simply to increase uniformity. With outstanding market prices predicted for the short term, AI for the commercial beef ranch offers an opportunity without increasing herd size or finding new pastures to quickly increase production taking advantage of those prices.