

Economic Effects of Estrus Synchronization and Artificial Insemination

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Why Not AI?

- Fewer than 10% of beef producers currently use estrus synchronization and AI (ESAI).
- Why?
 - Beef production systems are extensive
 - Limited by facilities
 - Not important enough
 - Intimidated?



Summary

- Cost per pregnancy of natural service versus AI
- Short-term return on investment of ESAI
- Long-term return on investment of ESAI



Cost per Pregnancy

- Costs associated with getting a cow pregnant (Sandy Johnson and coworkers, Kansas State University)
- Factors:
 - Bull costs or service costs
 - Bull:cow ratio
 - Bull maintenance costs
 - Pregnancy rate



Table 1. Cost per Pregnancy Using Natural Service

	1,500.00	1,700.00	2,000.00	2,300.00	2,500.00	3,000.00
Purchase Price	1,500.00	1,700.00	2,000.00	2,300.00	2,500.00	3,000.00
Salvage Value	860.00	860.00	860.00	860.00	860.00	860.00
Summer Pasture	104.13	104.13	104.13	104.13	104.13	104.13
Crop Residue	7.50	7.50	7.50	7.50	7.50	7.50
Hay	90.61	90.61	90.61	90.61	90.61	90.61
Protein, mineral	25.00	25.00	25.00	25.00	25.00	25.00
Labor	50.00	50.00	50.00	50.00	50.00	50.00
Vet	21.00	21.00	21.00	21.00	21.00	21.00
Repairs	31.00	31.00	31.00	31.00	31.00	31.00
Misc.	7.00	7.00	7.00	7.00	7.00	7.00
Interest	15.13	15.13	15.13	15.13	15.13	15.13
Total Variable	351.37	351.37	351.37	351.37	351.37	351.37
Depreciation on Equipment	12.39	12.39	12.39	12.39	12.39	12.39
Depreciation on bull	160.00	210.00	285.00	360.00	410.00	535.00
Interest on bull	212.40	230.40	257.40	284.40	302.40	347.40
Death loss	15.00	17.00	20.00	23.00	25.00	30.00
Total Fixed	399.79	469.79	574.79	679.79	749.79	924.79
Total cost/year	751.16	821.16	926.16	1,013.16	1,101.16	1,276.16
Purchase Price	1,500.00	1,700.00	2,000.00	2,300.00	2,500.00	3,000.00
Cows Exposed Per Year						
15	53.27	58.24	65.69	73.13	78.10	90.51
20	39.96	43.69	49.26	54.85	58.57	67.88
25	31.96	34.94	39.41	43.88	46.86	54.30
30	26.64	29.12	32.84	36.57	39.05	45.25
35	22.83	24.96	28.15	31.34	33.47	38.79
40	19.98	21.84	24.63	27.42	29.29	33.94
50	15.98	17.47	19.71	21.94	23.43	27.15

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Table 2. Partial Budget for Synchronization of Estrus Synchronization Plus AI

Budget Effect	Source	Budget Effect	Source
Increased Returns	Heavier calves (earlier average birth date)	Decreased Returns	Fewer cull bulls to sell
	Improved genetics (calves and replacement females)		
	Uniformity of calf crop (fewer sires could be used, total breeding season could be shorter)		
Decreased costs	Fewer bulls to purchase and maintain	Increased costs	Planning and management for synchronization of estrus and AI
	Less labor for more concentrated calving season		Synchronization products and supplies
	More predictable calving ease		Labor
			Improved facilities?

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Factors Affecting Costs of Pregnancy - ESAI

- Cost of service
 - Semen, technician, labor, etc.
- Pregnancy rate
- Herd size
- Estrus synchronization system used



Select Synch

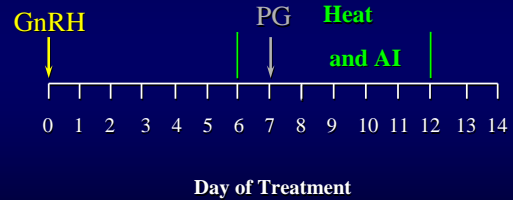


Table 3. Effect of Changing Pregnancy Rate on Breeding Cost per Pregnant Female in a Select Synch Protocol

Calving herd size	AI pregnancy rate (%)	No. of bulls for natural service	Breeding cost (\$) per pregnancy	Proportion % of total cost attributed to:			
				Bulls	Semen	Labor	Treatments
100	75	1	42.06	20	37	19	15
100	55	2	46.08	37	24	18	14
100	48	3	53.01	48	19	15	12
300	65	5	40.90	35	33	11	16
300	55	6	41.49	41	27	11	15

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Table 4. Breeding System Costs and 500lb Equivalent Weaned Calf Breeding Cost per cwt.

System	Days Worked	Preg. Rate (%)	Total Labor Hours			No. of Bulls			Cost (\$) per pregnancy			500 lb. equivalent weaned calf breeding cost (\$) per cwt.					
			Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size				
Natural Service						2	4	12	56	34	34	12.91	-	7.79	-	7.79	-
Select Synch	9	50	45	82	142	1	2	6	67	45	40	12.75	0.16	7.74	0.05	6.68	1.11
MGA+PGF	6	50	37	67	116	1	2	6	60	39	35	11.20	1.71	6.47	1.32	5.56	2.23
CO-Synch	3	50	26	47	82	1	2	6	70	51	48	13.41	(0.51)	9.04	(1.25)	8.32	(0.53)

* Diff = difference between natural service and breeding system, \$/cwt
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Table 5. Breeding System Costs (\$) and 500 lb Equivalent Weaned Calf Breeding Cost (\$) per Cwt at Various AI Pregnancy Rates

System	Days Worked	Preg. Rate (%)	No. of Bulls			Cost (\$) per pregnancy			500 lb. equivalent weaned calf breeding cost (\$) per cwt.					
			Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size	Herd Size			
Natural Service			2	4	12	56	34	34	12.91	-	7.79	-	7.79	-
CO-Synch	3	40	1	3	7	70	59	50	13.93	(1.02)	11.50	(3.71)	9.48	1.11
	3	50	1	2	6	70	51	48	13.41	(0.51)	9.04	(1.25)	8.32	(0.53)
	3	60	1	2	5	70	51	45	12.90	0.01	8.53	(0.74)	7.16	0.63
MGA/PGF	6	40	1	3	7	58	46	36	11.20	1.71	8.41	(0.63)	6.21	1.58
	6	50	1	2	6	60	39	35	11.20	1.71	6.47	1.32	5.56	2.23
	6	60	1	2	5	62	42	35	11.20	1.71	6.46	1.33	4.91	2.88
Select Synch	9	40	1	3	7	85	51	41	12.75	0.16	9.68	(1.90)	7.33	0.45
	9	50	1	2	6	67	45	40	12.75	0.16	7.74	0.05	6.68	1.11
	9	60	1	2	5	69	47	40	12.75	0.16	7.73	0.06	6.03	1.76

* Diff = difference between natural service and breeding system, \$/cwt
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Summary

- Cost per pregnancy varies dramatically even in natural service breeding systems
- Cost per pregnancy is approximately similar between ESAI and natural service if calculated on an equivalent production basis.

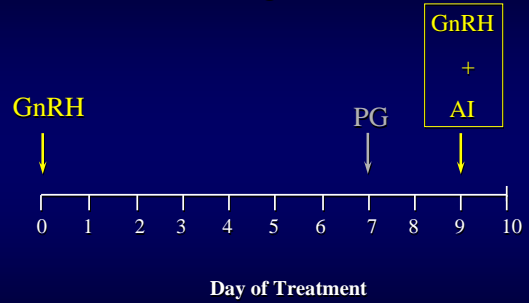


Is Estrus Synchronization and AI Profitable?

- Trial on Western Kentucky Farm
 - Commercial cows
 - 351 mature cows and first-calf heifers
 - Two-thirds were subjected to heat synchronization and AI (n = 251) and rest were exposed to a bull (n = 100).
 - All costs were determined.



CO-Synch



Comparisons

- Synchronized
 - Overall:
 - 85% calved in first 30 days
 - 90% calving rate
- Natural breeding
 - Overall
 - 62% calved in the first 30 days
 - 81% calving rate



Table 6. Cost of AI

Item	Cost per cow
GnRH	\$4.00
Prostaglandin	\$4.00
Technician	\$5.00
Semen	\$10.00
Labor ^a	\$2.88
Total	\$29.88

^a 8.6 hours X 3 working days X 4 workers X \$7.00 per hour for 251 cows



Table 7. Results of Short-Term ESAI Trial

	SYNC	NAT	Diff
Cows	251	100	
Calving Rate	90%	81%	9%
% Calving 1st 30 days	85%	62%	23%
Mean Julian date of calving	74 ± .4	84 ± .7	10d
% calf crop weaned	88%	79%	9%
Weaning age	210 ± 9	200 ± 12	10 d
Weaning Weight	576.9 ± 18.1	504.8 ± 21.2	72.6 lbs
Lbs. calf weaned/cow exposed	507.9	398.4	109.5 lbs



Table 8. Increased Revenues from ESAI

	Revenue
Weaning Weight	72.6 pounds x \$80 cwt = \$58.08
% Calf crop	9% more calves x \$80 cwt = \$41.54
Total Revenue	\$99.62
Return on Investment	\$99.62 – 29.88 = \$69.74



AI Partial Budget

AI System Partial Budget			
A.I. vs. Natural Service w/ Known Genetics			
		Return to Step 3	Return to Main Menu
Increased Costs		Increased Returns	
drugs, semen, & technician	\$6,777	value of added feeder calf weight	\$26,024
additional labor	\$722.98	value of additional calves	\$11,711
Total additional costs	\$7,500 subtotal	Total additional returns	\$37,734 subtotal
Reduced Revenue		Reduced Costs	
	N/A	cleanup bulls required	5 head
		change in bull costs	\$2,126 subtotal
Total decrease in profits	\$7,500	Total increase in profits	\$39,608
Net Change in Profits		\$32,359	



Long-term Effects of ESAI?

- Trial
 - Approximately 45 cows/heifers.
 - Charolais/Angus cross cows
 - Two-breed rotation; change breeds every 4 years or so.
 - Last ten years average percent calf crop weaned = 74.5%.
 - Average weaning weight = approx. 500 lbs.



Trial

- Change breeding program
 - AI-terminal system
 - Synchronize all cows and heifers for timed insemination. Inseminate to maternally-oriented breeds (Hereford and Angus). White cows bred to Angus bulls, black cows bred to Hereford bulls. Replacement heifers are kept from AI-inseminated cows.
 - Clean-up with terminal sire. All calves from clean-up bulls are sold.



Trial

- Data
 - CHAPS and SPA analysis
 - Control data (financial/production records) were collected from 1991-2000
 - Treatment data (financial/production records) were collected 2001-2002



Table 9. Effects of ESAI on Production Efficiency and Profitability in a Medium-Sized Herd

	Avg from 1991 to 2000		
	2001	2002	
No. of females exposed	45	45	44
Calving Rate Percentage (# Cows Calving/# Cows Exposed)	82 %	95%	93%
% Calf Crop Weaned	74.5%	91%	86%
WW Average (pounds)			
Steers	525	542	556
Heifers	484	514	482
Sale Weight*			
Steers	554	588	600
Steer Sale Price (per cwt)	\$77.00	\$88.00	\$83.00
Lbs of calf weaned per cow exposed	381.2	481.4	448.2
# Cows Sold	5	9	6
Cash Cow Costs	\$235.38	\$285.82	\$292.26
Net Profit per Cow Exposed (Cash sales per cow- cow cost)	\$57.75	\$116.62	\$76.83

* Calves were backgrounded for approximately 25 days prior to marketing



Trial

Item	2000	2001	Diff
Avg Sale weight - steers	532	588	56 lbs
- heifers	488	500	12 lbs
Market Price (per cwt)	\$87	\$88	\$1
Pregnancy Rate (%)	78	95	17%
Percent Calf Crop Weaned	70	91	21%
Lbs Calf Weaned/Cow Exp	359	481	122 lbs
Cost per cow	292.50	285.82	-\$6.68
Net Profit	1413.76	6463.65	+5049.89



Summary

- ESAI is a profitable enterprise both in the short- and long-term
- Returns could be greatly increased if producers take advantage of added value of their product
 - Key: Identify your target and breed to hit that target



So.....

- Are you interested in becoming a more efficient beef producer?
- Do you want to make more money?
- Is it worth the effort?

