

# Economic Considerations of AI

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## Who Uses AI?

### Percent Operations

Herd Size (number of beef cows)

Reproduction technology	Small (1-49)		Medium (50-199)		Large (200 or more)		All operations	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Estrus synchronization	4.8	(0.8)	12.2	(1.5)	24.9	(2.6)	7.3	(0.7)
Artificial insemination	8.7	(1.1)	17.7	(1.8)	29.4	(2.8)	11.6	(0.9)
Palpation for pregnancy	14.2	(1.4)	29.3	(2.1)	53.6	(3.3)	19.3	(1.2)
Blood test for pregnancy	2.8	(0.7)	5.6	(1.0)	5.8	(1.2)	3.5	(0.5)
Ultrasound	4.7	(0.9)	16.0	(1.7)	39.4	(3.1)	8.8	(0.8)
Pelvic measurement	4.4	(0.8)	12.8	(1.7)	15.0	(2.2)	6.6	(0.7)
Body condition scoring	10.7	(1.3)	19.8	(1.9)	30.6	(3.0)	13.6	(1.0)
Semen evaluation	14.5	(1.4)	31.0	(2.2)	50.5	(3.3)	19.7	(1.1)
Embryo transfer	2.5	(0.6)	4.4	(1.0)	5.5	(1.2)	3.0	(0.5)
Any of the above	30.4	(1.8)	53.3	(2.3)	78.1	(2.6)	37.5	(1.5)

Source: USDA APHIS



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## Why AI?

- Access to superior genetics at a reduced cost
  - Potential for cow herd genetic improvement
  - Heavier weaning weights/better replacements
- More selective breeding
  - For calving ease, milk production, etc.
  - For gender (sexed semen)
- Increased uniformity
  - Marketing opportunities
- Improved conception rates
- Reduced bull requirements



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## Estrus Synch & AI Case Study

- 251 cows estrus synch and AI compared to 100 cows natural service (Anderson & Deaton)
  - Calving rate: +9%
  - Calving in 1<sup>st</sup> 30 days: +23%
  - Calf crop weaned: +9%
  - Weaning weight: +72.6 lbs
  - Calf weaned/Cow exposed: +109.5 lbs
  - Calving season reduced: 10 days



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## Marketing: What Do Buyers Value?

- Uniformity is important
  - KSU study:
    - Lots of 40 calves increased price by \$3.50/cwt
    - Lot of 10 calves increased price by \$1/cwt
    - Uniform weight increased price by \$2.11/cwt
  - MS Board Sale Results:
    - Shrinking weight range by 50 pounds increased price \$0.75/cwt
    - Uniform color (75%+) increased price \$0.84/cwt
      - \$4.62/hd – for 550 lb calf



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## Barriers to AI?

- Barriers
  - Costs
  - Labor requirements
  - Handling facilities
  - Lack of knowledge
  - Just too much trouble
    - Does not fit with continuous grazing, continuous calving, low-input management styles



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## Natural Service Costs

From: Johnson and Jones, 2005

Purchase Price	\$1,500	\$2,000	\$2,500	\$3,000
Total Cost/yr	\$751	\$863	\$1,011	\$1,158
Cows/bull	Cost/pregnancy (\$)			
15	50.78	61.24	71.70	82.16
20	38.08	45.93	53.77	61.62
25	30.47	36.74	43.02	49.30
30	25.39	30.62	35.85	41.08
35	21.76	26.24	30.73	35.21
40	19.04	22.96	26.89	30.81

- Economic incentive to keep a natural service sire for several years to spread expense across multiple calf crops



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## Does AI pay?

- *Depends on* your goals for the business
  - If goal is to improve herd quality and profitability
    - AI is viable option for that
    - Have to determine if increased costs are worth benefits
      - Depends on you much your time is worth
  - If goal is to keep status quo
    - May not be the right option for you
- *Depends on* how calves will be marketed
  - Not all outlets provide the desired premium for the better genetics and performance



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## Economic Considerations of AI: Partial Budget Analysis

- Compares the costs and returns that are different between two production systems

### System A.

- Revenues
- Costs
- Net Returns



### System B.

- Revenues
- Costs
- Net Returns



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## Partial Budget: 25 Head Example

- 25 cows
- 3 replacement heifers
- Pregnancy rate (cows) = 90%
- Steer selling price = \$290/cwt
- Heifer selling price = \$245/cwt
- 1 bull needed
- \$5,000/bull
- \$2,259 salvage value for bull
- Useful life of 3 years
- Bull ownership cost = \$914/yr
- Bull maintenance = \$650/yr
- Risk of bull loss = \$726/yr



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## Partial Budget: 25 Head Example

	<u>Natural Sire</u>	<u>AI</u>	<u>Change</u>
Pregnancy rate (cows)	90%	95%	5%
Steer weaning weight	575	600	25
Heifer weaning weight	535	560	25
Calves weaned	23	24	1



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## Partial Budget: 25 Head Example

- AI Costs
  - Drug costs = \$38.8/head
  - Semen = \$27/head
  - Vet/technician costs = \$20/head
  - Additional labor = \$4.72/head



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## 25 Head Example

	Natural Service	AI
Cows	25	25
Pregnancy Rate	90%	95%
Replacement Heifers (per year)	3	3
Steers sold	12	12
Steer weight	550	575
Steer price	\$2.90	\$2.90
Heifers sold	8	9
Heifer weight	535	560
Heifer Price	\$2.45	\$2.45
Revenue	\$29,626.00	\$32,358.00
Bull Costs	\$2,290	\$2,290
AI	\$0.00	\$2,263.17
Net Returns	\$27,336.43	\$27,805.26
Change in NR from AI		<b>\$468.83</b>



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## 25 Head Example-Gain \$0.02 Premium

	Natural Service	AI
Cows	25	25
Pregnancy Rate	90%	95%
Replacement Heifers (per year)	3	3
Steers sold	12	12
Steer weight	550	575
Steer price	\$2.90	\$2.92
Heifers sold	8	9
Heifer weight	535	560
Heifer Price	\$2.45	\$2.47
Revenue	\$29,626.00	\$32,547.85
Bull Costs	\$2,290	\$2,290
AI	\$0.00	\$2,263.17
Net Returns	\$27,336.43	\$27,995.11
Change in NR from AI		<b>\$658.67</b>



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## 25 Head Example-Lower Cattle Prices

	Natural Service	AI
Cows	25	25
Pregnancy Rate	90%	95%
Replacement Heifers (per year)	3	3
Steers sold	12	12
Steer weight	550	575
Steer price \$/lb	\$1.50	\$1.52
Heifers sold	8	9
Heifer weight	535	560
Heifer price \$/lb	\$1.25	\$1.27
Bulls	1	1
Cull bull value per year	\$566.67	\$566.67
Revenue	\$15,816.67	\$17,406.51
Bull Costs	\$1,445.00	\$1,445.00
AI Costs	\$0.00	\$2,263.17
Net Returns	\$14,371.67	\$13,698.34
Change in NR from AI		<b>-\$673.33</b>

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## 50 Head Example-Lower Cattle Prices

	Natural Service	AI
Cows	50	50
Pregnancy Rate	90%	95%
Replacement Heifers (per year)	5	5
Steers sold	23	24
Steer weight	550	575
Steer price \$/lb	\$1.50	\$1.52
Heifers sold	17	19
Heifer weight	535	560
Heifer price \$/lb	\$1.25	\$1.27
Bulls	2	1
Cull bull value per year	\$1,133.33	\$566.67
Revenue	\$31,477.08	\$34,955.26
Bull Costs	\$2,890.00	\$1,445.00
AI Costs	\$0.00	\$4,833.60
Net Returns	\$28,587.08	\$28,676.66
Change in NR from AI		<b>\$89.58</b>

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## Put some ranges in your budget. Account for what if...

*"What if calf prices are less than I expect?"*

*"What if my AI conception rates change?"*

*"What if my marketing plan changes?"*



*"What if my management does not bring out the true genetic potential of my AI calves?"*

*"What if my input costs go up more than I anticipate?"*



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## Thank You! Questions?

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Table 1. Comparison of Natural Service to Artificial Insemination Across Herd Sizes of 25, 50, and 100 head						
Item	Natural Service	AI Natural Service		AI Natural Service		AI
Cows	25	25	50	50	100	100
Pregnancy Rate	90%	95%	90%	95%	90%	95%
Replacement Heifers (per year)	3	3	5	5	10	10
Steers sold	12	12	23	24	45	48
Steer weight	550	575	550	575	550	575
Steer price \$/lb	\$2.90	\$2.92	\$2.90	\$2.92	\$2.90	\$2.92
Heifers sold	8	9	17	19	35	37
Heifer weight	535	560	535	560	535	560
Heifer price \$/lb	\$2.45	\$2.47	\$2.45	\$2.47	\$2.45	\$2.47
Bulls	1	1	2	1	4	3
Cull bull value per year	\$753.00	\$753.00	\$1,506.00	\$753.00	\$3,012.00	\$2,259.00
Revenue	\$30,379.00	\$33,300.85	\$60,473.75	\$67,229.60	\$120,663.25	\$133,831.29
Bull Costs	\$2,289.57	\$2,289.57	\$4,579.13	\$2,289.57	\$9,158.27	\$6,868.70
AI Costs	\$0.00	\$2,263.17	\$0.00	\$4,833.60	\$0.00	\$9,123.60
Net Returns	\$28,089.43	\$28,748.11	\$55,894.62	\$60,106.43	\$111,504.98	\$117,838.99
Change in NR from AI		\$658.67		\$4,211.81		\$6,334.00

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Table 3. Comparison of Natural Service to Artificial Insemination Across Herd Sizes of 25, 50, and 100 head, Lower Cattle Prices							
Item	Natural Service		AI	Natural Service		AI	AI
Cows	25	25	50	50	100	100	100
Pregnancy Rate	90%	95%	90%	95%	90%	95%	95%
Replacement Heifers (per year)	3	3	5	5	10	10	10
Steers sold	12	12	23	24	45	48	48
Steer weight	550	575	550	575	550	575	575
Steer price \$/lb	\$1.50	\$1.52	\$1.50	\$1.52	\$1.50	\$1.52	\$1.52
Heifers sold	8	9	17	19	35	37	37
Heifer weight	535	560	535	560	535	560	560
Heifer price \$/lb	\$1.25	\$1.27	\$1.25	\$1.27	\$1.25	\$1.27	\$1.27
Bulls	1	1	2	1	4	3	2
Cull bull value per year	\$566.67	\$566.67	\$1,133.33	\$566.67	\$2,266.67	\$1,700.00	\$1,133.33
Revenue	\$15,816.67	\$17,406.51	\$31,477.08	\$34,955.26	\$62,797.92	\$69,768.29	\$69,201.62
Bull Costs	\$1,445.00	\$1,445.00	\$2,890.00	\$1,445.00	\$5,780.00	\$4,335.00	\$2,890.00
AI Costs	\$0.00	\$2,263.17	\$0.00	\$4,833.60	\$0.00	\$9,123.60	\$9,123.60
Net Returns	\$14,371.67	\$13,698.34	\$28,587.08	\$28,676.66	\$57,017.92	\$56,309.69	\$57,188.02
Change in NR from AI		-\$673.33		\$89.58		-\$708.23	\$170.10

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