University of Idaho
College of Agricultural and Life Sciences

AI – WHEN DOES IT PAY?

JOHN B. HALL AND J. BENTON GLAZE. JR
EXTENSION BEEF SPECIALISTS

RANGE BEEF COW SYMPOSIUM 2019

DISCLAIMER

Economist

Physiologist

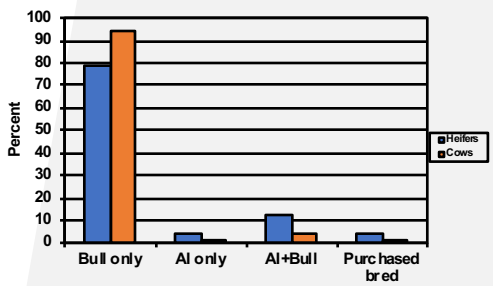
QUICK HISTORY OF MODERN BOVINE AI

- 1937 – Danish veterinarians develop current AI technique
- 1939 – Egg yolk used to protect sperm from cold shock during cooling
- 1941 – Semen extenders developed
- Late 1930's early 1940's – Breeding cooperatives develop in US
- 1949 – Process for freezing semen discovered
- 1950's – Semen frozen in ampules
- 1960's - Straws for storing frozen semen developed
- 1970's – Present - Synchronization systems
- 1991 – Patent for technology to sex-sort semen approved
- 2003 – Sex-sorted semen commercially available to dairies
- 2008 – Sex-sorted beef semen becomes available

WHERE ARE WE WITH AI IN THE US?

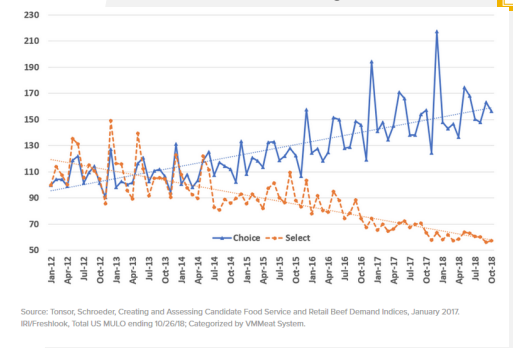
- 66% of dairy cows are bred AI
- 85% of registered Holsteins are product of AI
- Only 7.9% of beef operations in US use estrus synchronization.
- Only 7.6% of beef operations use AI

BREEDING METHOD FOR BEEF CATTLE



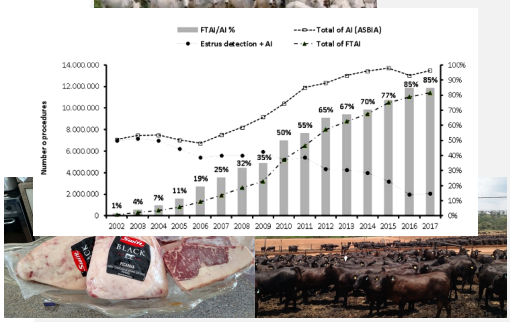
11/20/19

RETAIL BEEF DEMAND BY GRADE



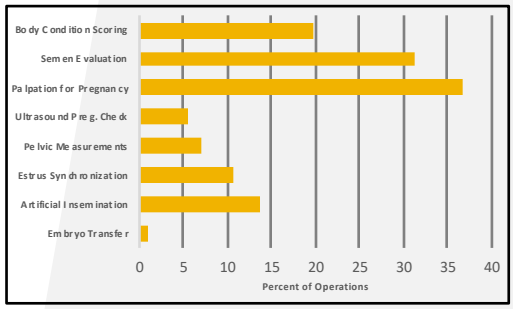
Source: Tonsor, Schroeder, Creating and Assessing Candidate Food Service and Retail Beef Demand Indices, January 2017.
IRI/Freshlook, Total US MULO ending 10/26/18; Categorized by VMMeat System.

CCB & NCBA 2019



Before Implementing AI – Don't Forget the Basic Reproductive Technologies

REPRODUCTIVE TECHNOLOGY USE IN WESTERN BEEF OPERATIONS



NAHMS, 2009

EFFECT OF BCS AT CALVING ON CUMULATIVE PREGNANCY RATES

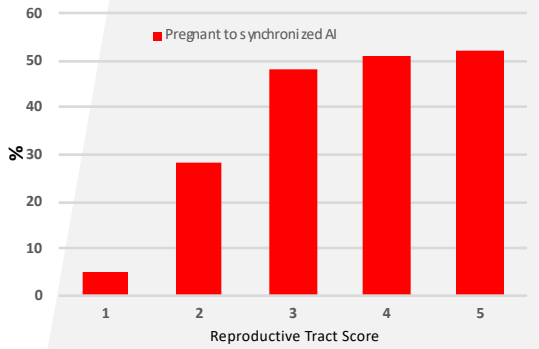
		Day of the Breeding Season		
	BCS	d 20	d 40	d 60
		Cumulative % Pregnant		
Mature Cows	≤ 4	41	67	84
	≥ 5	51	79	91
		Cumulative % Pregnant		
First Calf Heifers	4	27	43	56
	5	35	65	80
	6	47	90	96

IMPACT OF COMBINING BASIC REPRODUCTIVE MANAGEMENT ON BEEF COW REPRODUCTION

	O'Connor	Control	Difference
No. of Cows	89	86	
Showing heat after breeding begins (%)			
25 days	95	59	36
45 days	98	72	26
Pregnant after 1st 21 days	80	50	30
Calved by days of next calving season			
After 20 days	80	28	52
After 40 days	91	52	39
After 60 days	99	72	27
After 120 days	99	93	8

Wiltbank, 1984

REPRODUCTIVE TRACT SCORING AND HEIFER FERTILITY



Bonacker et al., 2018

BULL OR AI?

EXPENSIVE BULLS BUT FEW CALVES?

Bulls are more expensive that ever before

- $4000 - $5000 averages
- $10,000 for some bulls going to commercial operations

Work by Cal-Poly researchers (*Van Eenennaam* et al., 2014)

- Bulls sired an average of 18.9 calves per year (1:25)
- 0 – 64
- 4.4% sired no calves

IMPACT OF BULL PRICE ON COST PER CALF SIRED

Purchase price	$3,000	$4,000	$5,000	$7,000	$10,000
Maintenance cost (3yrs)	$2,100	$2,100	$2,100	$2,100	$2,100
Risk of Loss	$460	$560	$660	$860	$1,160
Salvage value	-$1,600	-$1,600	-$1,600	-$1,600	-$1,600
Total cost (3 yrs)	$3,960	$5,060	$6,160	$8,360	$11,660
Annual cost	$1,320.00	$1,686.67	$2,053.33	$2,786.67	$3,886.67
Cost per pregnancy	$58.24	$74.41	$90.59	$122.94	$171.47

IMPACT OF AI PREGNANCY RATE ON COST PER AI PREGNANCY

AI Pregnancy rate	45%	50%	55%	65%
AI calves produced	135	150	165	195
Cost per AI pregnancy	$105.68	$95.12	$86.47	$73.17

Assumptions

Item	Per cow	300 cow herd
Drug costs	$20	$6,000
Semen cost	$18	$5,400
Technician fee	$7	$2,100
Additional labor*		$768
Total		$14,268

PER PREGNANCY COST BULLS VS AI

	Bulls only	FTAI + Clean-up	Bulls only	FTAI + Clean-up
Average cost of bull used	$4000	$4000	$5000	$4000
Number of bulls used	12	6	12	7
AI cost	$0	$14,268	$0	14268
Bull cost	$20,240.04	$10,120.02	$24,639.96	11806.69
Total breeding cost	$20,240.04	$24,388.02	$24,639.96	26074.69
Pregnancy rate	90%	95%	90%	95%
Cost per pregnancy	$74.96	$85.57	$91.26	$91.49

11/20/19

CAPTURING THE VALUE OF AI

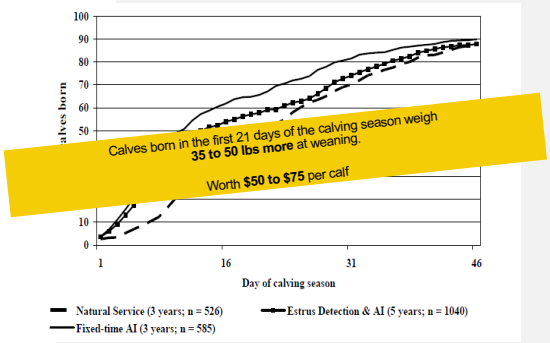
Impact of Fixed-Time AI on Calving and Weaning

	Treatment	
Item	Control	TAI
No. of cows	615	582
Weaning rate, %	78	84
Weaning weight, lb	387 ± 8[a]	425 ± 8[b]

[ab] Means within row differ (P < 0.01)

38 lbs

(Rodgers et al., 2011)



Schafer, 2005

11/20/19

IMPACT OF AI ON CALF PERFORMANCE

Group	Ave weight (lbs)	Age	WT/Day of Age
Sire AI – Dam AI	775	262	2.96
Sire AI – Dam NS	740	255	2.90
Sire NS – Dam AI	707	237	2.98
Sire NS – Dam NS	673	233	2.89
	720	**245**	**2.94**

Sutphin, 2007

POTENTIAL RETURNS TO A 300 COW HERD USING FIXED TIME AI

	FTAI+ Cleanup bulls	Bulls only	Bulls only
Bull purchase cost	$4,000	$4,000	$4,000
Number of bulls	7	12	12
Total breeding cost	$26,074.69	$20,240.04	$20,240.04
Pregnancy rate	95%	90%	93%
% calves weaned	90%	85%	88%
Cows exposed	300	300	300
Calves weaned	270	255	264
Weaning weight	580	550	560
Price per cwt	$137.60	$140.00	$139.20
Gross value of calves	$215,481.60	$196,350.00	$205,793.30
Return over breeding cost	$189,406.90	$176,110.00	$185,553.20
Increased return from AI (Column 1 vs Column 2)	$13,296.95		
Increased return from AI (Column 1 vs Column 3)	$3,853.67		

11/20/19

IMPACT OF AI ON FEEDLOT PERFORMANCE

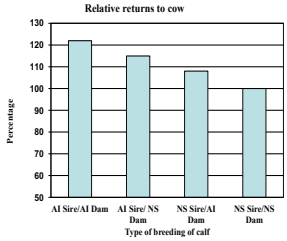
Group	Live weight at harvest *(lbs)	Days on Feed	ADG
Sire AI – Dam AI	1311	170	3.21
Sire AI – Dam NS	1260	172	3.18
Sire NS – Dam AI	1241	179	3.14
Sire NS – Dam NS	1235	189	3.13

Adapted from Sutphin, 2007

IMPACT OF AI ON PRODUCT QUALITY AND RETURNS TO COW AT HILLWINDS FARM

Carcass Category	Industry Average	Improved Sorting and Genetics
Prime	8%	15%
CAB	33%	55%
Choice	72%	80%
Select	18%	5%
YG 1	6%	6%
YG 2	35%	35%
YG 3	48%	54%
YG 4	10%	5%
YG 5	1%	0%
> 1,050 lb.	5%	2%
Net Grid Premium	$20.47/hd.	$64.91/hd.

* CAB percentage applies only to eligible, predominantly black animals

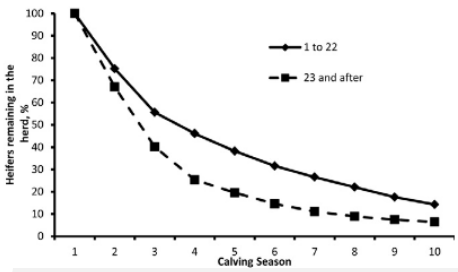


Adapted from Sutphin, 2007

11/20/19

11/20/19

IMPACT OF TIME OF 1ST CALVING ON LONGEVITY



Cushman et al., 2013

11/20/19

MATERNAL HETEROSIS ADDS VALUE

Trait	Units	%
Calving Rate, %	3.5	3.7
Survival to Weaning, %	0.8	1.5
Birth Weight, lb.	1.6	1.8
Weaning Weight, lb	18.0	3.9
Longevity, yr	1.36	16.2

Cundiff and Gregory, 1999 as adapted by Greiner, 2008

11/20/19

HEIFERS MAKING HEIFERS

Pregnancy rates[a] to split-time AI (STAI) by location, treatment[b], and bull.

Location	Treatment	Bull A		Bull B		Overall	
		Proportion	%	Proportion	%	Proportion	%
Location 1	Conventional	37/60	62			37/60	62
	Sex-sorted	37/61	61			37/61	61
Location 2	Conventional	65/107	61	63/105	60	128/212	60
	Sex-sorted	54/104	52	54/105	51	108/209	52
Location 3	Conventional	17/29	59	19/31	61	36/60	60
	Sex-sorted	19/29	66	14/28	50	33/57	58
Location 4	Conventional	32/49	65	24/48	50	56/97	58
	Sex-sorted	21/48	44	19/47	40	40/95	42
Total	Conventional	151/245	62	106/184	58	257/429	60[a]
	Sex-sorted	131/242	54	87/180	48	218/422	52[b]

[ab]Overall pregnancy rates to AI tended to be higher (P = 0.09) among heifers inseminated with conventional compared to sex-sorted semen.

Thomas et al., 2017

11/20/19

HEIFERS MAKING HEIFERS

Female	Semen Type	AI Pregnancy rate	Range
Heifers	Conventional	61.9 % (234/378)	57.6% – 70.2%
Heifers	Sexed	48.4 % (200/413)	26.8% – 72.5%
Cows	Conventional	54.6% (976/1789)	38.7% - 62.6%

No. Calves	WW (lbs)	Angus Calves	WW (lbs)
368	560.0	305	560.0
287	571.4	228	577.8
81	533.7	77	515.2

Estrus Synchronization Planner

Now free download updated 2019 version

http://iowabeefcenter.org/estrus_synch.html

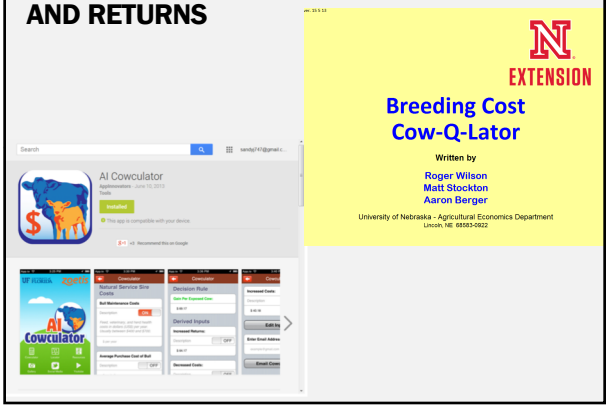
Iowa Beef Center

Features

- Recommended systems for cows & heifers
- Select systems by type
  - Heat detect & AI systems
  - Heat detect & cleanup AI systems
  - Fixed-Timed AI Systems
- List of daily activities
- Generates Barn Calendar
- Cost per AI pregnancy
- Support materials

11/20/19

PROGRAMS TO HELP ESTIMATE AI COSTS AND RETURNS



11/20/19

SUMMARY – WHEN WILL AI PAY?

First When……

- Management results in females that are reproductively ready.
- Estrus synchronization protocols are followed carefully.

Next by capturing AI value (with one or more opportunities) when…..

- More calves are born in 1st 21 days and high growth sires are used.
- A portion of the herd is mated to terminal sires.
- Heifers calve earlier in the calving season resulting in greater longevity and lifetime productivity.
- Maternal heterosis is captured through generating crossbred dams.
- Increased carcass value is realized through retained ownership.

Questions