"The two most important days in your life are the day you are born and the day you find out why."

Mark Twain

2018 - World
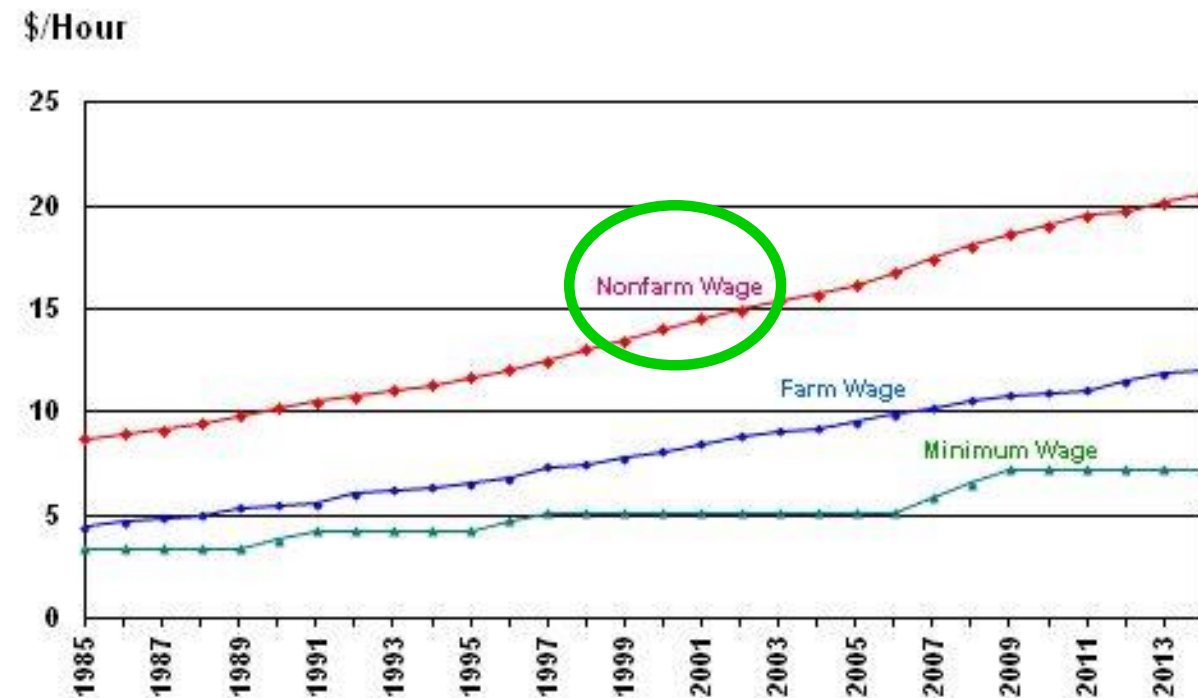Urban Population
55%
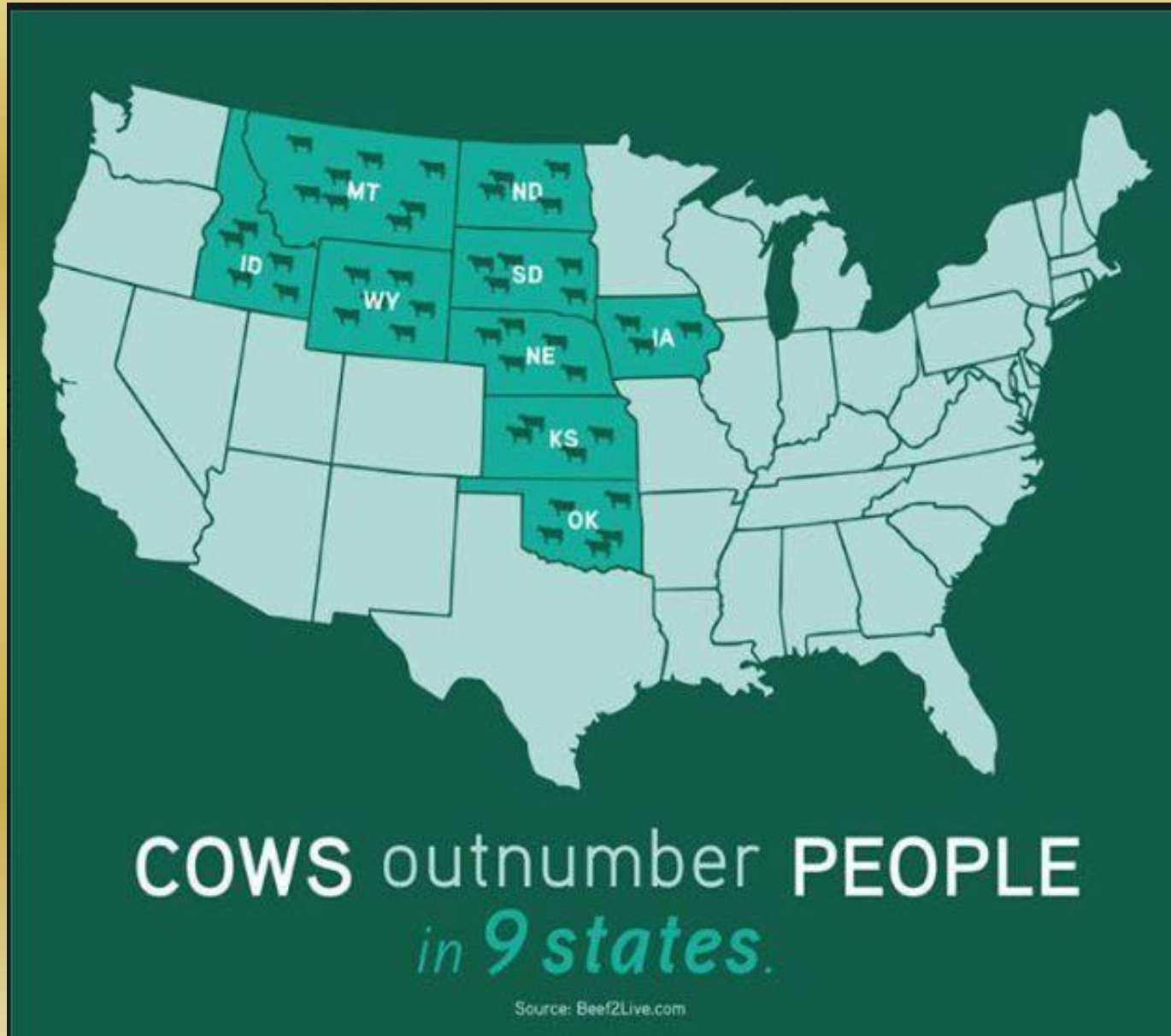
2050
68%
Projected

Source: UN Dept.
Economic and Social Affairs
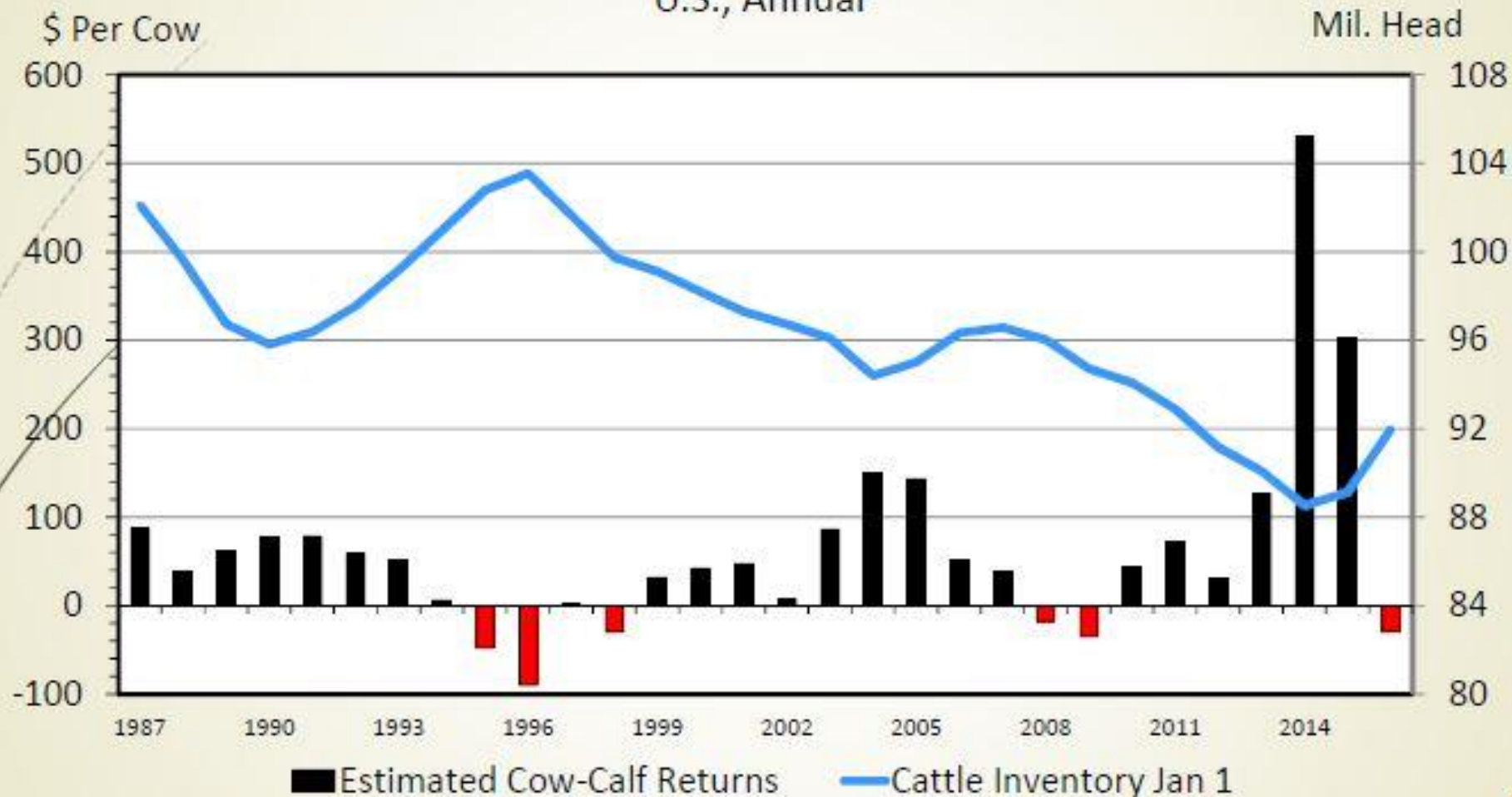
Top Dairy Producer in the state of Oklahoma

A Comparison of U.S. Wage Rates 1985 – 2014

Nonfarm Wage

Farm Wage

Minimum Wage

USDA-NASS, November 2014

COW-CALF RETURNS AND CATTLE INVENTORY
U.S., Annual

K-State Dept. of Ag Econ (Publication AM-GTT-2017.1)
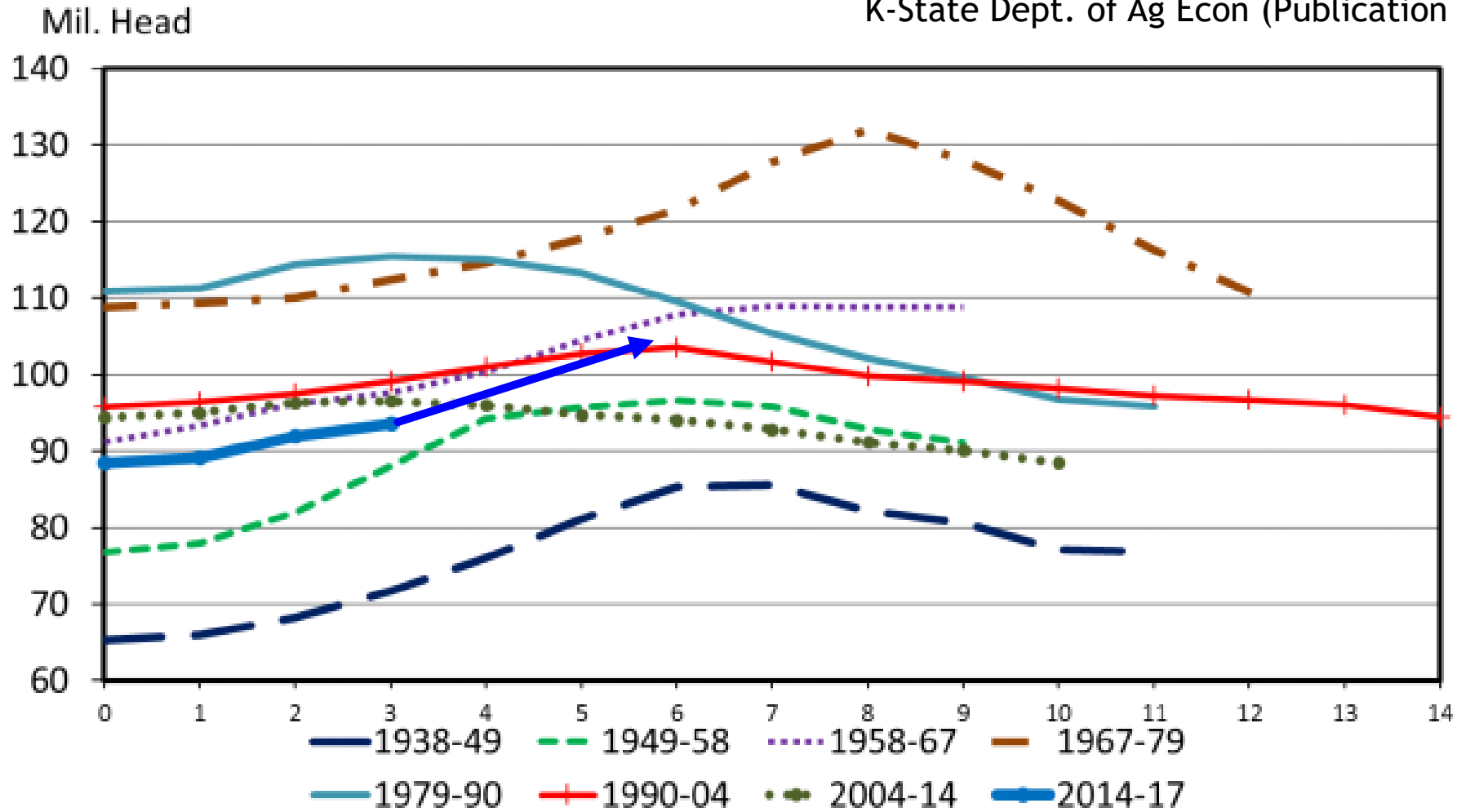
"The trigger year for the most profitable cows is approximately five years before the cattle cycle price break...the next cycle is projected to peak around 2026."

Harlan Hughes

"Buying your next 100 cows" Beef Magazine June 2019

"*Buy the cows to start calving in 2022. These animals would be born in 2020, bred in 2021, and have their first calves in 2022.*"

Harlan Hughes

Increase Market Value
- Increased market price
- Quality / niche bonuse

"Buying your next 100 cows"

Beef Magazine June 2019

Sustainable – Non Ag Revenue

Increase Production

- Pelvic Measurement
  - CED & BW EPD's
    - Pelvic Measurement
      - Reproductive Tract Score
        - Estrous Synchronization
          - Artificial insemination

"Production Medicine"
- Managing Cost

Need Industry tools
Do Not incentivize
   poor animal husbandry

Better Skill Sets

Sustainable

Sustainable

Biltmore Earl Bee, dam of Soldierboy Boomer Sooner of CJF.

" *Great cows are like great treasures…*
     They are WHERE YOU FIND THEM
          & hard to come by"

Great Beef Female

- **Cost**
  - **Optimize**
    - Labor
    - Successful outcomes
  - Breed Early
  - Thrive
    - Calve unassisted
    - Stay in herd
    - Sell a calf that stays healthy

Efficiency through Genetics – Selection Pressure

Table 1. Reproductive tract scoring method

Reproductive Tract Score	Uterine Horns	Ovaries			Ovarian structures
		Length (mm)	Height (mm)	Width (mm)	
1	Immature, < 20 mm diameter, no tone	15	10	8	No palpable follicles
2	20-25 mm diameter, no tone	18	12	10	8 mm follicles
3	20-25 mm diameter, slight tone	22	15	10	8-10 mm follicles
4	30 mm diameter, good tone	30	16	12	> 10 mm follicles, corpus luteum possible
5	> 30 mm diameter	>32	20	15	Corpus luteum present

Anderson KJ: MS Thesis, Colorado State University, 1987

"*Great cows are like great treasures…*
They are WHERE YOU FIND THEM & *hard to come by*"

How do we go about finding those great females ???

Reproductive Tract Score (RTS)	1	2	3	4	5
Number of heifers	163	893	8,422	10,092	9,773
Number pregnant	9	255	4,091	5,138	5,088
FTAI pregnancy rate (%)	6%	29%	48%	51%	52%

*Pregnancy rates resulting from fixed-time AI based on RTS. These data include pregnancy rates for 29,343 heifers that were inseminated beginning during the fall of 2010 through fall of 2016.

"Control of Estrus and Ovulation in Beef Heifers"
http://www.appliedreprostrategies.com/2017/proceedings/Patterson_David-etal.pdf

Reproductive tract score	AI and natural service group			Natural service only group	
	n	AI-PR (%)	BS-PR (%)	n	BS-PR (%)
1 and 2	108	40.7 [a]	81.2 [a,d]	72	79.7 [a,d]
3	596	48.3 [a]	86.5 [a,d]	283	84.3 [a,b,d]
4	736	57.6 [b]	90.4 [b,d]	370	88.4 [b,d]
5	1220	64.6 [c]	95.2 [c,d]	656	90.2 [b,e]

AI and natural service group, bull-to-cow ratio is 1:40 to 1:50.
Natural service only group, bull-to-cow ratio is 1:20 to 1:25.
* 85-day breeding season [29].
[a-c] Within columns, means without a common superscript differed (P < 0.05).
[d,e] Within rows, means without a common superscript differed (P < 0.05).
Abbreviations: AI, artificial insemination; AI-PR, artificial insemination pregnancy rate; BS-PR, breeding season pregnancy rate.

Effect of reproductive tract scoring on reproductive efficiency in beef heifers bred by TAI and NS versus only NS Gutierrez K, et al. Theriogenology 81, 2014 p. 918-924

Estrous synch. protocol

fixed-time insemination (FTAI)

- **reduce the amount of animal handling**
  - sorting estrual heifers at the time of insemination
  - Estrus detection and insemination at 12 hours does not accomplish minimal handling

"Establishment of Pregnancy in Beef Cattle: Application of Basic Principles"- Applied Reproductive Strategies in Beef Cattle, 2015,

Mike Smith
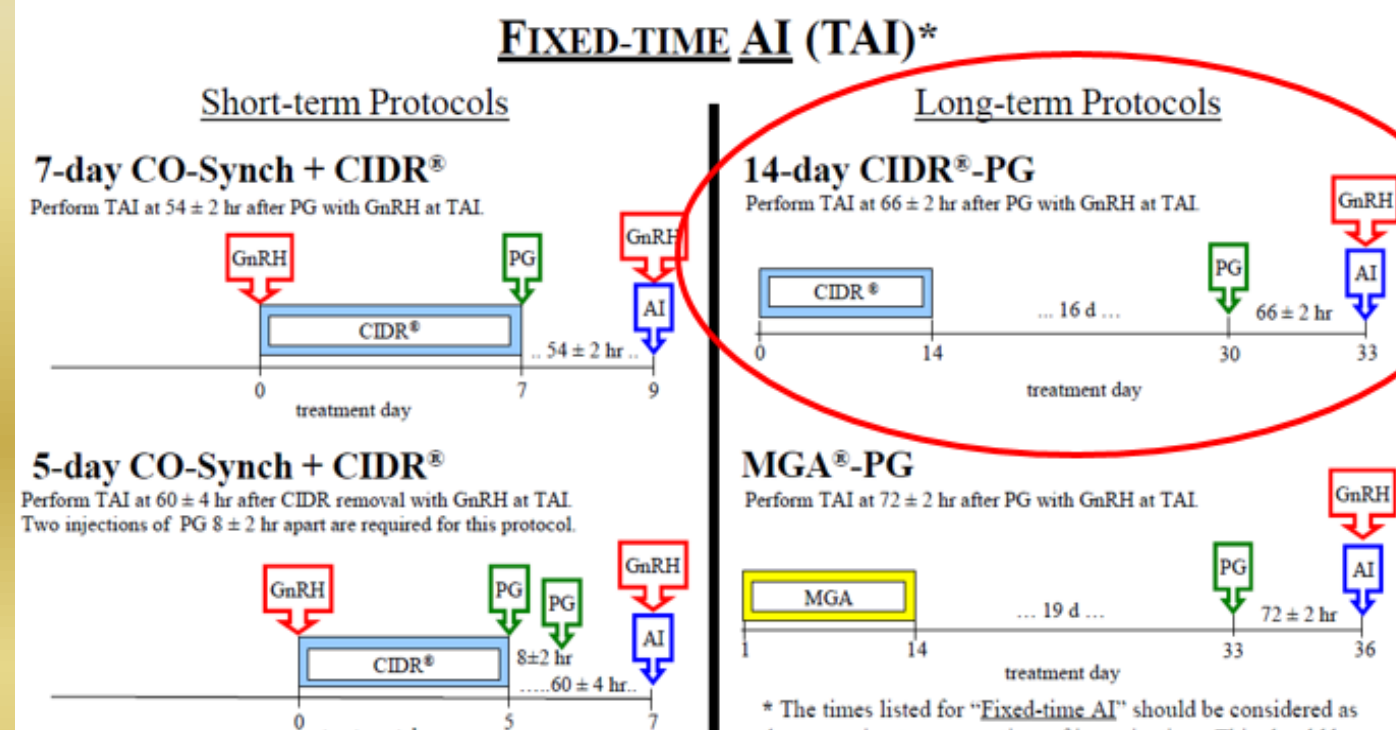
Note: Does not include RTS 1 - Prepubertal Heifers

Protocol	Reproductive tract score (RTS)			
	Non-cycling (2&3)		Cycling (4&5)	
7-day CO-Synch + CIDR	166/438	38%[a,x]	369/861	43%[b,x]
MGA-PG	81/230	35%[a,x]	265/564	47%[b,x]
14-day CIDR-PG	4,027/8,647	47%[a,y]	9,588/18,434	52%[b,y]

[a,b]Percentages within rows with different superscripts differ (P < 0.01).
[x,y]Percentages within columns with different superscripts differ (P < 0.01).

"Control of Estrus and Ovulation in Beef Heifers"
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2020 Heifer Development Season

# of Females P.M. & RTS	**456**		
Number Heifers culled for RTS #1 or Small Pelvis	**85**	18.6%	

A.I. Preg. Rate:	**# AI Preg**	**# A. I.**	**%**
	214	**371**	**58%**

Breeding Season Preg Rate:	**# preg**	**# Exposed**	**%**
	309	**371**	**83%**

NAHMS Open Rate = 17%

- Heifers that **returned to estrus** after being bred to a fertile bull differed (p<.05)

  o **first** heat (E1-43%) and **third** heat (E3-22%)
  o i.e. twice as many first heats returned to estrus

(Byerley et al., 1987, J. Anim. Sci. 65:645-650)

Other tools – Synchronized bull breeding

- **Pubertal heifers remains critical for efficiency**

Effect of RTS used with Fixed Timed A.I. (FTAI) and P_4-based ovulation synchronization

- 4041 Angus cross beef heifers
    - Age: 14.8 $\pm$ 0.6 months
    - 7 locations
    - RTS @ 4 wks prebreeding
    - 2008-2010 breeding seasons
    - Feed to NRC requirements

Controlling Labor cost through use of FTAI
- **Least number of times handled**
- **Efficient labor when handling**

Effect of reproductive tract scoring on reproductive efficiency in beef heifers bred by TAI and NS versus only NS Gutierrez K, et al. Theriogenology 81, 2014 p. 918-924

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    - 2,660 hd. = **AI-NS**
      - CIDR & FTAI followed by natural service B/H ratio 1:40
      - Total breeding season 85-day

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- U.S. Preg ck. at 70 days post A.I. and again 2mo post end of breeding season
- BSE, Trich, etc. and BCS of heifers standard across both groups
  - No difference among bulls – CR across all groups P>0.1

Effect of reproductive tract scoring on reproductive efficiency in beef heifers bred by TAI and NS versus only NS Gutierrez K, et al. Theriogenology 81, 2014 p. 918-924

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# Heifers in the AI-NS group, pregnant at least 25 days earlier than NSO group

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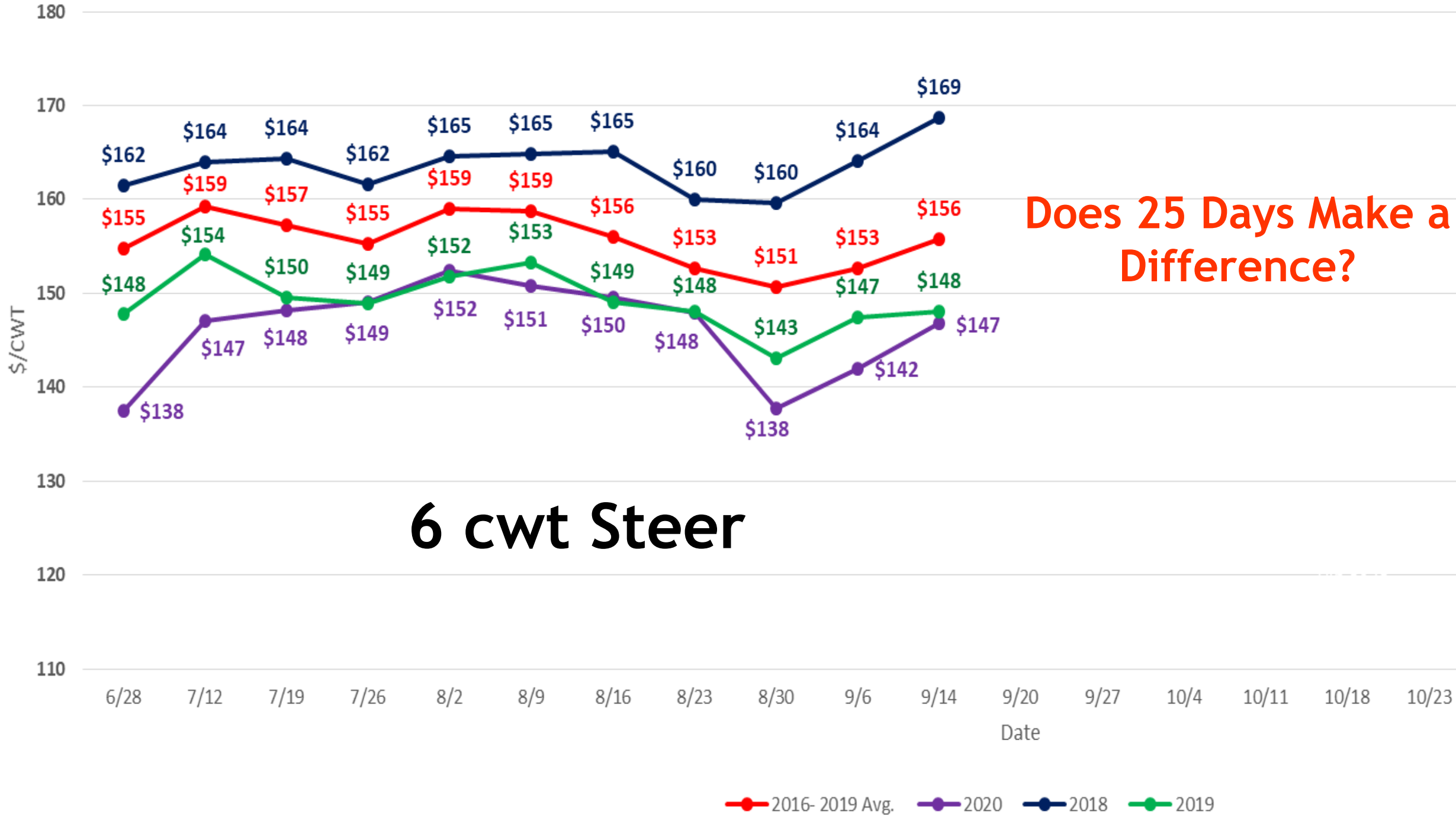## Heifers in the AI-NS group, pregnant at least 25 days earlier than NSO group

Increased Revenue by increasing age & weight
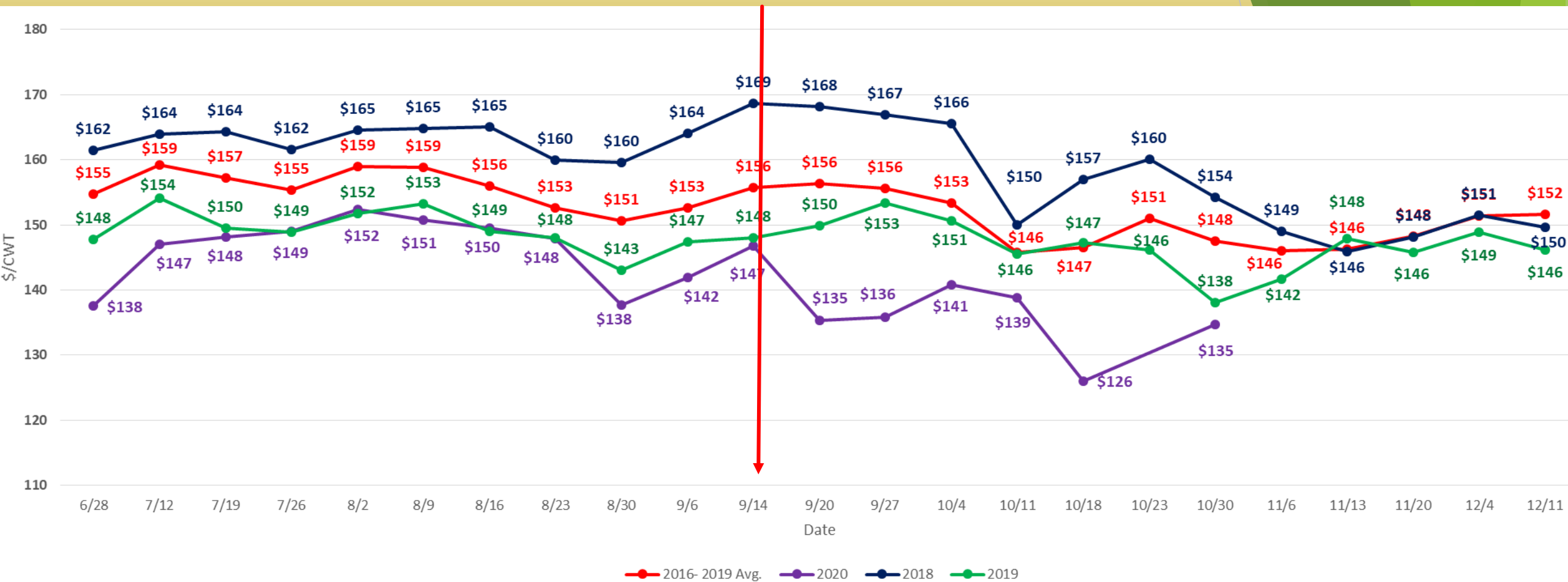

% of Herd Bred by Day (Heifers) A.I. Vs. Bull Bred Herds

A.I.: 61%, 83%, 91%, 92%, 92%, 92%, 92%

Bull: 0%, 30%, 45%, 57%, 65%, 69%, 72%
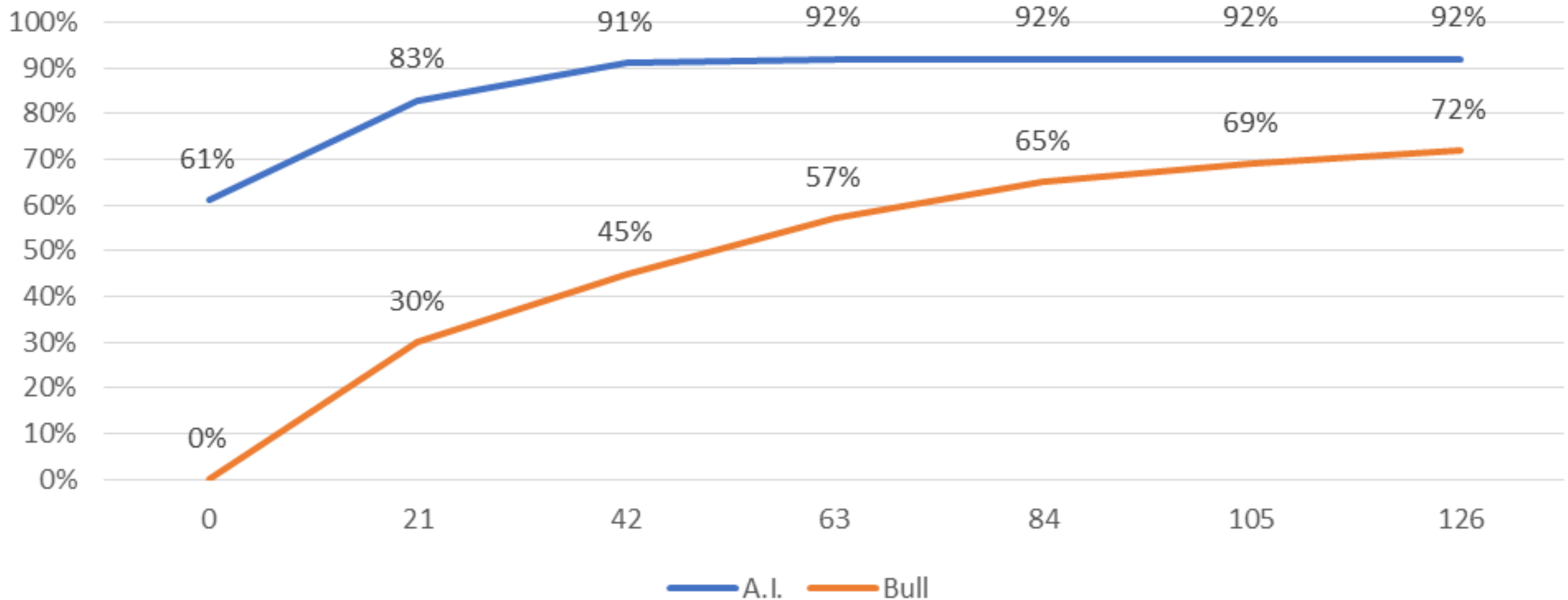
25 days - 6 cwt Steer

Cost for Artificial Insemination

AI Costs/head		Dose # 1	Dose # 2	Labor 50 cows/heifers	Hours	Rate	Cost
Semen	$ 22.50	$ 22.50		Corral	1.5	$ 18.00	$ 27.00
CIDR	$ 13.75	$ 13.75		Insert CIDR	0.5	$ 18.00	$ 9.00
Lutalyse	$ 3.80	$ 3.80		Corral	1.5	$ 18.00	$ 27.00
GNRH	$ 2.48		$ 4.96	Pull CIDR	0.3	$ 18.00	$ 5.40
Estrus Alerts	$ 1.62	$ 1.62		Corral	1.5	$ 18.00	$ 27.00
Artificial Insemination	$ 16.45	$ 16.45		Assist Breed Day	3	$ 18.00	$ 54.00
		$ 58.12	$ 4.96			Total	$ 149.40
	Total Meds.	**$63.08**			**Total Labor**	**Per Hd.**	**$2.99**

$ 66.07 per hd.

Cost of Natural Service Sires

Breed	3 Year Average Sales
A	$3,989
B	$4,265
C	$3,263

Multi-year   -   Multi – breed   -   Mean Sire Purchase Price

$ 3,800

Average age at cull: 6 years

Prorated Price Bull / Year: $ 650

Average 15 % loss due to lame, fertility, penis/sheath: $ 765

Average Carrying cost / Year: $ 755

Total Annual Average Bull cost: $ 1,520

Average Cows Serviced per Year: 25

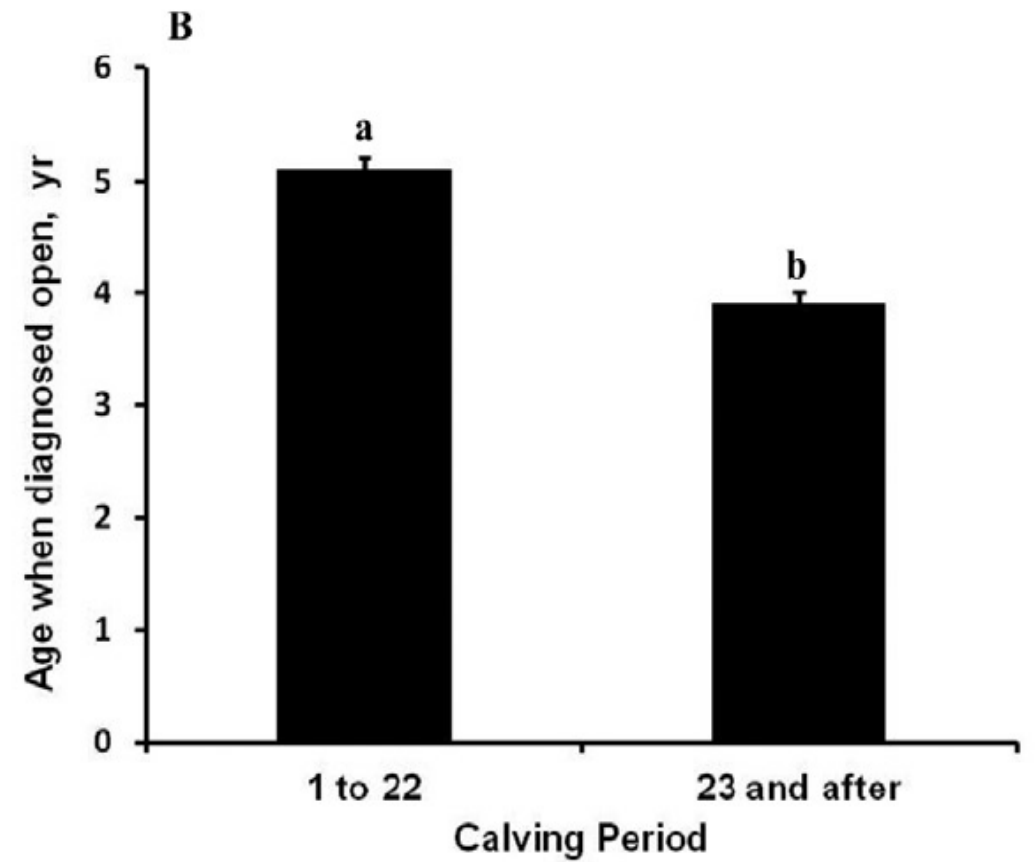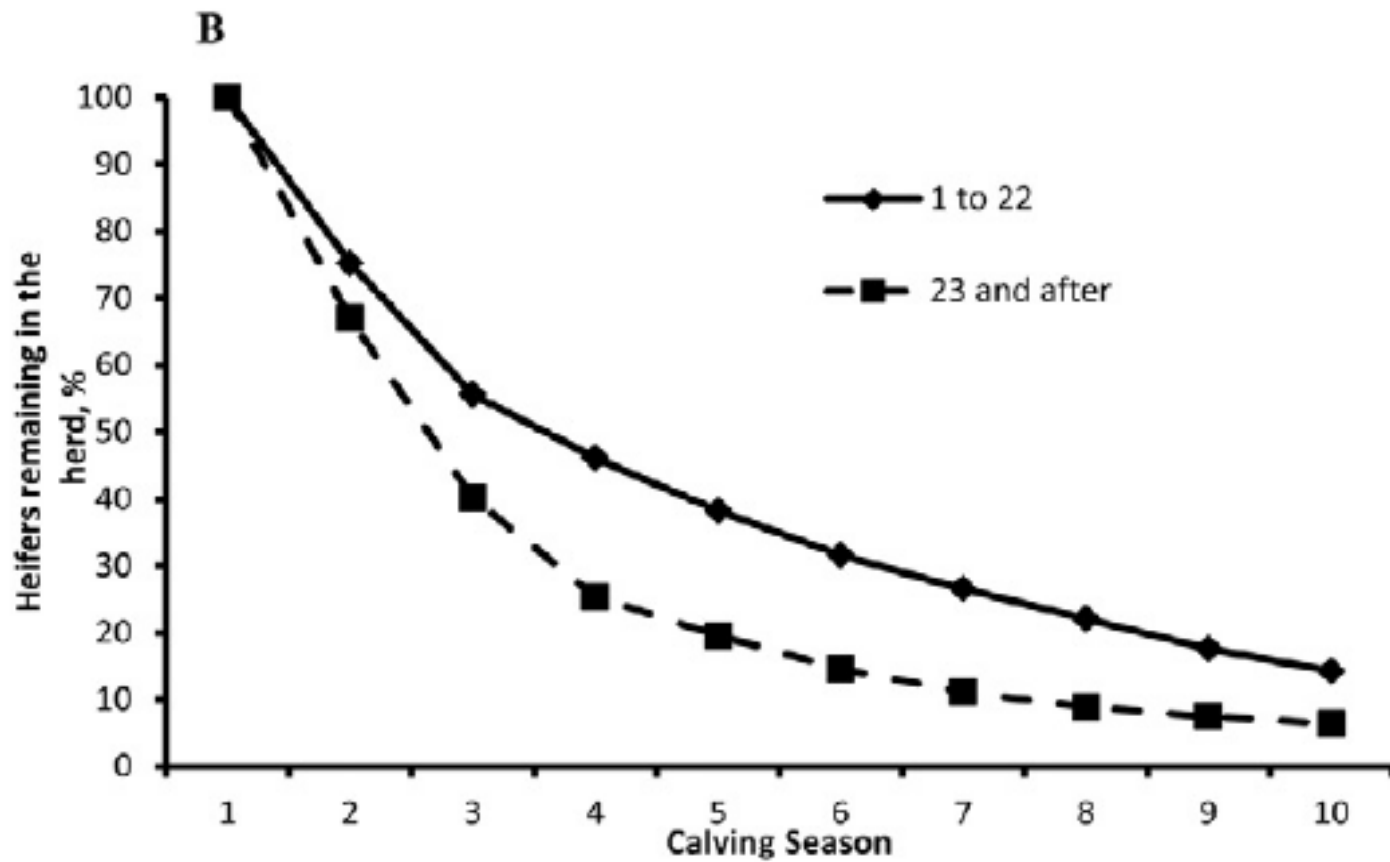

Average cost per cow at 100% preg rate: $ 76

Figure 1. Analysis of the influence of calving period on herd survival from (A) U.S. Meat Animal Research Center (USMARC) and (B) South Dakota Integrated Resource Management groups. (A) Results from Angus and Angus crossbred heifers ($n = 16,549$) from USMARC. More heifers from the first calving period remained in the herd at 5 yr of age than from the later calving periods ($P < 0.01$); (B) Commercial beef heifers ($n = 2,195$) on producer operations that were retained by producers as replacement heifers. Heifers that calved during the first 21-d period with their first calf remained in the herd longer than heifers that calved later ($P < 0.01$).
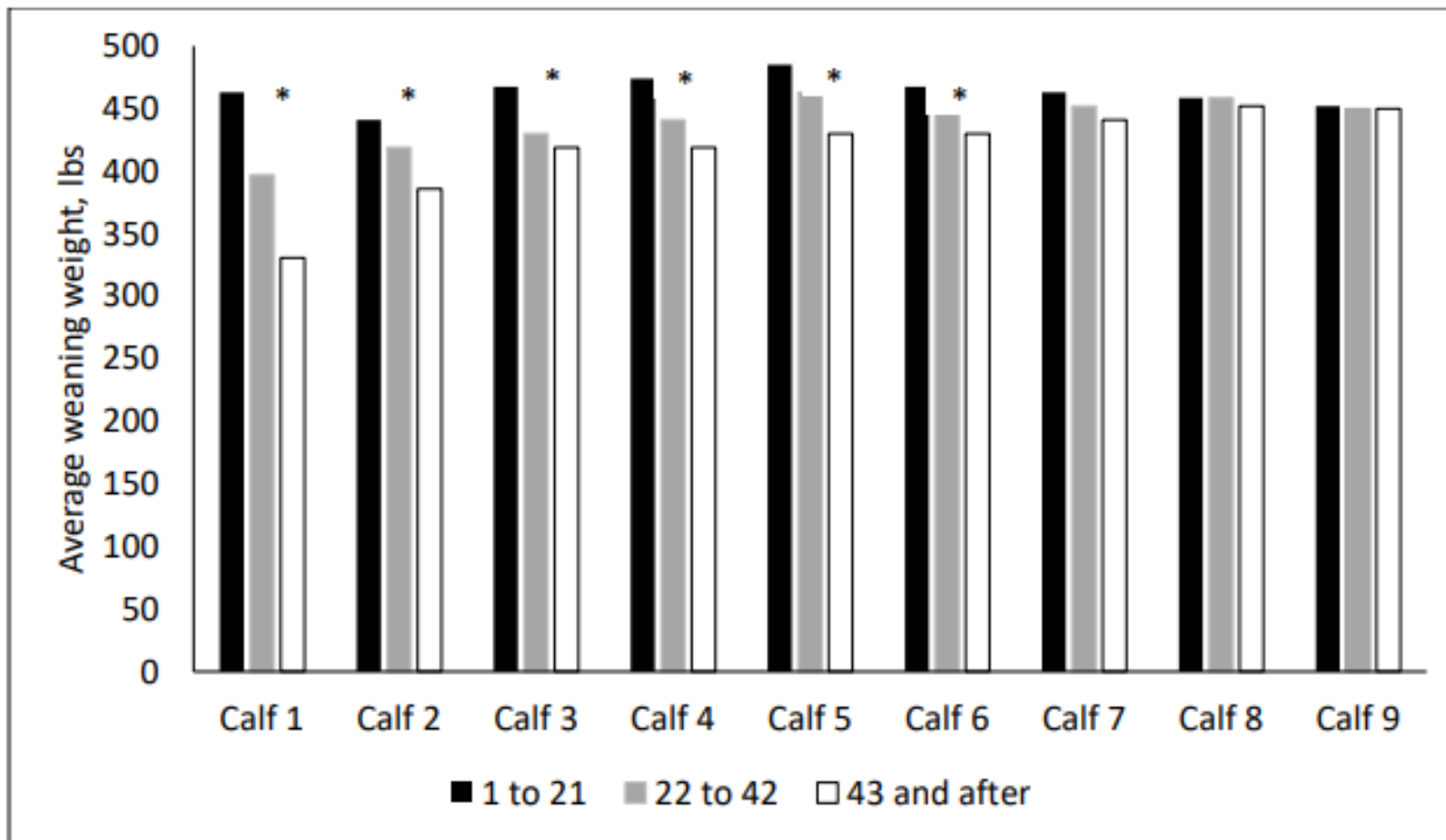
Sustainable
· **Great Cows !**

Figure 2. Calf weaning weights based on heifer calving period at USMARC. (*P < 0.05). Adapted from Cushman et al., 2013.

Cushman - reported increases in calf weaning weights for cows calving in the first 21 days compared to their contemporaries **through first 6 calves.**

Cushman R A, Funston R N, Heifer calving date positively influences calf weaning weights through six parturitions, J. Anim. Sci. 2013.91:4486-4491

Real World Application

Drought/Fire Recovery herd – ½ owned and managed, ½ leased and managed

Same Heifers – same feed costs – same breeding cost
- $156.41 Sept. 2019 WW livestock
- $?.?? /head Advantage

				Leased
19	Age of last calf @ weaning	171	Age of last calf @ weaning	182

8	Avg. Weight of steers	660	Avg. Weight of steers	567
9	Avg. weight of heifers	608	Avg. weight of heifers	546

93 lb. difference in average w.wt. steers = $10,881

62 lb. difference in average w.wt. heifers = $2,604

(Heifers kept as replacements removed from revenue)