

A vertical photograph on the left side of the slide shows a person wearing a cowboy hat riding a dark horse through a field of tall grass. The scene is captured in a monochromatic purple color scheme.

# THE IDEAL COW SIZE FOR YOUR ENVIRONMENT

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# WEBSTER DEFINES OPTIMUM

- 1: the amount or degree of something that is most favorable to some end; especially : the most favorable condition for the growth and reproduction of an organism
- 2: greatest degree attained or attainable under implied or specified conditions

# OVERVIEW

- What are the trends in mature cow size/growth traits?
- What are the relationships among mature cow size and production traits?
- Ways to improve production efficiency at cow-calf level.
- **GOAL: Find the optimum cow size that maximizes profit on your farm/ranch!**



# TRENDS IN COW SIZE



October 12, 2021

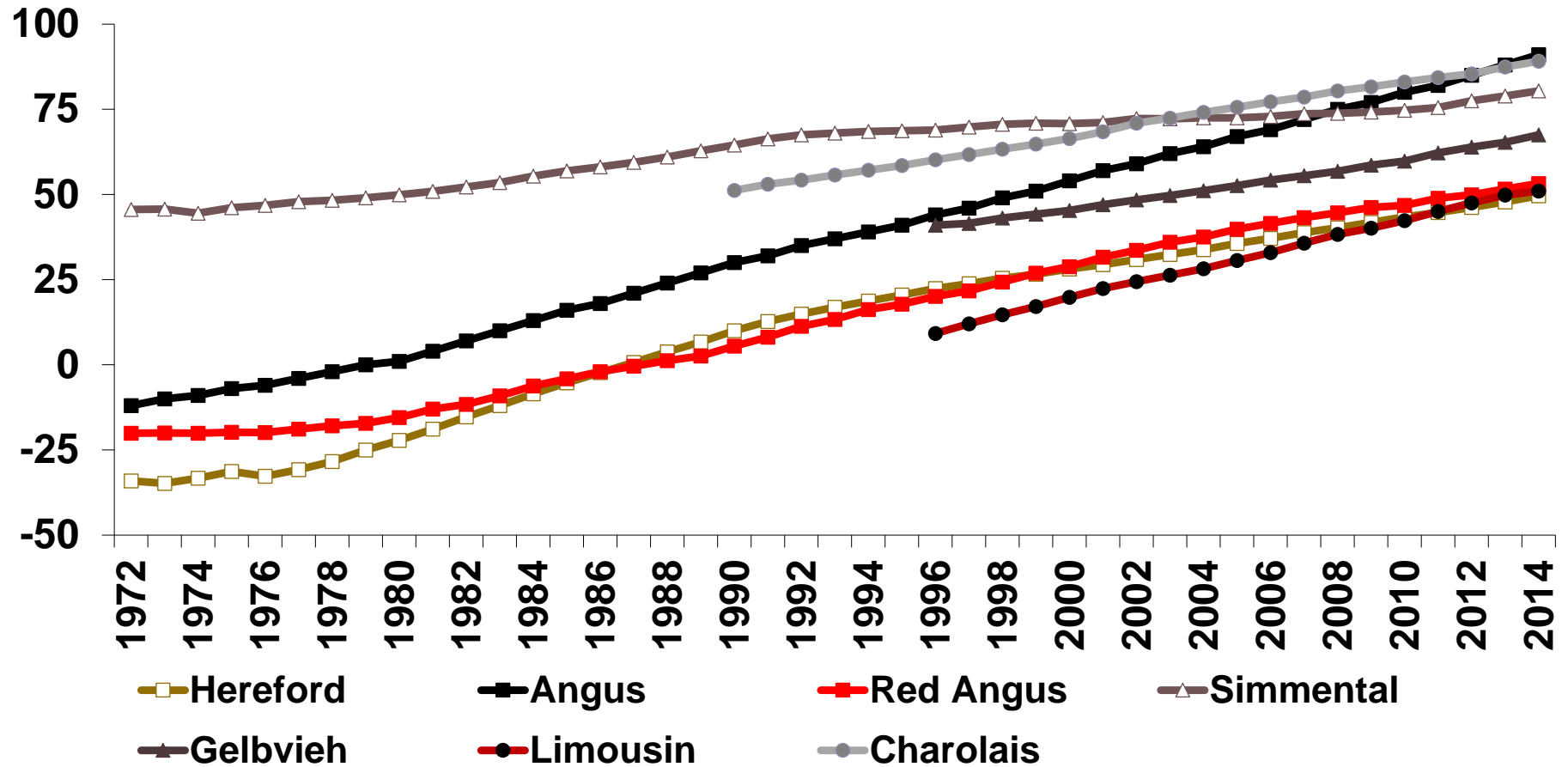
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# HOW HAVE COWS CHANGED DUE TO SELECTION?

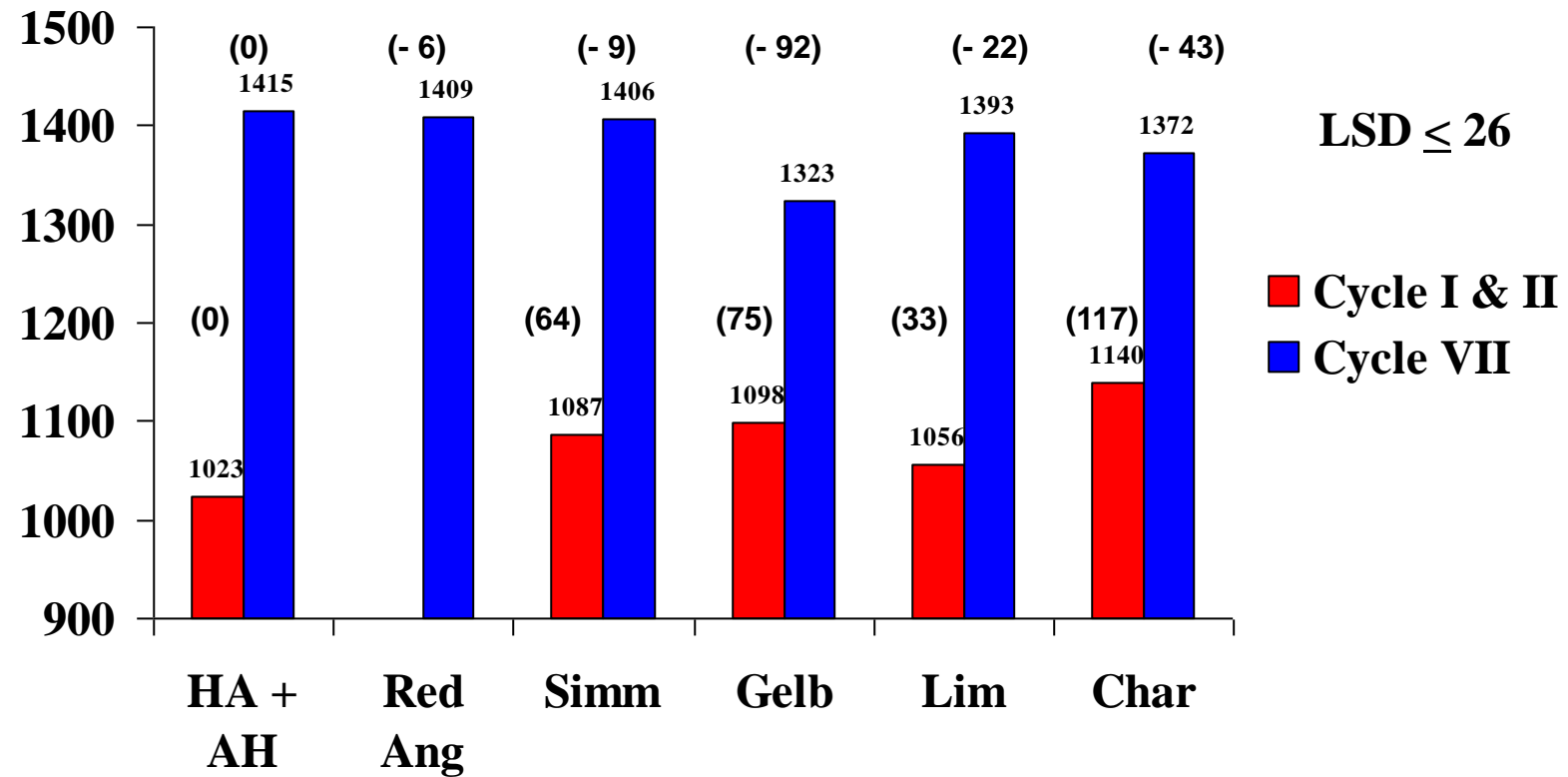
- Over the last **30 years** seedstock breeders have increased growth and lactation potential in every major US beef breed. (I suspect they have in SA, too!)
- Trends indicate no change in selection emphasis for growth (esp YW)
- Moderation in some breeds (esp Continental breeds) for MILK
- What's the problem with that?

# GENETIC TRENDS FOR YEARLING WEIGHT, LB

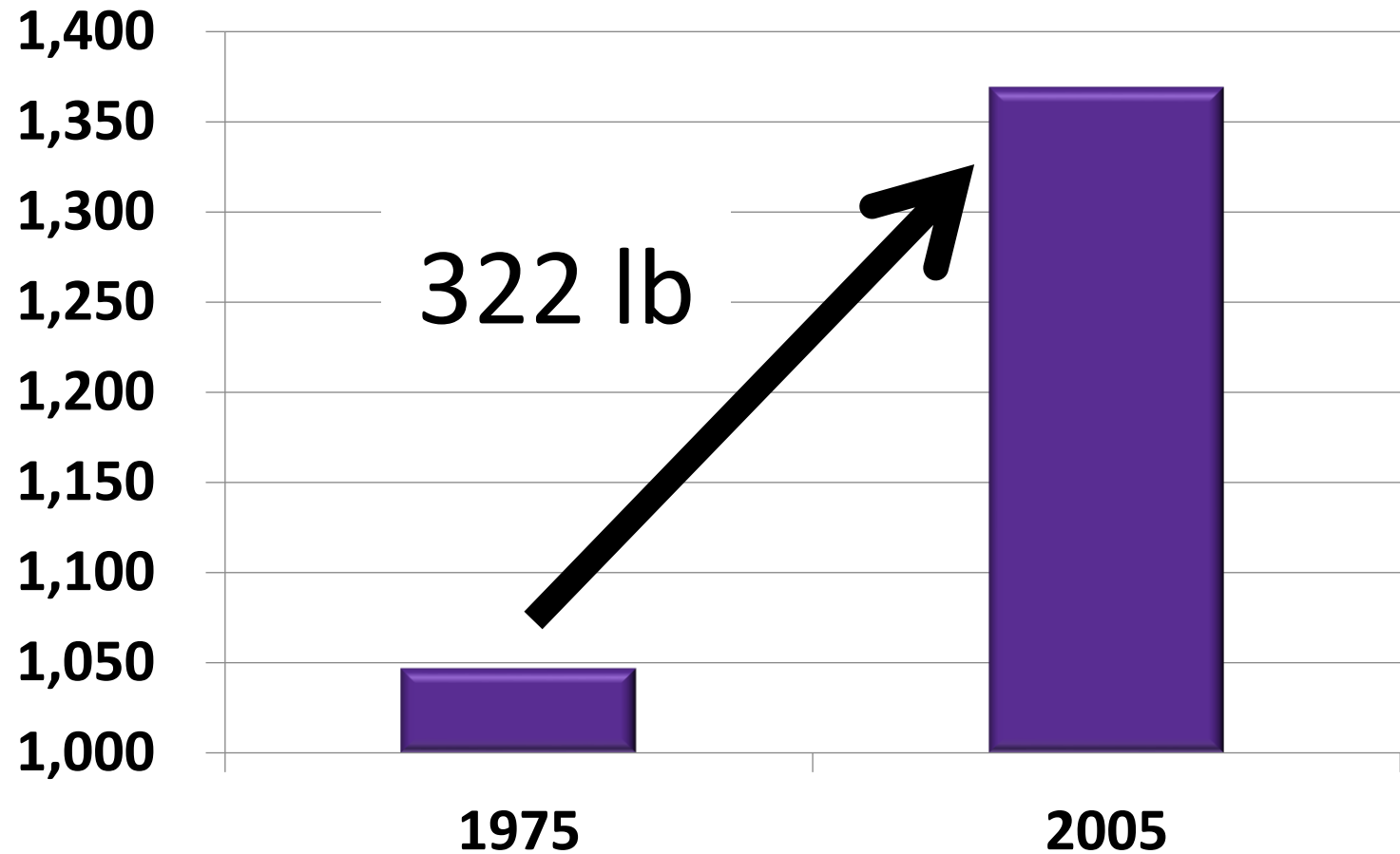


Adapted from Spring 2016 Genetic Trends from Breed Associations and 2016 AB-EPD factors

**BREED GROUP MEANS (DEVIATIONS FROM HA & AH) FOR MATURE WEIGHT (ADJUSTED TO CONDITION SCORE OF 5.5) OF F1 CROSS COWS IN CYCLES I AND II (BIRTH YEARS: 1970-74) COMPARED TO CYCLE VII (BIRTH YEARS 1999-2000), lb**



# HOW MUCH BIGGER ARE OUR COWS?



(McMurray, 2008)





# RELATIONSHIPS AMONG TRAITS



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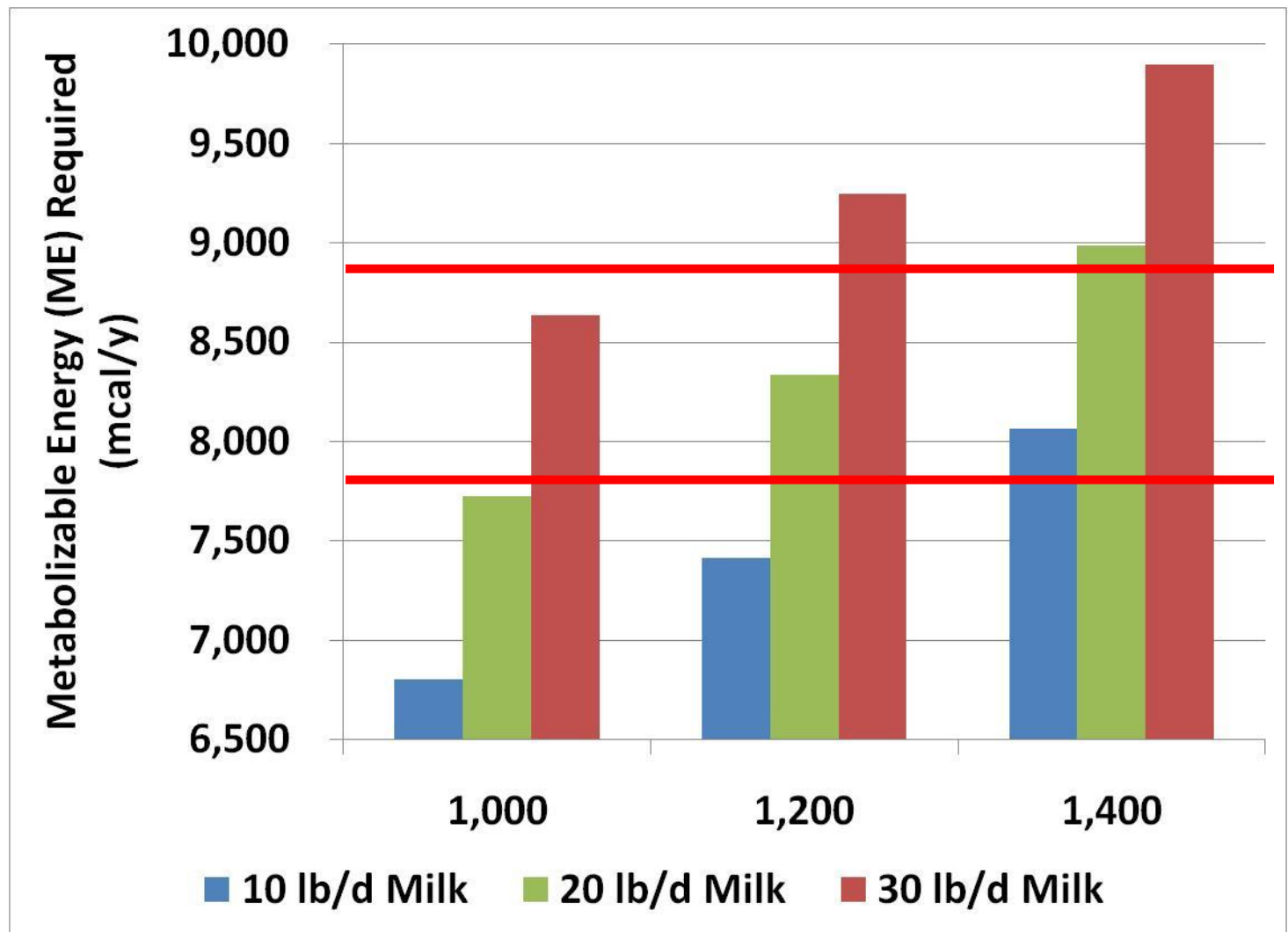
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# GENETIC ANTAGONISMS

	Weaning Weight	Carcass Weight	Mature Weight	Mature Height
Weaning Weight	<b>0.35</b>		<b>0.65</b>	
Carcass Weight		<b>0.52</b>	<b>0.82</b>	<b>0.69</b>
Mature Weight			<b>0.57</b>	<b>~0.80</b>
Mature Height				<b>0.71</b>

Heritability on diagonal, genetic correlations on off diagonal

# EFFECT OF MATURE WEIGHT AND MILK POTENTIAL ON ME REQ'D



↑ 27% Wt.

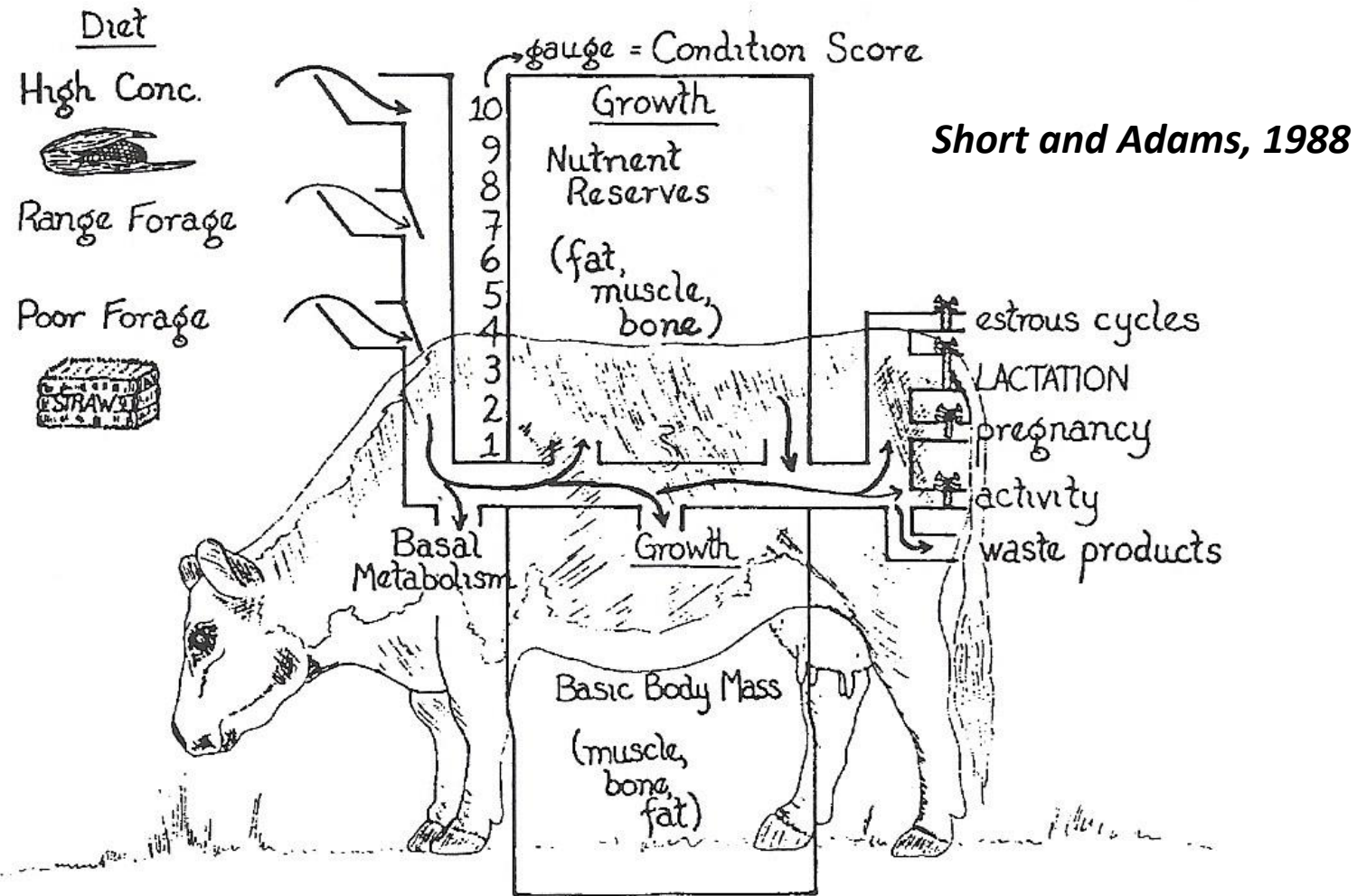
↑ 16% Milk

1000 lb = 444 kg

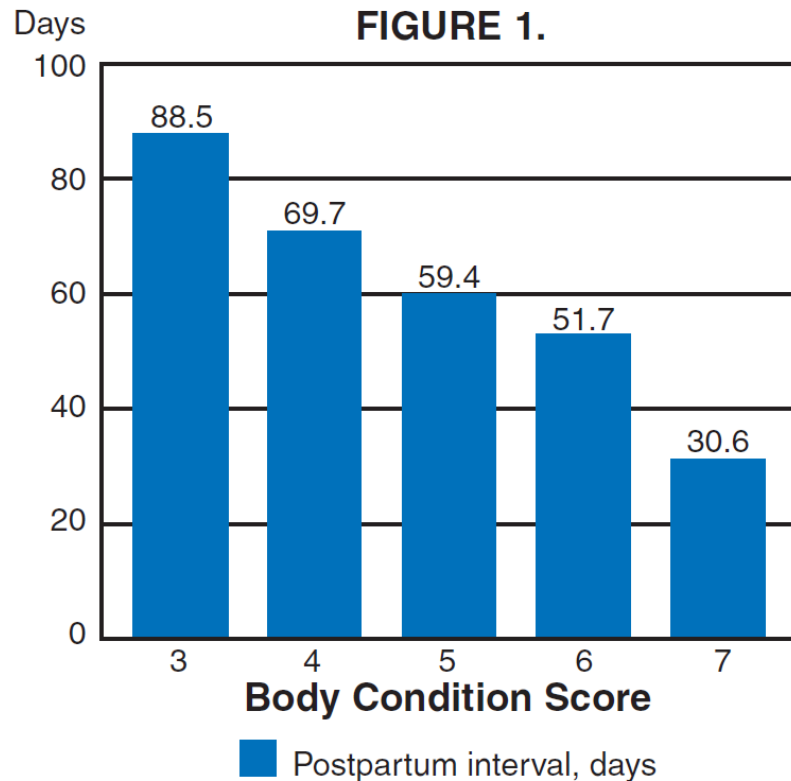
1200 lb = 544 kg

1400 lb = 629 kg

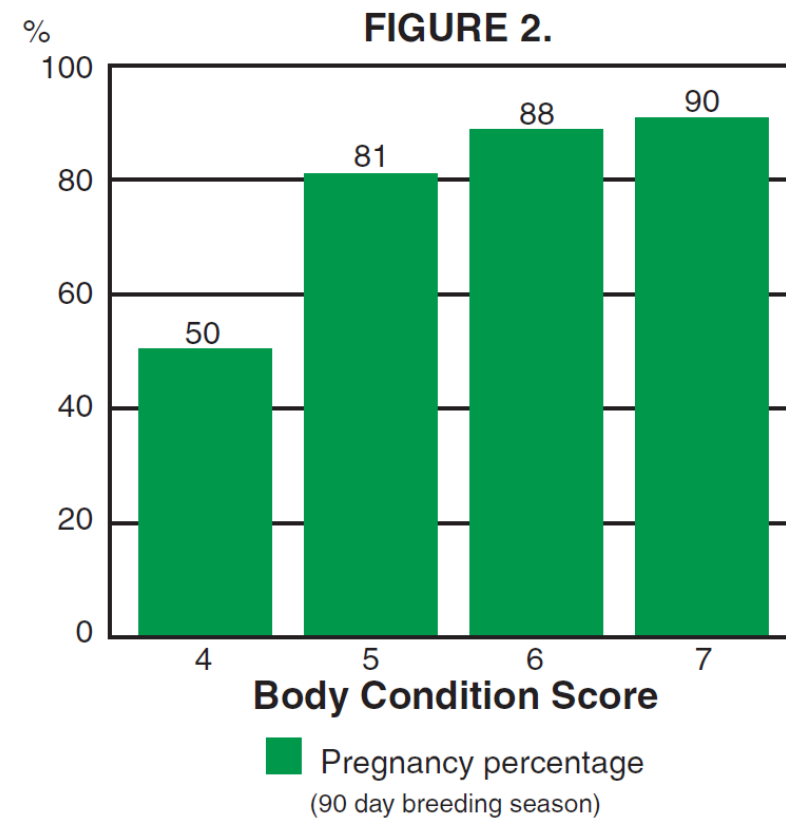
# BEEF COW NUTRIENT PARTITIONING



# BODY CONDITION AT CALVING: SETTING UP REPRO SUCCESS



Houghton et al., 1986. Purdue University



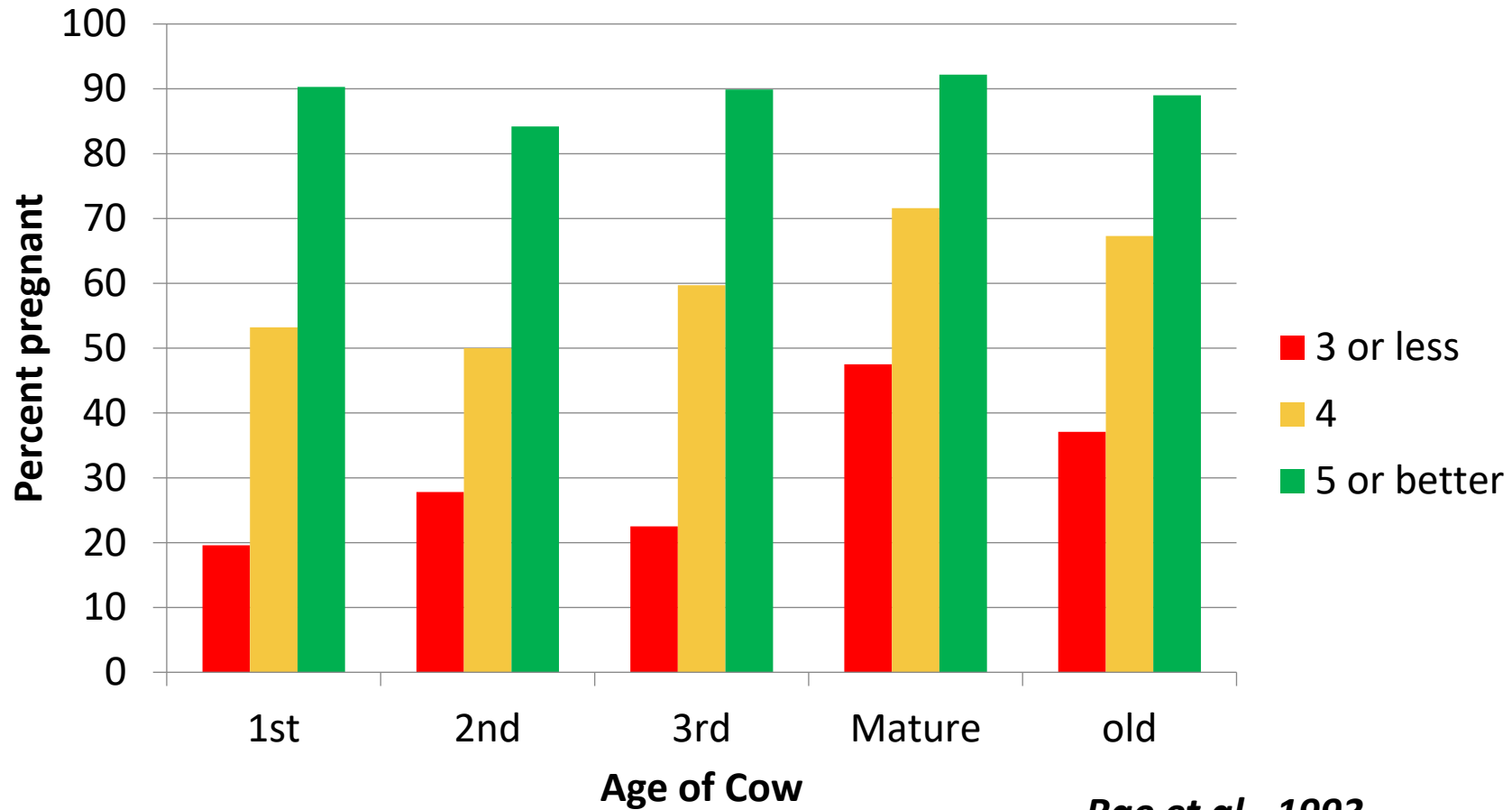
Selk et al., 1986. Oklahoma State University

**Source: Elanco-Body Condition: The Beef Cows Energy Gauge**  
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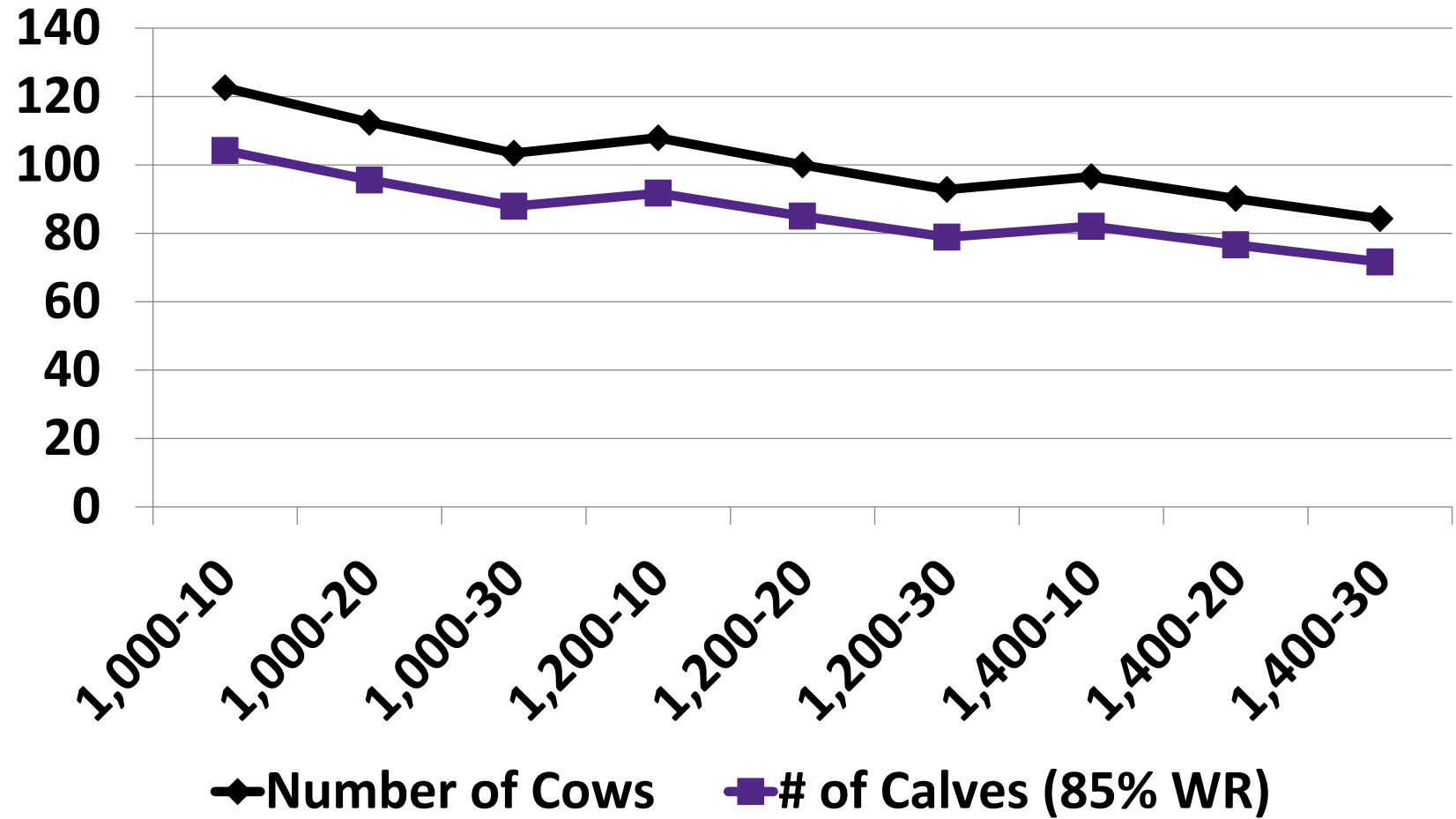
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# EFFECT OF BODY CONDITION AT PREGNANCY CHECK



*Rae et al., 1993*

# EFFECT OF WT. AND MILK ON COW AND CALF COUNTS WITH FIXED RESOURCES



# EFFECT OF WEIGHT AND MILK ON FORAGE COSTS AND ME REQ'S



Mature Cow Wt.	Milk (lb/day)	ME (Mcal)/year	Percent Increase	Forage Costs/cow (\$300 base)	ME bu. Corn
1400	30	9,896	19%	\$ 356.02	19
1400	20	9,249	11%	\$ 332.72	11
1400	10	8,637	4%	\$ 310.73	4
1200	30	8,987	8%	\$ 323.29	8
1200	20	8,339	0%	\$ 300.00	0
1200	10	7,728	-7%	\$ 278.00	-8
1000	30	8,062	-3%	\$ 290.04	-3
1000	20	7,415	-11%	\$ 266.75	-11
1000	10	6,803	-18%	\$ 244.75	-19

Highest Level
Intermediate Level
Lowest Level

Corn: ~36 bushels per ton;  
3.33X energy density prairie hay



## EFFECT OF WT. AND MILK ON PAY WT. AND VALUE (500 LB. @ \$1.55/CWT, \$0.10 SLIDE)

Mature Cow Wt.	Milk (lb/day)	Expected Calf WW	Gross Pay Wt.	Calf Price/lb.	Frame Discount	Realized Price	Gross Sale	Value Difference	Rank
1400	30	657	47,058	\$ 1.39	\$ (0.05)	\$ 1.34	\$ 63,118.93	\$(7,962.83)	9
1400	20	600	45,984	\$ 1.45	\$ (0.05)	\$ 1.40	\$ 64,299.52	\$(6,782.24)	7
1400	10	535	43,905	\$ 1.52	\$ (0.05)	\$ 1.46	\$ 64,246.62	\$(6,835.14)	8
1200	30	616	48,587	\$ 1.43	\$ -	\$ 1.43	\$ 69,674.28	\$(1,407.48)	5
1200	20	562	47,770	\$ 1.49	\$ -	\$ 1.49	\$ 71,081.76	\$ -	3
1200	10	501	45,955	\$ 1.55	\$ -	\$ 1.55	\$ 71,183.93	\$ 102.17	2
1000	30	575	50,553	\$ 1.48	\$ (0.11)	\$ 1.37	\$ 69,076.05	\$(2,005.71)	6
1000	20	522	49,901	\$ 1.53	\$ (0.11)	\$ 1.42	\$ 70,829.94	\$ (251.82)	4
1000	10	476	49,594	\$ 1.57	\$ (0.11)	\$ 1.47	\$ 72,674.83	\$ 1,593.07	1

# RELATIONSHIP BETWEEN COW BW AND CALF WW-OKLA.

- Individual cow and calf weaning records (n=737 ) collected over 6 yr from a commercial Angus and Angus x Hereford commercial cowherd were evaluated.
- Cow BW adj. to 5.0, AOD adj. to 5 yrs.
- Every 100 lb increase in Cow BW, increased Calf WW by 10 lb. ( $P < 0.05$ )

# INPUT:OUTPUT RELATIONSHIPS

- Do bigger cows wean bigger calves?
  - Small cows weaned a greater percentage of their body weight
  - Small cows weaned heavier calves
  - Cows 1200 lbs and under weaned an average of 617 lbs
  - Cows 1600 lbs and over weaned an average of 434 lbs

*(CHAPS Database, 2008)*

# INDIVIDUAL PERFORMANCE VS. HERD LEVEL PERFORMANCE

Average Calf Weaning Weight

Efficiency has to be viewed from an operation standpoint and not from a per cow or per steer basis.  
– Steve Radakovich at Beef Cow Efficiency Forum, 1984

WW / Exposed Cow

Mature Weight of Cows



# RIGHT SIZING COWS TO YOUR PRODUCTION ENVIRONMENT



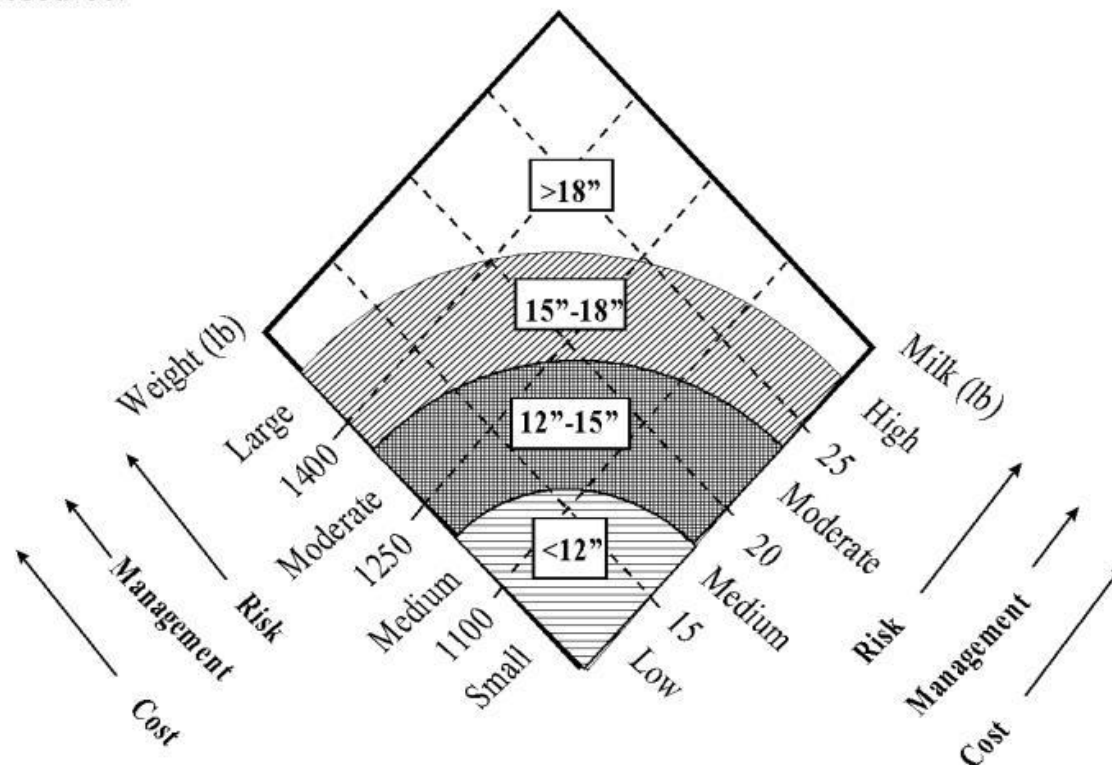
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# RIGHT SIZING COWS: MATURE WEIGHT AND MILK

Figure 1. Matching cow biological type (weight and milk) to range environment, with associated risk, management, and cost. Ranges in inches (12"-15") are annual precipitation and/or represent availability of winter feed resource.

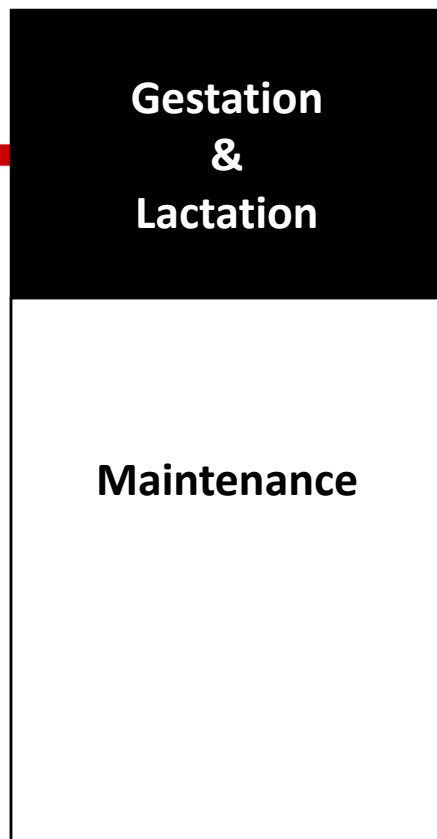


(BIF, 2010)

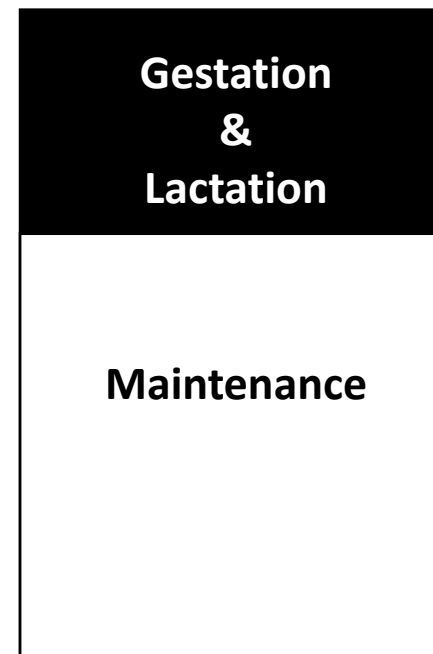
# IMPROVE EFFICIENCY OF FEED UTILIZATION OR MATCH NUTRIENT DEMAND TO ENVIRONMENT?



**Cow 1**



**Cow 2**



# OPTIMAL BEEF COW WEIGHTS IN SOUTHERN PLAINS

- Under all breed, calving season and forage types, highest NPV cows were **950 lb.**
- Wait...what? Why?
  1. Higher stocking rates for smaller cows; more lb. weaned per acre (i.e. gross pay weight)
  2. Lighter calves sell for higher price per lb.
  3. Feed costs don't scale linearly (maintenance costs don't) with weight, increased revenue from heavier weaning weights don't offset added feed costs from heavier cows

*Bir et al., 2019, JARE 43(1)103-117*



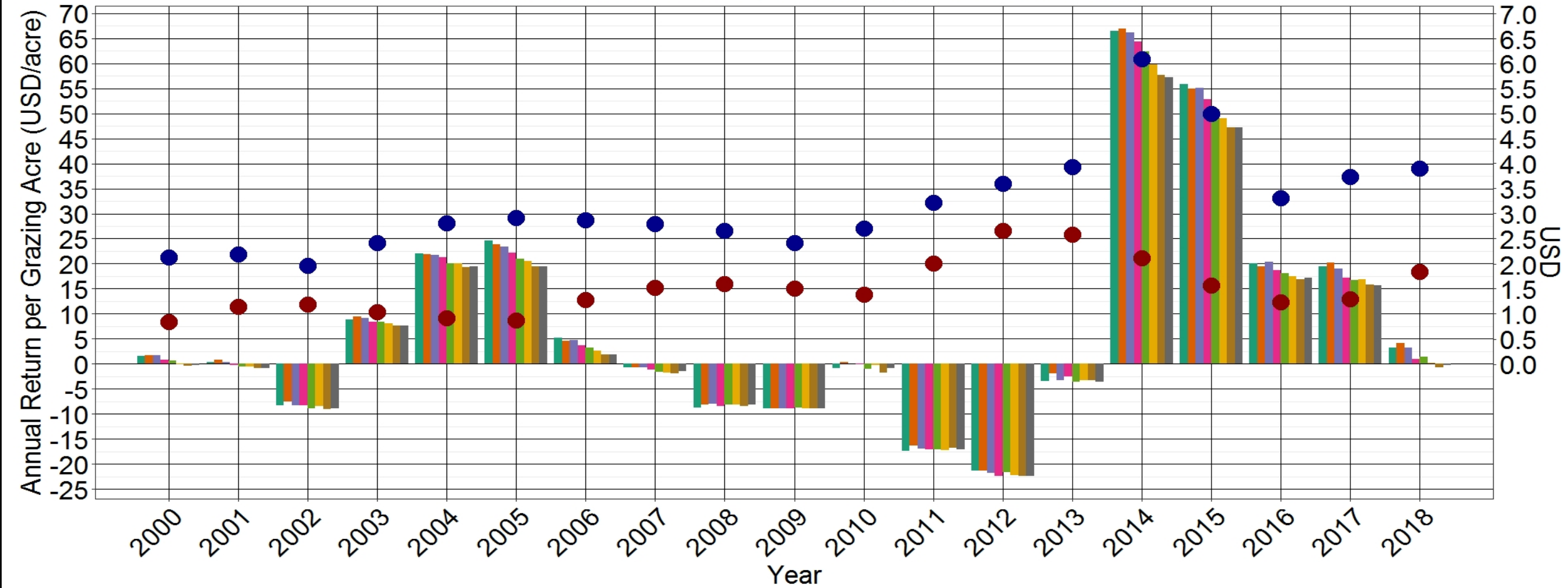
# CATTLE FAX MODEL (FEB 2015)

- 1150 vs. 1350 lb cows
- 575 vs. 675 lb calves
  - ~30lb weaned calf weight per cow exposed /cow cwt
  - 3X the OSU estimate
- Equal repro rate (benefits big cows)
- Little cows still win!
  - 52 more cows net \$89/hd more

Average Cow Weight (lbs.)	1,150	1,350
Cow Feed Costs	\$ 180.00	\$ 210.00
Pasture Costs	\$ 299.00	\$ 351.00
	\$32.50/AU/Mo (32.50*1.15*8mos.), (32.50*1.35*8mos.)	
Other Cow Cash Costs	\$ 210.00	\$ 230.00
Cow Cash Cost	\$ 689.00	\$ 791.00
Calf Weight	575	675
Calf Breakeven	\$ <b>119.83</b>	\$ <b>117.19</b>
Number of Cows for 400 AU Ranch	348	296
	(400÷1.15)	(400÷1.35)
Total Number of Calves (85% calf crop)	296	252
Calf Price (/cwt, 2014 avg.)	\$ 244.06	\$ 223.24
Price per Calf Received	\$ 1,403.35	\$ 1,506.87
Net Return per Calf	\$ 714.35	\$ 715.87
Total Net Returns	\$ 211,446.12	\$ 180,399.24
Difference- Net Returns	\$31,046.88	

# Median Annual Return per Grazing Acre 2000-2018

(Aherin et al., 2020)



Sire Mature Cow Weight (kg) Genetic Potential

<span style="color: green;">■</span> 454	<span style="color: orange;">■</span> 499	<span style="color: purple;">■</span> 544	<span style="color: pink;">■</span> 590	<span style="color: red;">●</span> Avg Base Ration Price per 10 kg DM
<span style="color: green;">■</span> 635	<span style="color: yellow;">■</span> 680	<span style="color: brown;">■</span> 726	<span style="color: grey;">■</span> 771	<span style="color: blue;">●</span> Sept 226 kg Steer Price per kg

Columns represent the median return per grazing acre by MW category across all iterations for each production year from 2000 through 2018. Ration and cattle prices are exogenous variables based on historical data.



# WHAT CAN I DO TODAY??

- Know how much your cows weigh
  - At weaning
  - Before calving
- Collect Body Condition Scores
- Compute BCS Adjusted Mature Weights by age class to BCS 5
  - Each BCS is approximately 80 lb. body weight
  - E.g. for a BCS 4 cow that weights 1200 lbs-Adj MW is 1280
  - Sample 2 year old and 5 year old cows

# WHAT CAN I DO TODAY??

- Analyze the failures in your herd...
- Who are the culls?
  - Heifers that failed to breed as two-year-olds?
    - Too much growth potential given nutrient resources
    - Fail to reach puberty for breeding as yearlings (or two's if that's your system)
  - Young cows that fail to rebreed for second or third calf?
    - Too thin at calving
    - Lost too much weight during lactation (poor nutrient availability/too much lactation potential)
    - Remember repro goes first...
  - Old cows
    - Worn out teeth; Poor body condition

# WHAT CAN I DO TODAY??

- Selection for Moderate Levels:
  - Milk EPD
  - BW, WW, YW, or preferably Mature Wt. EPD
  - Higher values of \$EN
  - Implement **crossbreeding system**-enhanced system efficiency
- Select cows (their sires) to fit production environment
- Mate these cows to produce calves desired by marketplace (think terminal sire...)

# NO FAVORITISM...

***“..... thus environmental conditions existing at any given time will lead to the natural selection of genes giving rise to characters in harmony with the environment concerned.”***

***--Hammond, 1947***



**Thank You!**  
**Questions?**