# Addressing Fertility Using Genetics and Management

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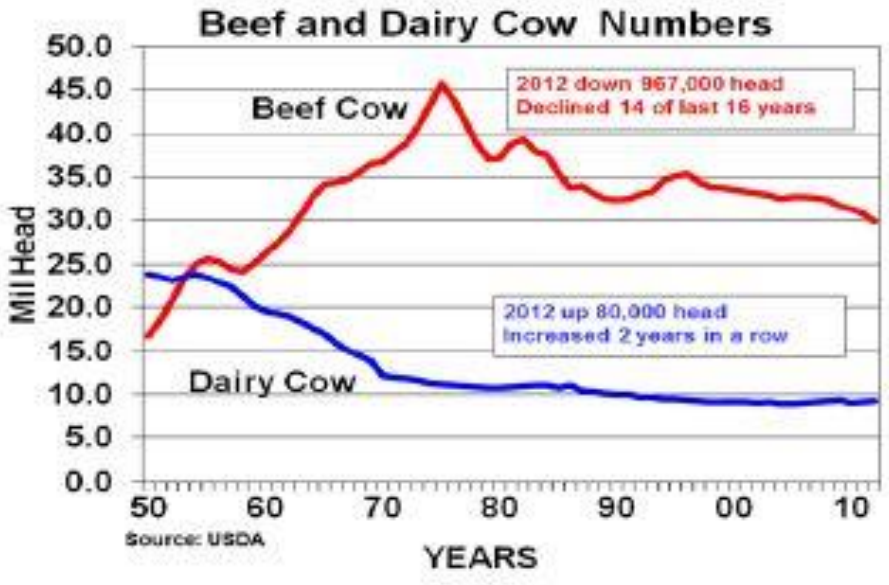
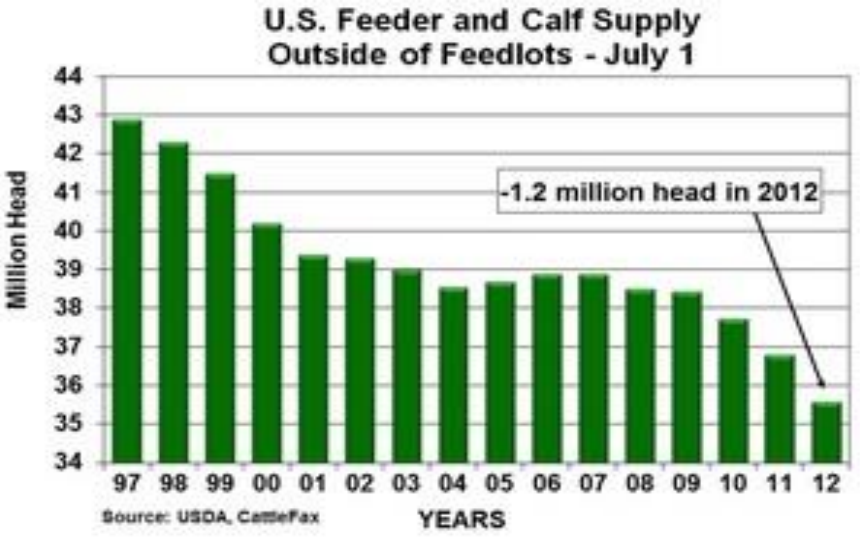
# Overview

- State of Nature … the beef industry in flux
- Key to success
  - Established breeding objective
  - Separate terminal vs. maternal service sire selection decisions
- Strategically 'build' cows via sire/system selection
  - Appropriate cow size/lactation potential
  - Appropriate level of heterosis
  - Use 'maternal' selection tools

# US Cow Inventory

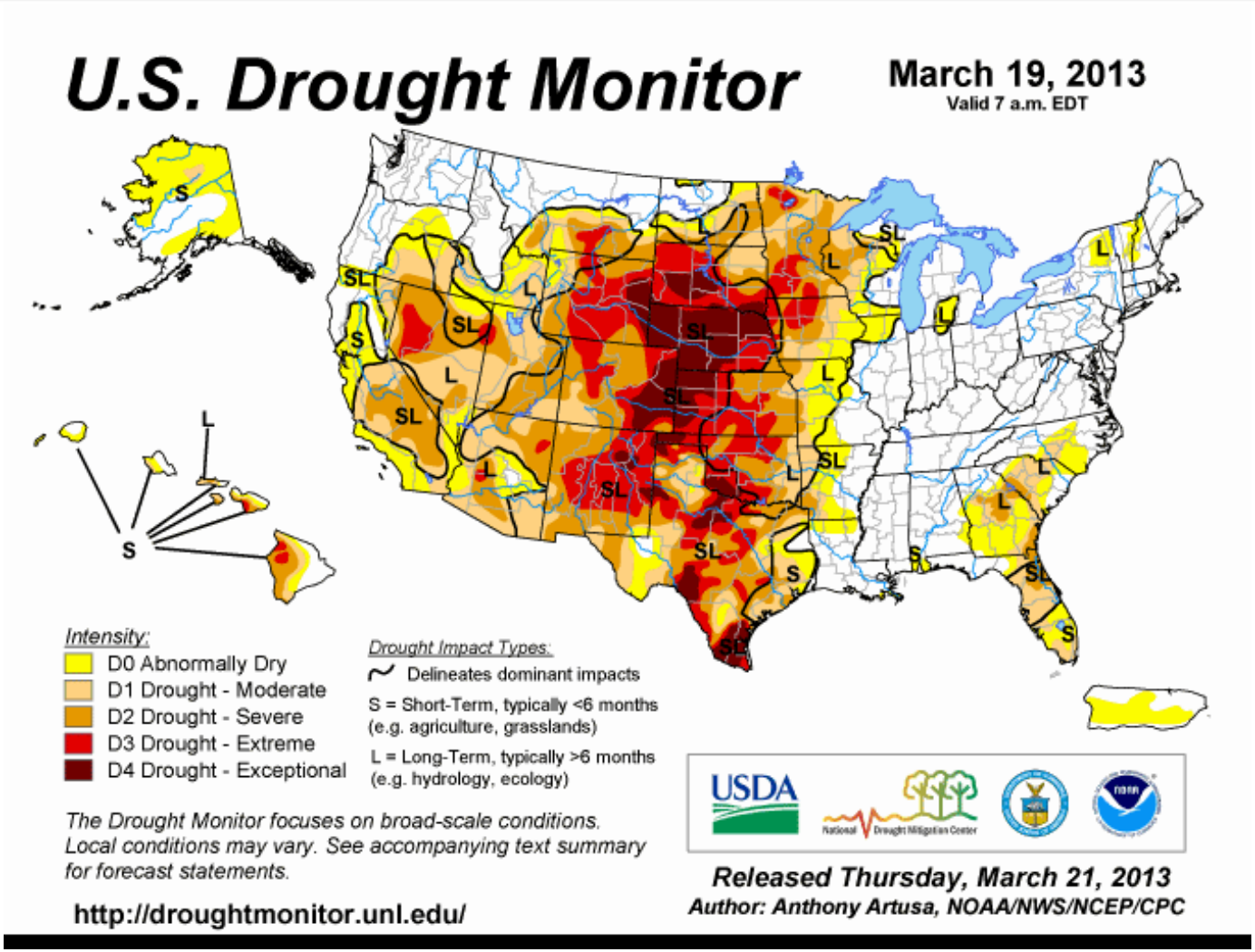



- 33% reduction in cow inventory from peak
- 2012 back a million cows vs 2011
- 2012 needed ~33,000 fewer bulls




- Seedstock prices in 2015 increased
- Leaner times ahead as cow herd contracts
- How will you compete?

# Persistent Drought in Cow Country



# Revisiting the Breeding Objective(s)

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# Cow-calf Production Objective

- Grow grass
- Efficiently harvest grass with cows
- Cows most efficiently convert grass to calves
- Maximize profit (not only $)

**Keys to success:**

1. Minimize supplement inputs
2. Optimize cow harvester to environment
3. Mate optimum cow to sire that maximizes value of terminal calves

# Do You Have a Breeding Objective??

Our objective is to breed cattle that breed as yearlings, calve unassisted and rear a good calf for sale at weaning every year. We aim to breed functional cattle that flesh easily and can forage on the hills over winter but must have the temperament and soundness to be farmed intensively during calving and the breeding season.

# Do You Have a Breeding Objective??

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***Missing:*** *How do they replace females in herd?*

# The Role of Economically Relevant Traits

- A trait that has a direct cost or return associated with it is an Economically Relevant Trait (ERT).
- Traits that are correlated to ERTs are indicator traits.
- Example: Is Birth Weight or Calving Ease the ERT? Why??
- Weaning Weight or Yearling Weight?

# Relative Economic Weights for Integrated Beef Firm

Reproduction:Growth:End Product

# 2:1:1

(Melton, 1995)

# Right Sizing Cows to Your Production Environment

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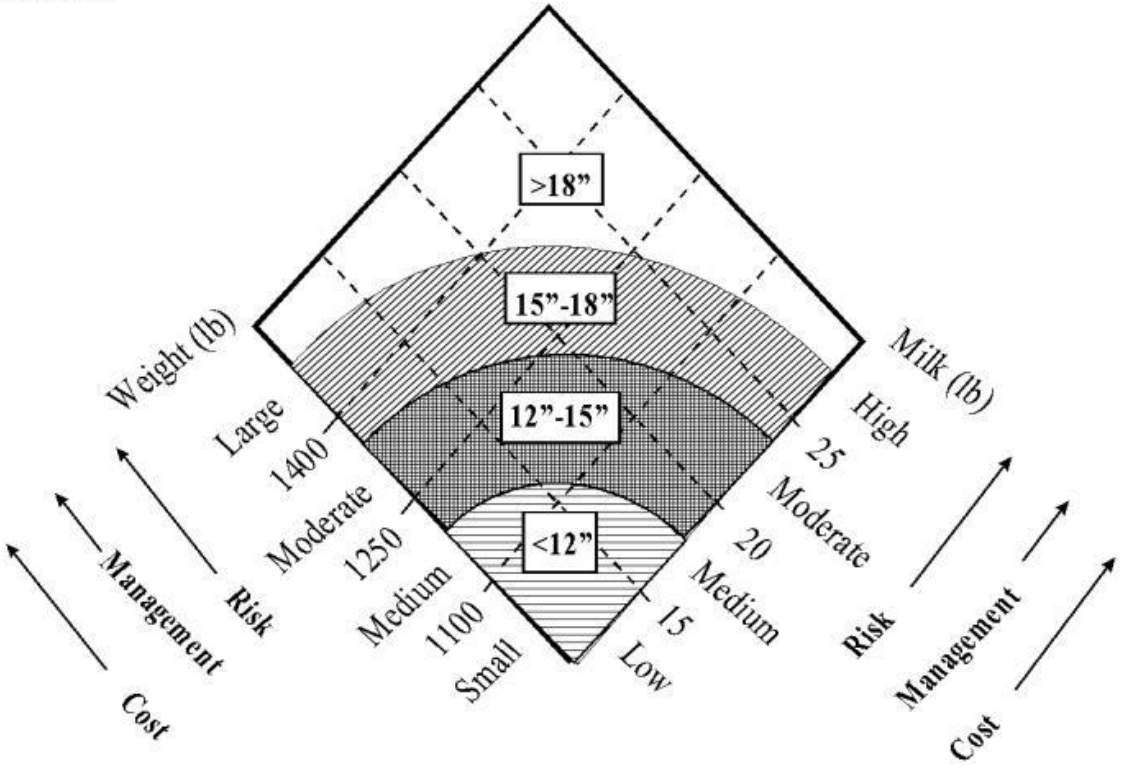
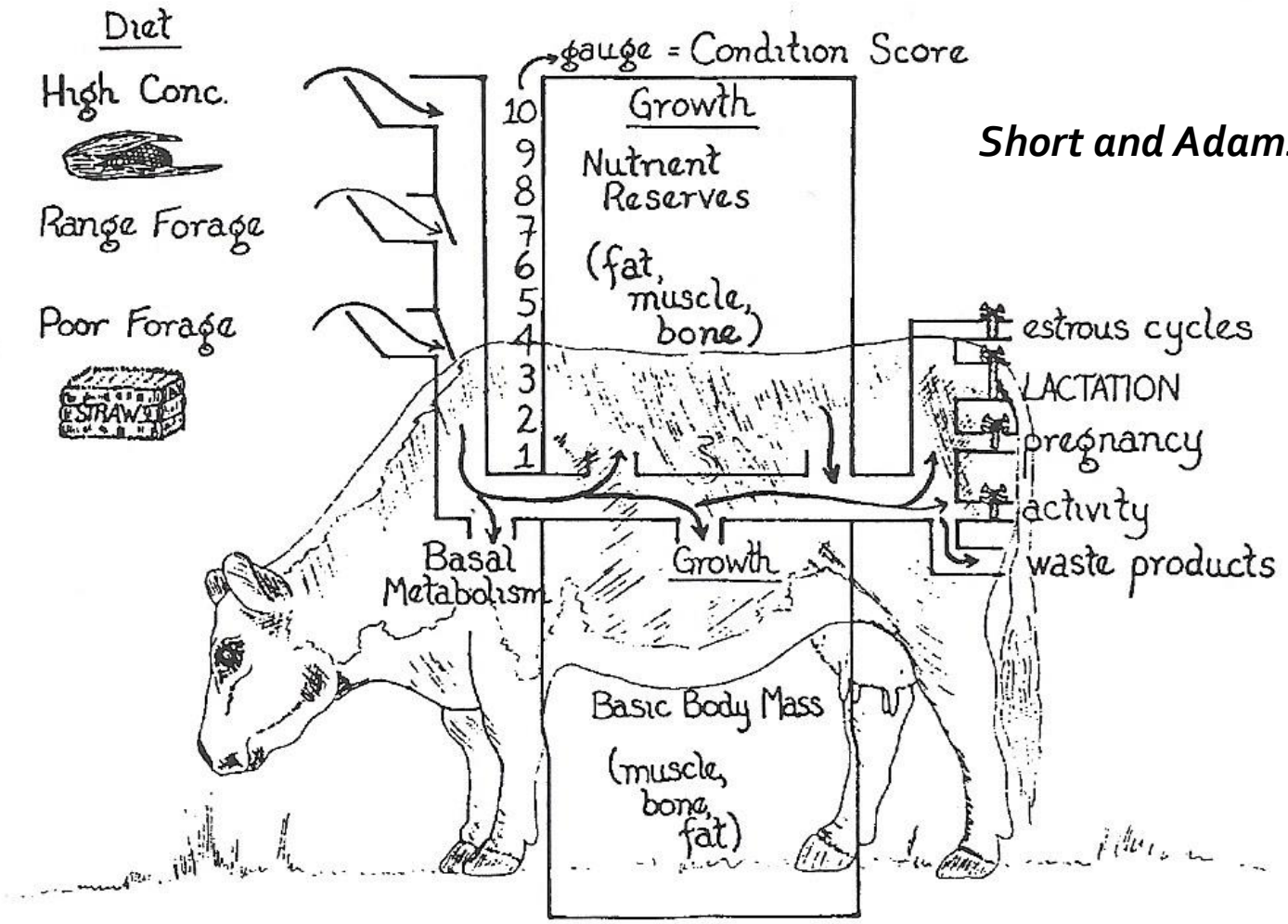
# Right Sizing Cows: Mature Weight and Milk

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.



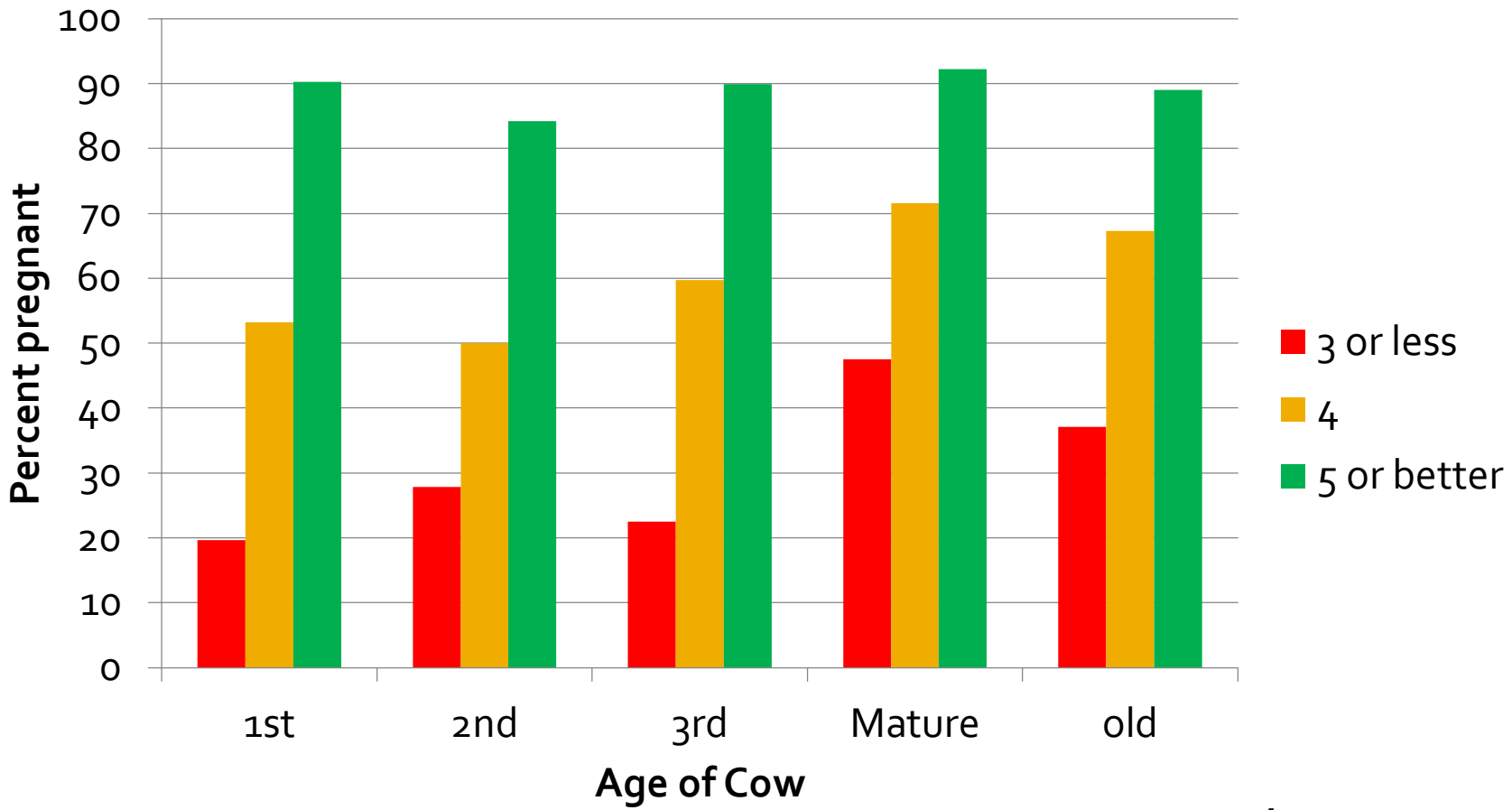

*(BIF, 2010)*

# Beef Cow Nutrient Partitioning




***Short and Adams, 1988***

# Effect of Body Condition at Pregnancy Check




***Rae et al., 1993***

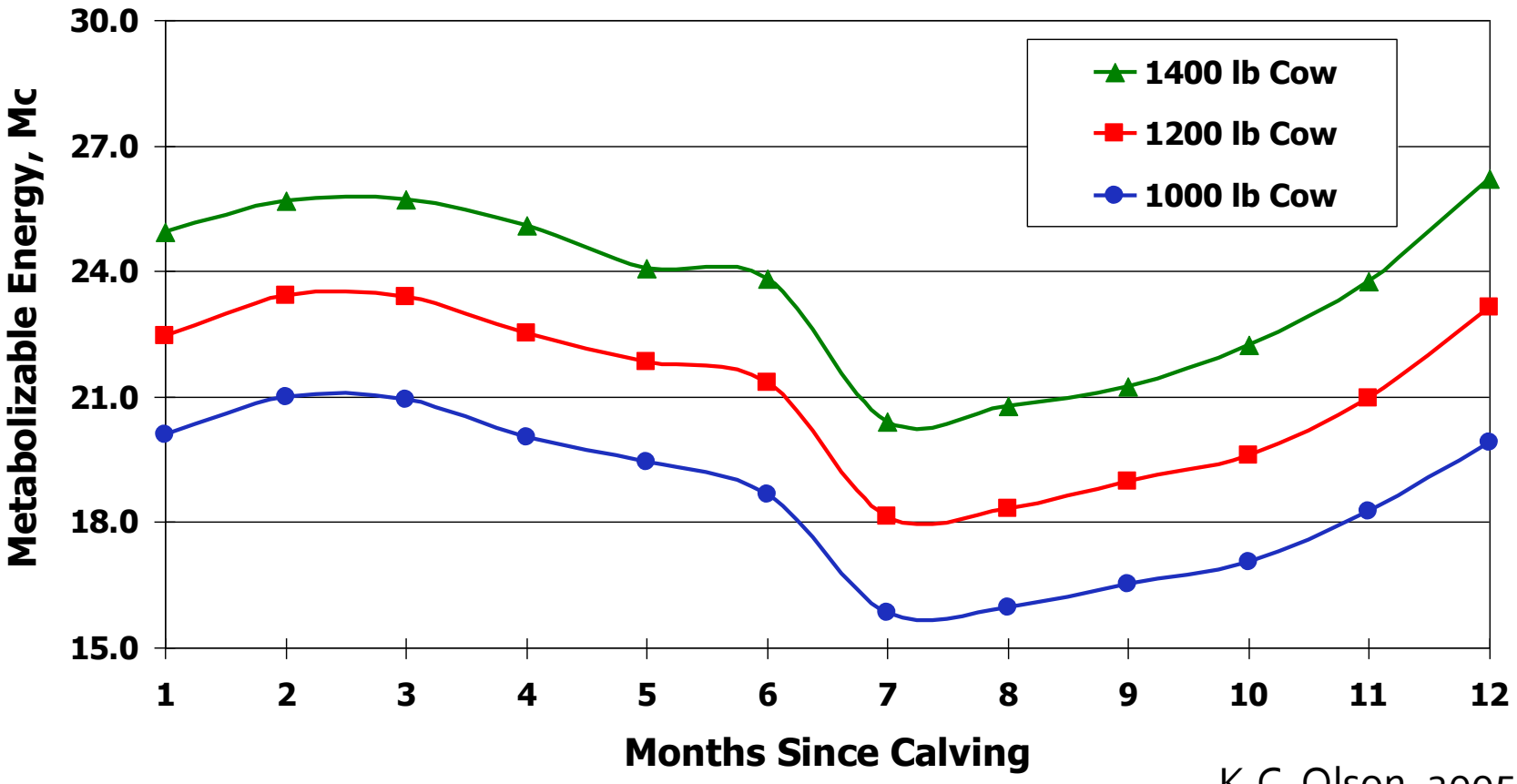
# Genetic Correlations

- BW – Mature Wt. 0.61
- WW – Mature Wt. 0.65
- YW – Mature Wt. 0.65
- Feed Intake – Mature Wt. 0.75

- Correlated response to selection!!!
  - Continued selection for increased WW or YW w/o downward pressure on MW will drive up mature weight of cows!
  - Making cows smaller and mating to same kind of sires that produced these cows may (will) reduce WW, YW, CW unless you change mating strategy

# Animal Nutrient Requirements

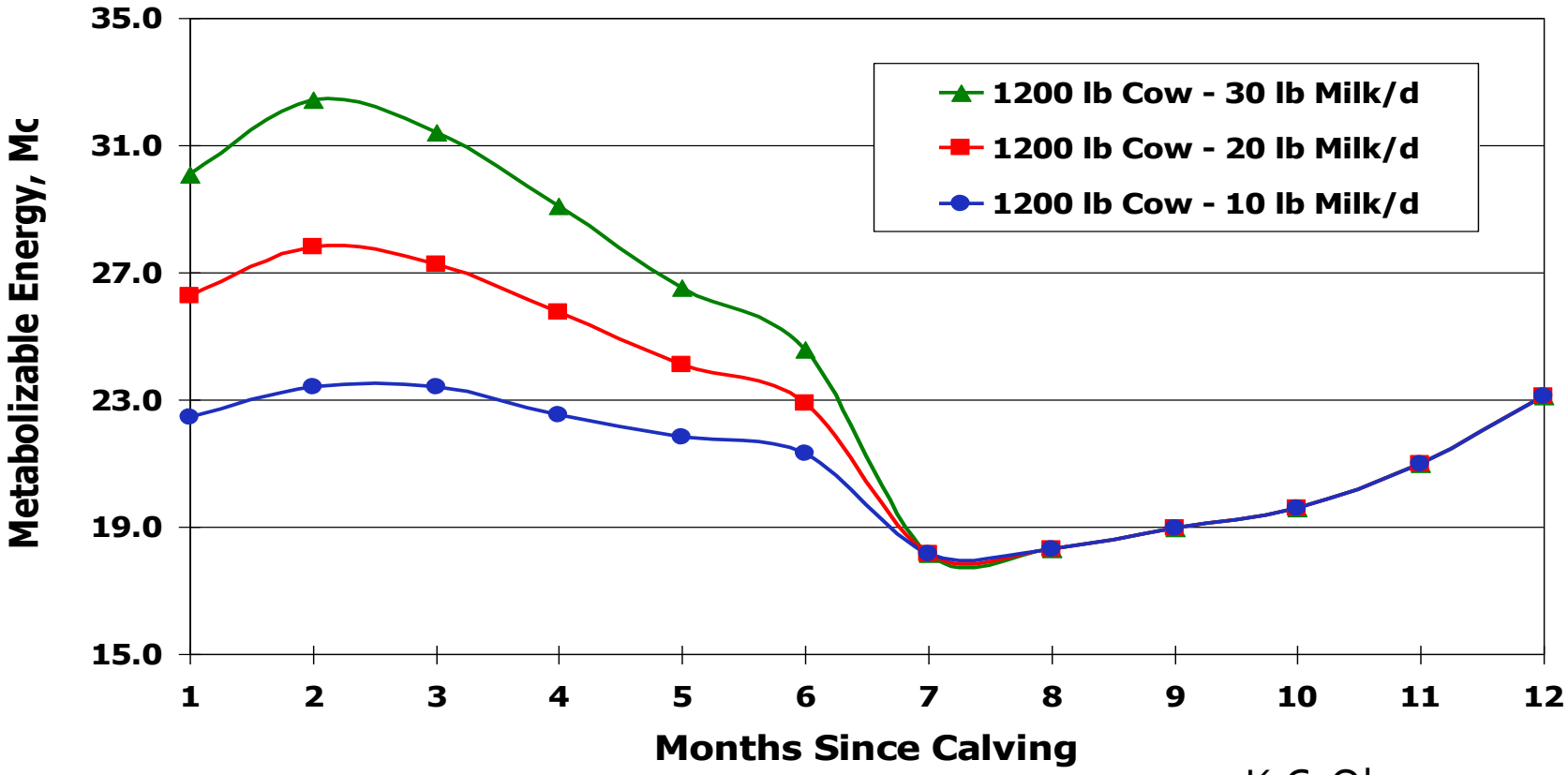
## Effect of Cow Body Size




K.C. Olson, 2005

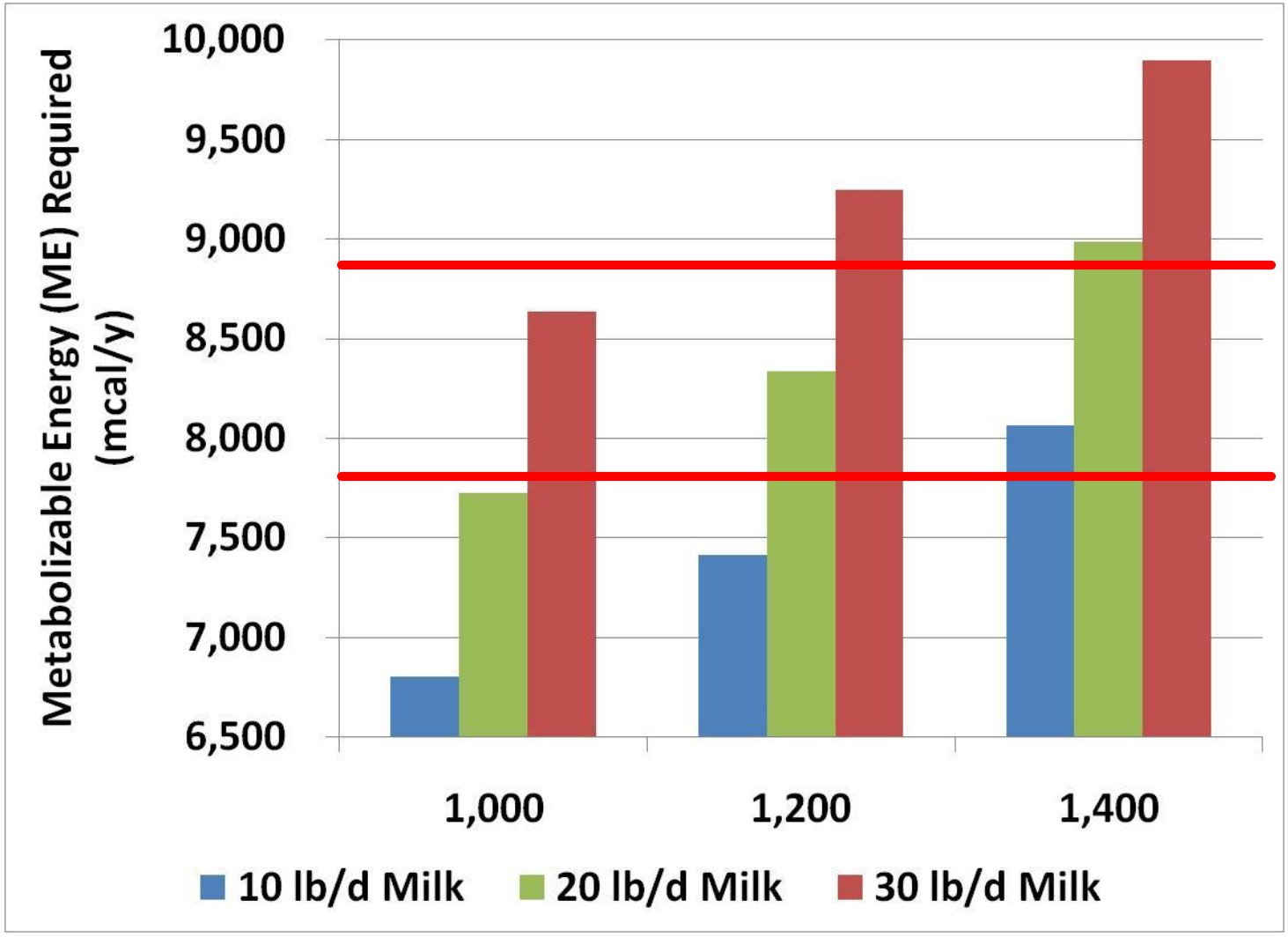
# Animal Nutrient Requirements

## Effect of Milk Production Level and Pregnancy




K.C. Olson, 2005

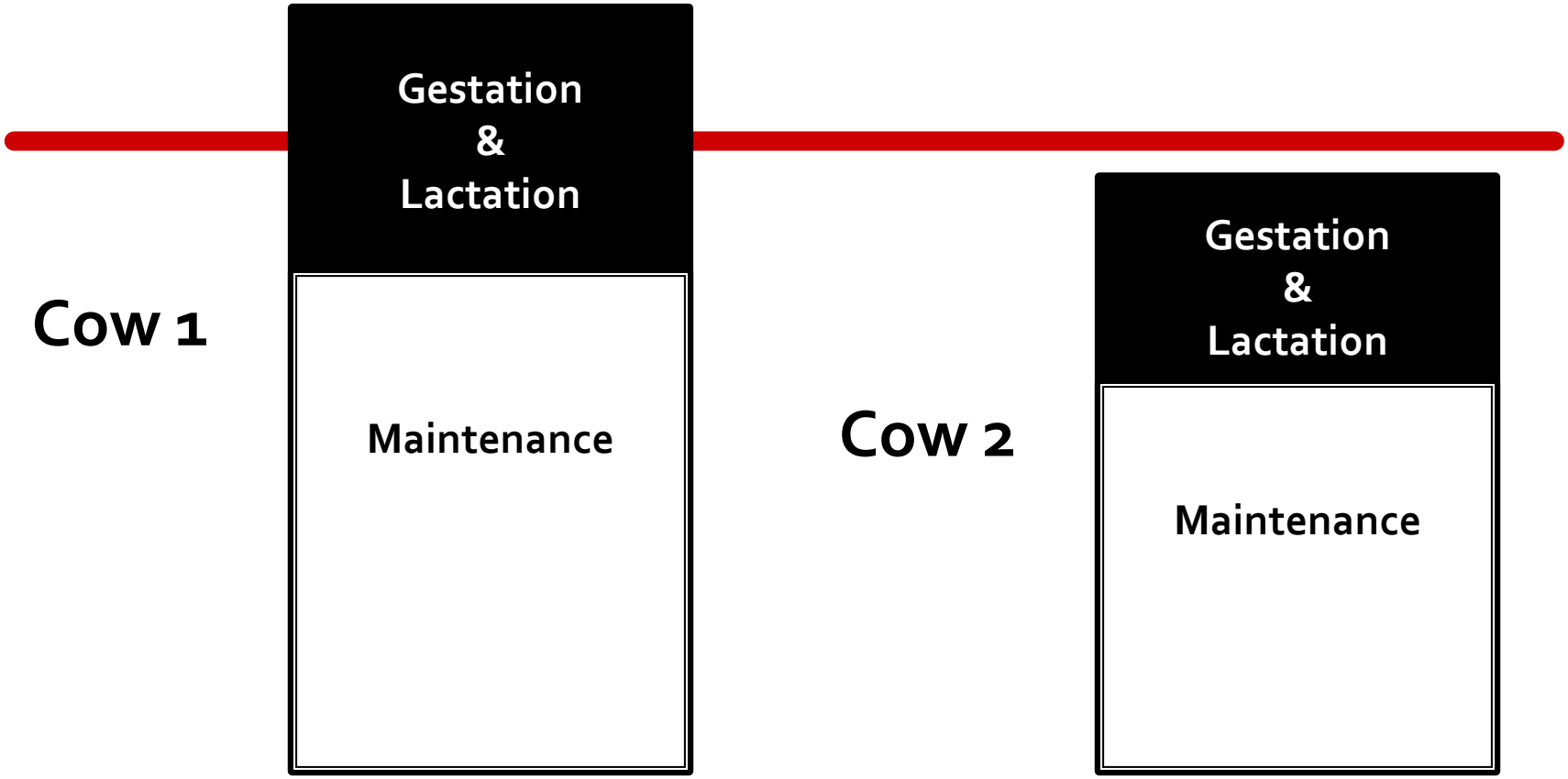
# Effect of Mature Weight and Milk Potential on ME Req'd




↑ 27% Wt.

↑ 16% Milk

# Improve Efficiency of Feed Utilization or Match Nutrient Demand to Environment?



# What to do? What to do?

A. Change environment to fit the cows?

B. Change the cows to fit the environment?

# Leveraging the Power of Heterosis

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# Heritability and Heterosis: Inversely Related

| Trait | Heritability | Heterosis |
|---|---|---|
| **Reproduction (fertility)** | Low | High |
| **Production (growth)** | Moderate | Moderate |
| **Product (carcass)** | High | Low |

# Heterosis Effects on Economically Relevant Traits

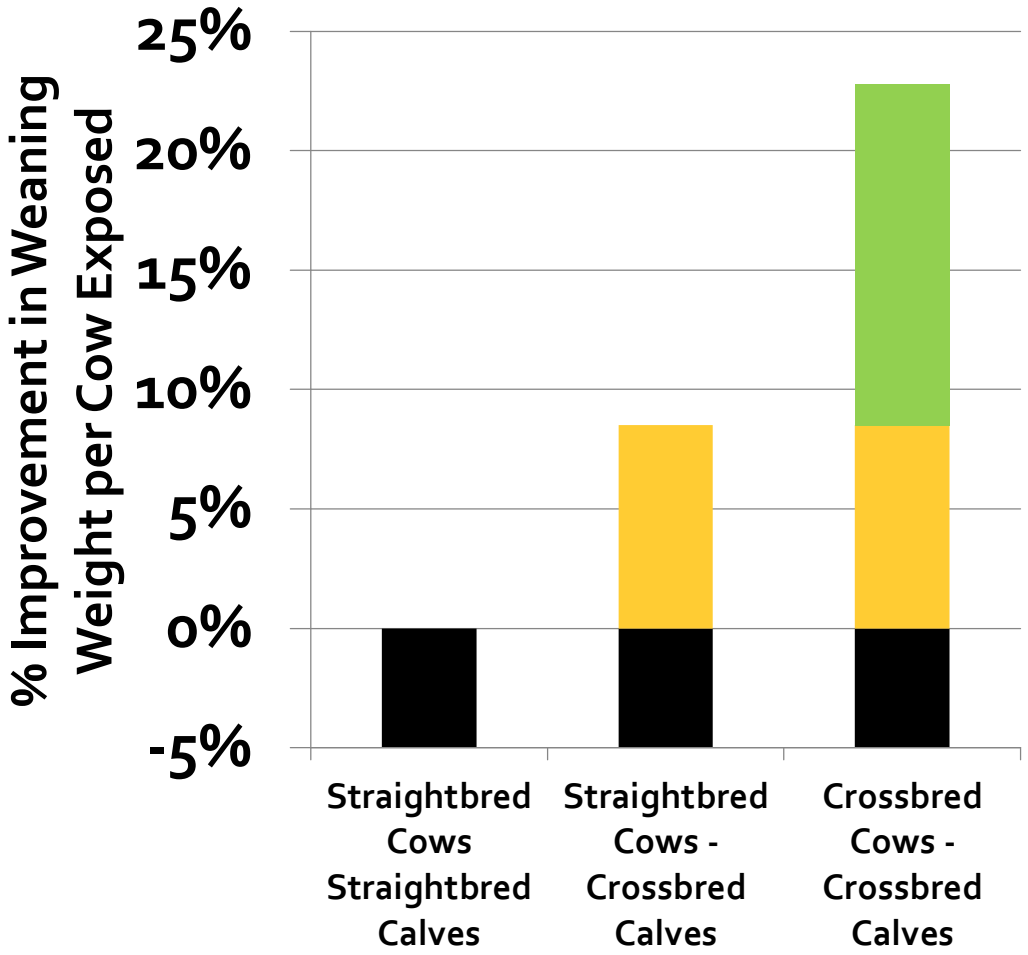
- Improves Calving Rate – 6% [a]
- Improves Calf Survival to Weaning – 4% [a]
- Improves WW -- 8% [a]
- Improves YW – 4% [a]
- Improves Carcass Traits – 0-2% [a]
- Significant improvement in traits with low $h^2$
- Improves Weaning Wt. Per Cow Exposed – 23% [b]
- Animal disease resistance: BRD and Pinkeye
- **PLUS:** Breed Complementarity

[a] Kress and Nelsen (1998)
[b] Gregory and Cundiff (1980)

# Benefits of Heterosis

- Heterosis increases production 20 to 25% per cow in *Bos taurus x Bos taurus* crosses; *50% in Bos indicus x Bos taurus* crosses in subtropical regions
- More than half of this effect is dependent on use of crossbred cows

Jenkins, MARC



# Impact on Profit

**Profit = Revenue - Costs**

Heterosis Impact

# The Dollars of Heterosis

*100 cows, 80% Weaning Rate, 575 avg. weaning weight, 10 year horizon*

Calf Survival to Weaning (6%) = 60 hd.
Weaning wt. (4%) = +19,780 lb.

Weaning wt. per cow exposed (23%) = **+105,800 lb.**

**…or the equivalent of 18 more 575 lb. calves/year**
**Heterosis is worth ~$250/cow/year**

*($2.50/lb for 5-6 cwt calves)*

**Decreases breakeven by $0.43/lb…straightbred would have to generate an additional $330 per head to be equivalent**

# Impact of Increased Reproductive Rate

- Increase % Calf Crop Weaned
- Increase revenue
  - Let's assume a 7% increase, 83-90%, 100 cows
  - 7 hd. of 500 lb calves, $145/cwt, grosses $5,075
  - Equivalent to increasing revenue by $61.44/hd
  - Decrease breakeven by $11.27/cwt
- No matter how you sell calves, pay wt. drives the bus (#head * avg. wt)

# Leveraging the Power of Breed Complementarity

*Match cows to environment, calves to market….*

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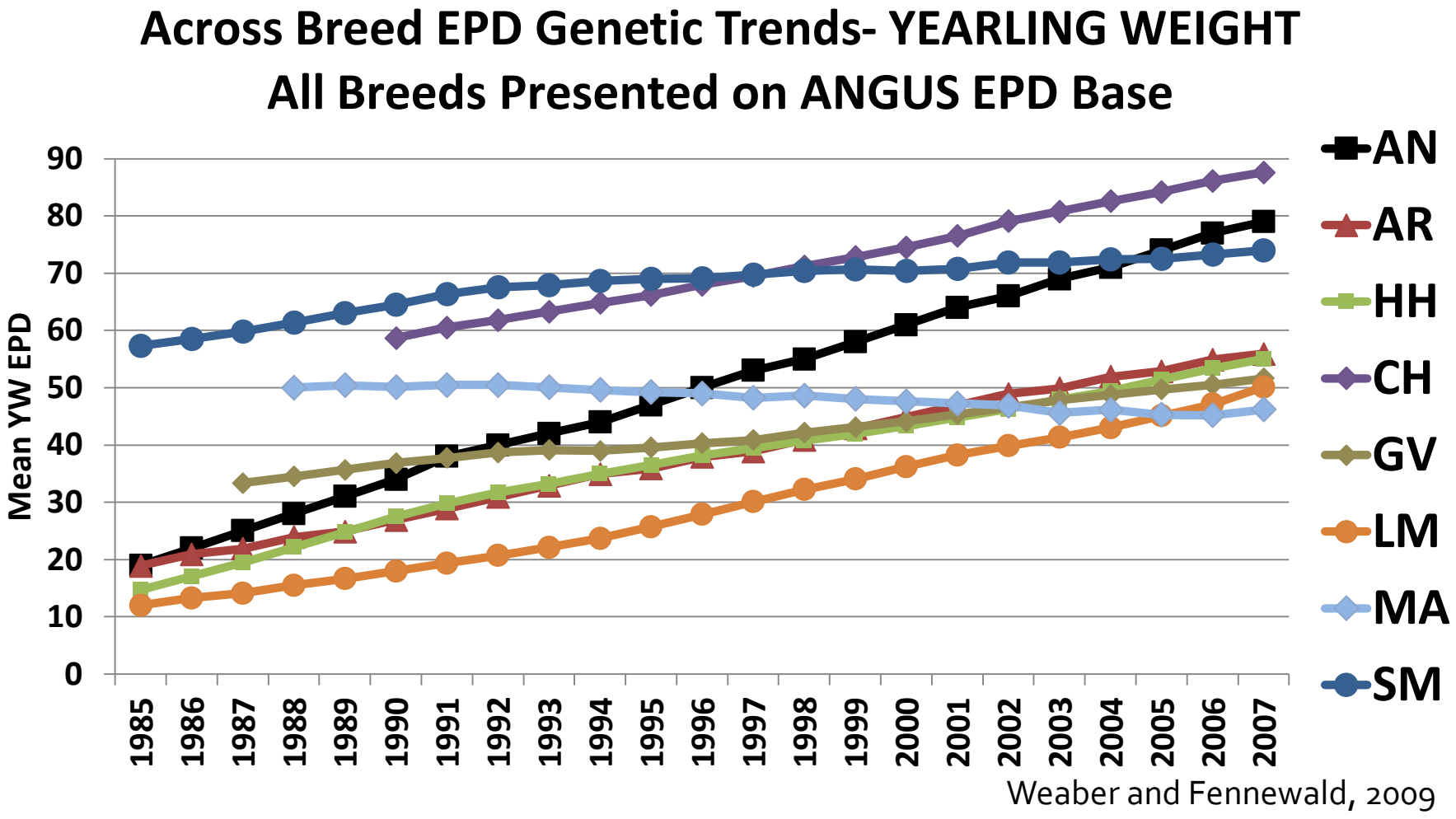
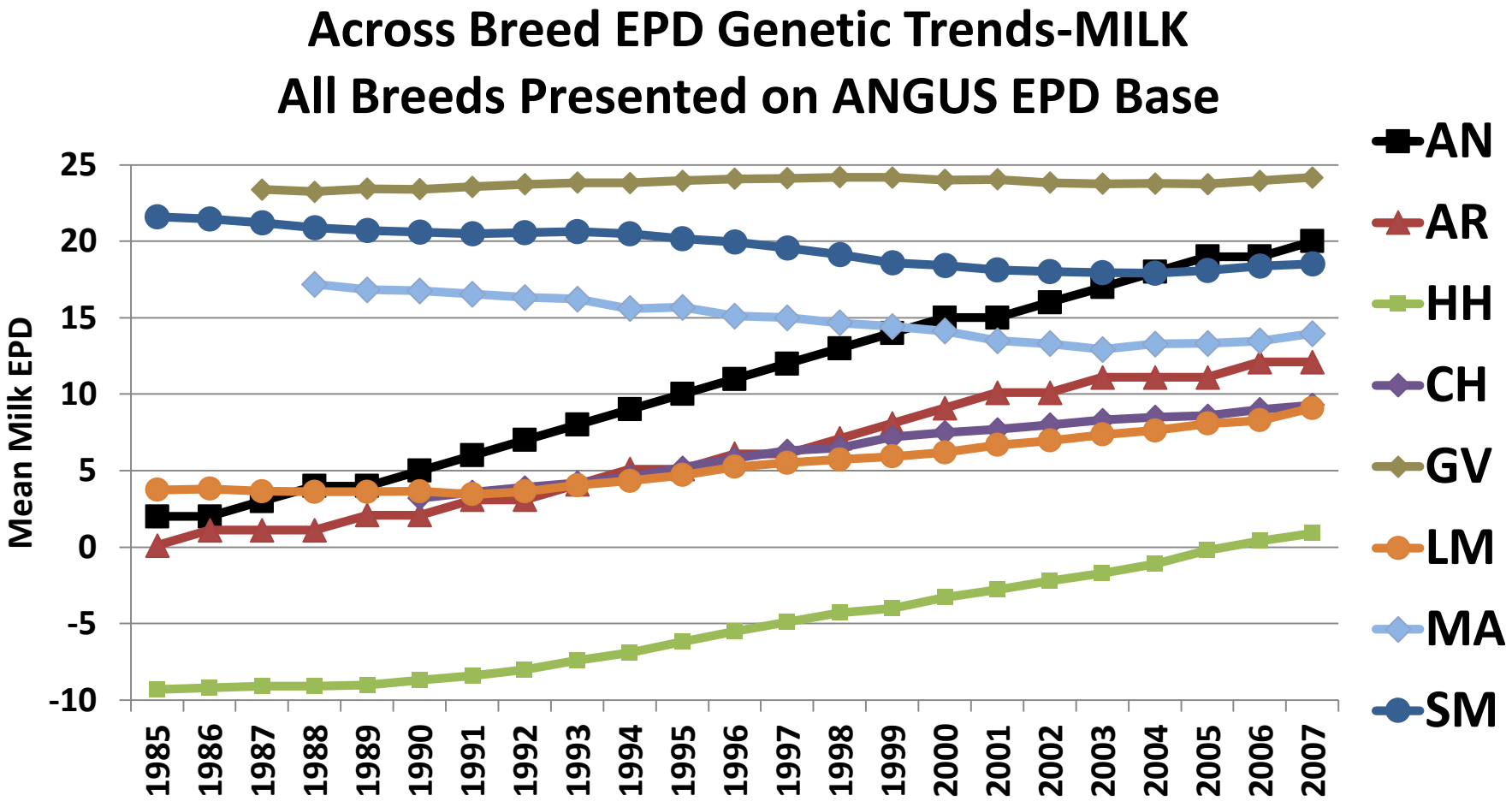
# YW EPD Genetic Trends




Weaber and Fennewald, 2009

# MILK EPD Genetic Trends




Weaber and Fennewald, 2009

# Different Mating Decisions

- Terminal
  - Target calves to marketplace
  - Select for traits that impact an endpoint where **YOU** generate **$$$**
- Maternal
  - Select service sire for proven cows to 'build' replacement heifers
  - Focus on traits that 'make' cows
- Increasing difficult to find bulls that do both

# Use Maternal Selection Tools to Build Better Cows

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# You get what you sow…

- If you use terminal traits and terminal indexes in selection, what do you get?
- **You get response in terminal traits!**

- If maternal traits are important to you, put pressure on maternal traits
  - Think 'optimization'
  - Traits: CE, CEM, DOC, HP, Stay (rebreeding), MW, ME, replacement indexes

# Replacement candidates that have a leg up…

- Born early in calving season
- From older dam with proven record of fertility
- By a proven sire with:
  - High stayability, heifer pregnancy, docility, calving ease and maternal calving ease EPDs
  - Moderate levels of lactation (MILK), growth
- From middle of calf crop for Adj. BW, WW
- Is a crossbred…exceptional value of maternal heterosis

# Tools to Select for Improved Maternal Performance

- Heifer Pregnancy EPD (potential gain: 8%)
- Rebreeding Rate EPD
- Stayability EPD (P(6|2), P(5|4), P(4|3), P(3|2)) (potential gain 9%)
- Index Selection
  - Effective weighting of the economic importance of sustained fertility and survival.
  - Balance trade offs between output traits and fitness traits
- Sexed semen from high acc 'cow bulls' for replacement production?
  - Separate maternal and paternal mating decisions to increase intensity

# How Valuable is the Improvement?

- Heifer Pregnancy
  - **Easy:** Heterosis: +7% FSCR, +5% HP (45 d)
  - **Difficult:** Selection: +8% (avg. vs top 1% HP RAAA)

- Longevity
  - **Easy:** Heterosis: +16% (~1.4 years)
  - **Difficult:** Selection: +9% (avg. vs top 1 % STAY ASA)
    - 9% fewer replacements-~$20,000 cost savings per 100 cows…that's $200 per cow/lifetime

# Conclusions:

- Do the easy, effective things first
  - Cow size/lactation/sire selection to fit prod. env.
  - Heterosis (esp. maternal)
  - Separate maternal/terminal sire selection decisions
- Longer term goals (but tactics implemented ASAP)
  - Sire selection for maternal traits
    - Daughter traits: fertility (HP, Rebreeding), longevity (Stayability), maintenance energy (ME)
    - Low heritabilities=slow progress but important

# Thank You!

# Questions?

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