Optimizing The Cow Herd Through Cow/Heifer Selection

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The Beef Geneticist's Dilemma…

- Seedstock production…all the tools all the time!
  - Genotype is what we build and sell
- Commercial production
  - Phenotype pays the bills
  - P=G+E
  - What's the role of 'E' proportionally?
  - What genetics technologies should we use?

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Replacement Female Genetic Improvement

- Most of improvement is not from selection of heifers per se.
  - Heritability of fertility/repro traits is low
  - Maternal trait heritability is low
  - In commercial herds little to no genetic predictions on candidates
- Sire selection contributes >87% of gene flow in herd over time…make it count!

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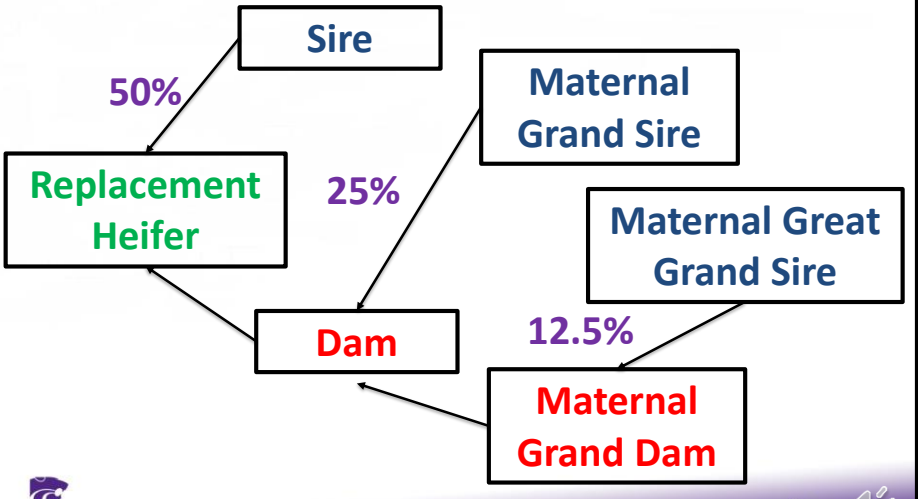
Influence of Sire Selection



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Genetic Selection for Replacements

- Leverage sire selection
- Select sires of replacements for traits of economic importance for maternal performance
  - Optimal growth, mature size, milk, etc.
  - Desirable levels of CED, **MCE**, HP, STAY, $EN, ME
- Breeding system-build and maintain optimal levels of maternal heterosis
- Build environmentally adapted cows; breed them to market targeted bulls

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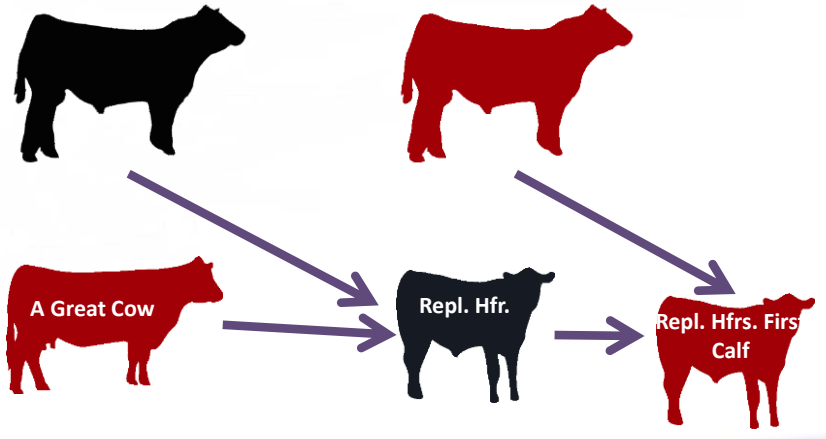
Building and Breeding Replacement Heifers



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One Bull to Do It All…

Antagonisms

Retained Heterosis

Breed Complementarity

Selection tools/trait focus

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Separate Maternal and Terminal Mating Decisions

More Flexibility

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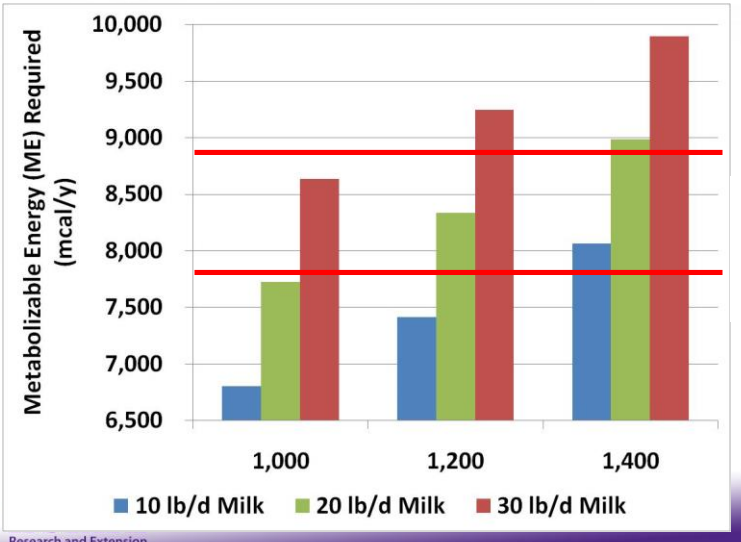
Effect of Mature Weight and Milk Potential on ME Req'd



↑ 27% Wt.

↑ 16% Milk

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Heritability and Heterosis: Inversely Related

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

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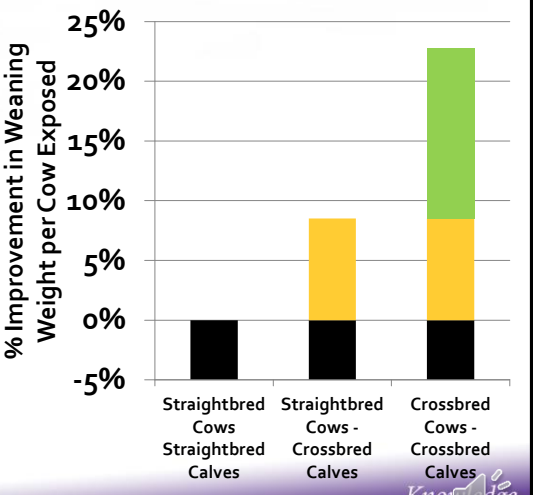
Benefits of Heterosis

- 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

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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)

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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

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What makes a heifer? What makes her SUCCESSFULL?

- Environmental Effects?
  - Age at breeding
  - When were they born in calving distribution
  - Body condition score at calving and breeding
- Genetic Effects
  - Heritability of traits important to maternal performance? LOW h^2 = 0.1-0.2
  - Heterosis (value ~$150/cow/year)

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Which heifers will be successful?

	Heifers own birth calving periods, 21 day intervals			P-Value
	1	2	3	
n (%)	651 (64)	304 (30)	64 (6)	
Birth date	77[a]	93[b]	113[c]	<0.01
Weaning Weight	482[a]	469[b]	433[c]	<0.03
Prebreeding Weight	651[a]	642[b]	607[c]	0.01
Cycling @ breeding, %	70[a]	58[b]	39[c]	<0.01
Pregnancy rate, %	90[a]	86[b]	78[c]	0.02
Pre-calving weight	944	946	920	0.06
Calved in 1st 21 days, %	81[a]	69[b]	65[b]	0.01
Calf weaning weight	425	416	409	0.10

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Funston et al., 2012

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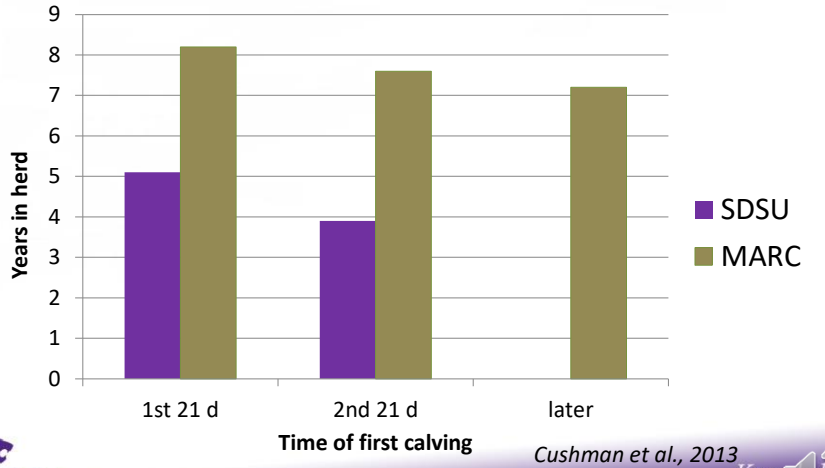
Longevity in herd based on calving date as heifer



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Cushman et al., 2013

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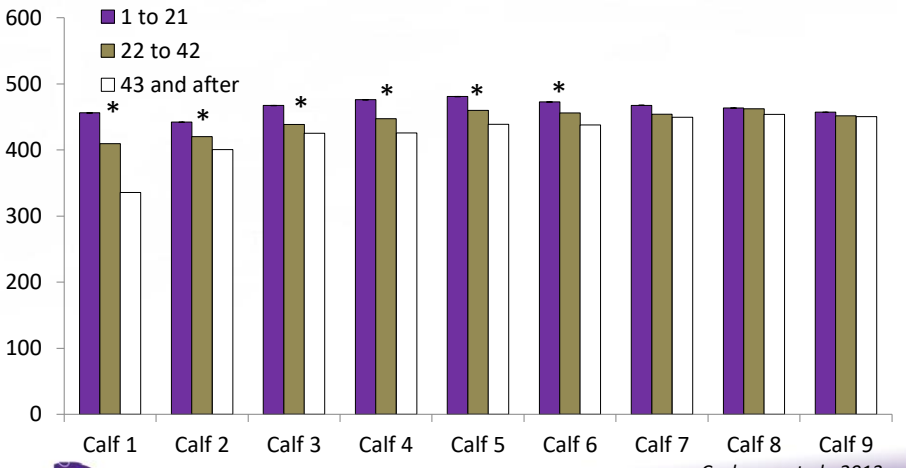
Effect of time of conception at first breeding on average weaning weight



Cushman et al., 2013

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Heifer Selection-SOP

- Select heifers born early in calving season (first 30 days) 50% or heifers
- Select heifers from the middle 50% for adjusted weaning weight to prevent run up in mature weight lactation.
- Half of half is a quarter. How many replacements do you need?
  - Many breeders will breed enough to replace ~20-25% of herd EACH YEAR.

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Use of Repro Technologies

- Estrus Sync and AI to breed early calved cows to high merit maternal sires
  - Gender sort semen to target female production
    - reduces proportion of the cows bred 'maternally' in herd
    - Increases cows mated to 'terminal' bulls-enhanced calf revenue
  - Easier implementation of crossbreeding system
- Genomics to confirm parentage of AI calves if necessary

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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

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Thank You!

Questions?

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