First must come the blinding realization that no one breed excels in all areas that lead to profitability

Crossbreeding: One of the Tools to Increase Profitability

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Matt–What Are the Benefits of Heterosis?

Heterosis

- Hybrid Vigor
- Superiority of a crossbred animal as compared to the **average** of its straightbred parents
- More divergent parental lines = more heterosis
- NOT available from within breed matings

Advantages of the crossbred calf

Trait	Observed Improvement	% Heterosis
Calving rate	3.2	4.4
Survival to weaning	1.4	1.9
Birth weight	1.7	2.4
Weaning weight	16.3	3.9
ADG	0.08	2.6
Yearling weight	29.1	3.8

Adapted from Cundiff and Gregory, 1999

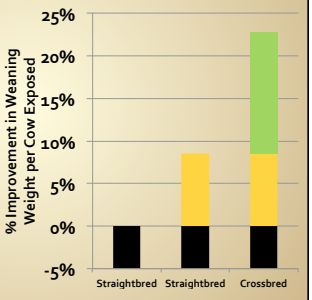
Advantages of the crossbred cow

Trait	Observed Improvement	% Heterosis
Longevity	1.36	16.2
Cow Lifetime Production:		
No. Calves	0.97	17.0
Cumulative Wean. Wt., lb.	600	25.3

Adapted from Cundiff and Gregory, 1999.

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

Bob–What Does this Mean in Terms of Economic Returns?

Relative Economic Weights for Integrated Beef Firm

Reproduction:Growth:End Product

2:1:1



(Melton, 1995)

Improvement of Herd Efficiency

- [Dam Weight*Lean Value of Dam + **No. Progeny***Progeny Weight*Lean Value of Progeny] - [Dam Feed*Value of Feed for Dam + **No. Progeny***Progeny Feed*Value of Feed for Progeny].
- By simply increasing number of progeny per dam through either selection, heterosis from crossing, or better management, we will increase efficiency of production.

Adapted from Dickerson 1970

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 ~$150/cow/year

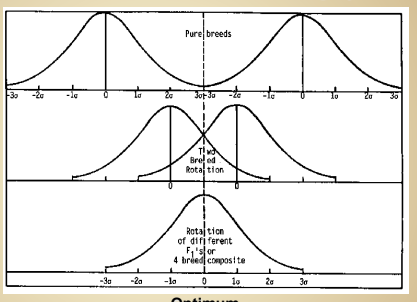
Crux of Straight-breeding

Do the benefits of selection for economically important/convenience traits within breed (straight-breeding) outweigh the improvement of lowly heritable traits via heterosis (especially maternal)?

Selection should be for **BOTH** additive and non-additive genetic merit.

Bob–Will I sacrifice Uniformity/ Marketability of Calves By Crossbreeding?

Genetic Variation in Alternative Mating Systems



Optimum

Assumes that the Two F_1's Used are of Similar Genetic Merit

Variation

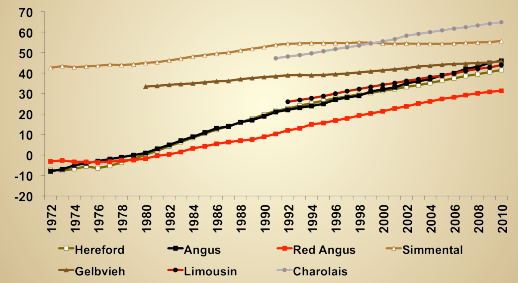
Trait	Purebreds	Composites
Birth weight	0.12	0.13
Wean weight	0.10	0.11
Carc. weight	0.08	0.09
Retail Product %	0.04	0.06
Marbling	0.27	0.29
Shear Force	0.22	0.21

Adapted from Gregory et al., 1999

So, Matt–Breeds Have Changed Overtime, Does Heterosis Still Exist?

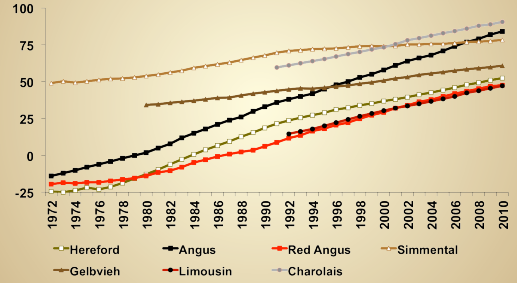
What About Complementarity?

Genetic Trends for Weaning Weight, lb



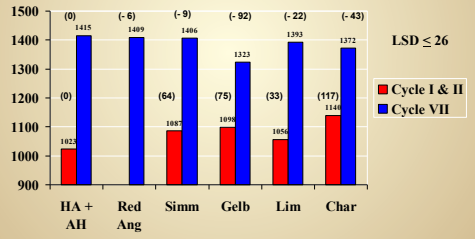
Adapted from Spring 2012 Genetic Trends from Breed Associations and 2012 AB-EPD factors (Kuehn and Thallman, 2012)

Genetic Trends for Yearling Weight, lb



Adapted from Spring 2012 Genetic Trends from Breed Associations and 2012 AB-EPD factors (Keuhn et al., 2012)

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



What about end-product traits?

- Highly heritable so little effect of heterosis
- Some breeds compliment each other very well
- "Combination of quality and yield grade"

Sire Breed	% YG 1&2	% Choice & Prime	YG 4	Standards
British (AN,AR,HF)	33.7	86.1	22.9	0.0
Continental (SM,GV,LM,CH)	69.8	57.6	3.3	0.3

Cundiff et al., 2004

Bob–How Do I Decide Which Breeding System Is Right For Me?

Crossing Systems Compared

	Advantage	Retained heterosis
A*B*C rotation	20	86
T*(A*B)	24	100
F1 Bulls		
A*BxA*B	12	50
A*BxA*C	16	67
A*BxC*D	19	83

Adapted from Ritchie et al., 1999 ; Gregory and Cundiff 1980.

How Do I Choose a Breeding Program

- Are you profit or premium focused?
  - Why not both?
- Herd size
  - Efficient bull utilization/manage variation in marketing groups
- How do I generate replacement heifers?
- How do I market calves?
- Constraints
  - Environment
  - Management

Is it worth the effort….

We think so…