COW–CALF Management School

GENETICS

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Genetic Strategies for Commercial Cattle Breeders

- Selection
  - Effectiveness a function of variation, heritability, and accuracy
  - Choice of breeds and individuals in matings to increase the frequency of desired genes
- Hybridization
  - Added vigor over expected from additive genetics
  - A function of mating diversity and heritability
- Complimentarity
  - Use of specialized genetics for particular function to overcome trait antagonisims or blend strengths of differing breeds

Trait Response to Breeding Strategies

	Selection	Heterosis	Complement
Fertility		High	
Calving Ease			High
Longevity		High	
Milk Production	High		
Maintenance			High
Growth Rate	High		
Carcass Merit	High		High

Variation

Breed-Cross Means for Marbling, Growth Rate & Mature Size, & Milk Production

Breed Group	Marbling*	Growth Rate & Mature Size**	Milk Production**
Jersey X	13.2	X	XXXXX
Her/Ang X	11.3	XX	XX
Charolais X	10.3	XXXXX	X
Maine Anjou X	10.1	XXXX	XXX
Simmental X	9.9	XXXXX	XXXX
Gelbvieh X	9.6	XXXX	XXXX
Limousin X	9.0	XXX	X
Chianina X	8.3	XXXXX	X

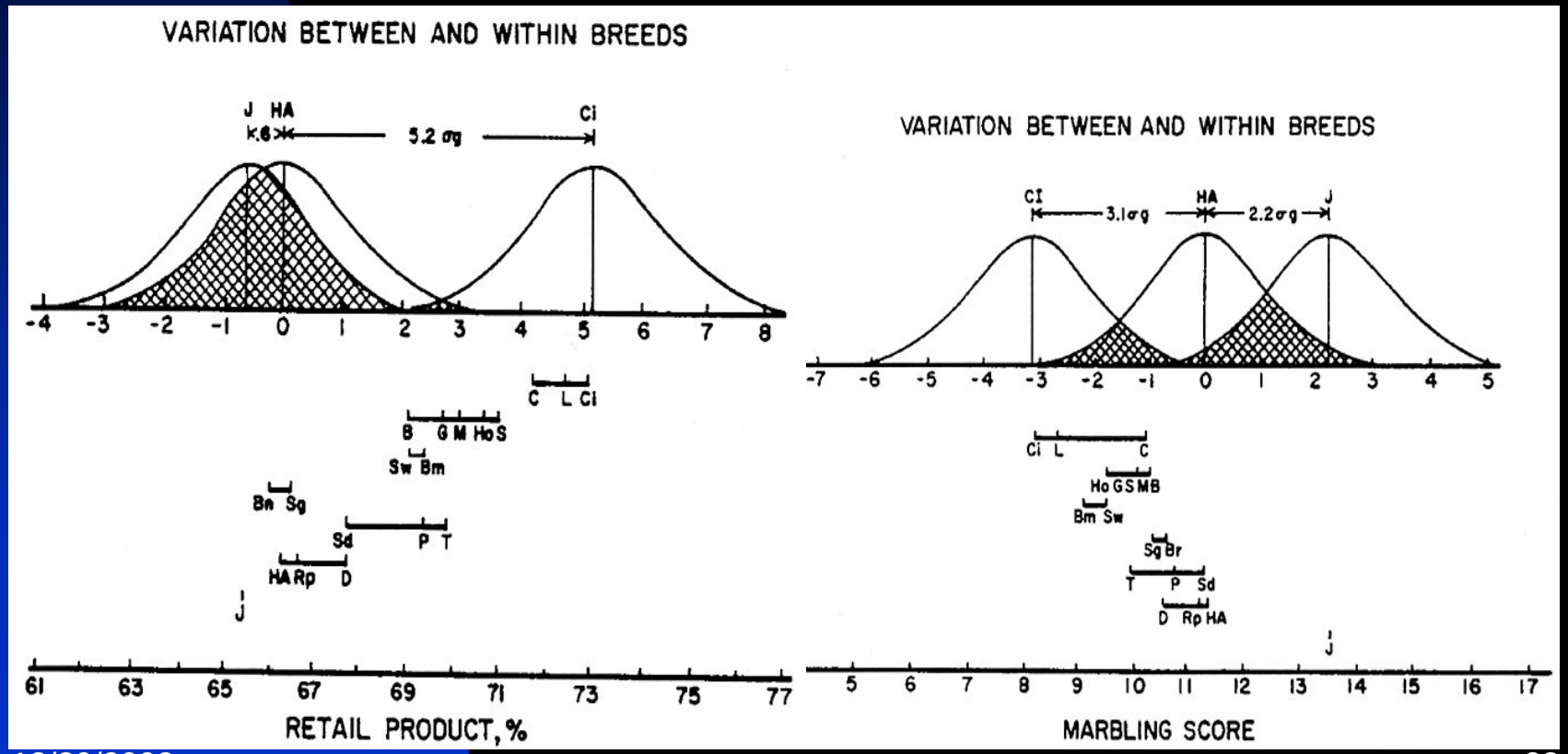
*Marbling: 8 = Slight, 11= Small, 14 = Modest

** Number of X's represent the magnitude of trait expression

Cundiff et at. MARC, 1998

Variation Between and Within Breeds

breed populations differ widely in traits of economic importance



Estimates of Heritabilty

- Calving interval .08
- Fertility .10
- Birth weight .45
- Weaning weight .24
- Feedlot gain .34
- Final weight .46
- Feed efficiency .45
- Weaning height .82
- Quality grade .50
- Yield grade .60
- Fat thickness .45

Genetic Correlations

some complimentary – some antagonistic

Calving Ease / Birth Weight		-.74
Birth Weight / Weaning Weight		+.50
Weaning Weight / Yearling Weight		+.81
Weaning Weight / Mature Weight		+.57
Yearling Weight / Feed Efficiency		-.60
Scrotal Circumference / Feed Eff		+.61
Marbling / Cutability		-.35
REA / Cutability		+.45

Antagonistic Traits

• Small cows with low feed needs	vs	• Heavy calves from high growth and milk
• Early puberty, good fleshing ability, and ability to store fat	vs	• Carcass leanness and efficient feedlot growth
• Carcass grading and percent choice	vs	• Carcass cutability and retail product yield

Dealing with Antagonisms

- “middle of the road”
  - Best compramise
- “curve benders”
  - Unique individuals
- “specialization”
  - Maternal and terminal differences

EPD –
Expected Progeny Difference

An expression of genetic merit of an animal in a numerical term used to estimate difference in progeny performance when compared to others

Genetic Evaluation - EPD

- History
- Characteristics
- Limitations
    - Breeding objective
    - Relevant traits
    - Multi-trait selection
    - Crossbreeding application
- Additional Traits
    - Production – growth, disposition
    - Reproduction - pregnancy, survival, longevity
    - Product – marbling, yield, tenderness
- Economic Indices
- Further Developments
    - Multi-breed evaluations, Genetic Markers, Web-based support

Select a bull to improve weaning weights

- Birth date – 2/10/01
- 9/25/01 wt - 745
- 205 adj wt – 684
- In herd ratio – 117
- WW EPD - +43

- Birth date – 2/17/99
- 10/01/99 wt - 880
- 205 adj wt – 822
- In herd ratio – 113
- WW EPD - +40

Features and Characteristics

- Calculated by breed associations annually, twice a year, or more frequently using pedigree and performance data bases
- Interim procedures used to estimate EPDs on individuals added to data base between analysis
- Incorporate information on the individual and relatives including ancestors, siblings, and progeny on trait and correlated traits
- Account for contemporary group through linkages in the data allowing for direct comparison across herds and years within breed

$$Y = Xb + ZdUd + ZmUm + ZpeUpe + e$$

- Multi trait reduced animal model solutions
- Fixed effects defined by sex, age, and contemporary group
- Random Genetic effects both direct and maternal
- Other Random effects as permanent environment and residual error

EPD implies a comparison

single EPD values have little meaning

- Individual to individual
  - Bull A WW EPD +36 Bull B WW EPD +43
    - Expected difference in WW of progeny 7lbs
- Individual to Breed Average
  - Avg WW EPD of sires +37
    - Bull A progeny expected to be –1lbs WW than Avg Sire
- Individual to Breed Distribution
  - 25 percentile for WW +43
    - Bull B ranks in the 25% of breed for WW EPD

Fall 2005 — Percentile Breakdowns

Current Sires | Current Dams | Non-Parent Bulls | Non-Parent Cows

Percentile Breakdown Current Sires*

	Production						Maternal					Carcass					Ultrasound		
Top Pct	CED	BW	WW	YW	YH	SC	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	%RP	IMF	RE	Fat
1%	+13	-2.4	+60	+107	+1.3	+1.62	+13	+32	+112	+2.0	+28.15	+35	+.68	+.64	-.056	+1.01	+.47	+.72	-.033
2%	+12	-1.7	+57	+102	+1.2	+1.43	+12	+30	+99	+1.7	+24.71	+30	+.58	+.58	-.049	+.91	+.41	+.63	-.029
3%	+11	-1.3	+56	+99	+1.1	+1.30	+11	+29	+92	+1.6	+22.85	+26	+.54	+.53	-.045	+.82	+.37	+.58	-.026
4%	+11	-1.0	+54	+97	+1.0	+1.24	+11	+29	+88	+1.4	+21.62	+24	+.50	+.49	-.040	+.78	+.34	+.55	-.024
5%	+11	-.8	+53	+95	+1.0	+1.17	+11	+28	+84	+1.4	+20.52	+23	+.48	+.45	-.038	+.72	+.32	+.52	-.022
10%	+9	-.1	+49	+89	+.8	+.97	+10	+26	+68	+1.1	+17.37	+18	+.40	+.38	-.029	+.55	+.24	+.42	-.017
15%	+8	+.5	+47	+85	+.7	+.84	+9	+25	+61	+1.0	+15.43	+15	+.33	+.33	-.022	+.46	+.20	+.36	-.013
20%	+8	+.8	+45	+82	+.7	+.74	+9	+24	+54	+.9	+14.00	+13	+.30	+.29	-.018	+.38	+.17	+.31	-.010
25%	+7	+1.1	+43	+80	+.6	+.65	+8	+23	+50	+.8	+12.84	+11	+.25	+.25	-.014	+.31	+.14	+.27	-.008
30%	+6	+1.4	+42	+77	+.6	+.57	+8	+22	+45	+.7	+11.89	+10	+.22	+.22	-.011	+.26	+.12	+.24	-.006
35%	+6	+1.7	+41	+75	+.5	+.50	+7	+21	+42	+.7	+10.96	+8	+.19	+.19	-.008	+.22	+.10	+.20	-.004
40%	+5	+1.9	+40	+73	+.5	+.44	+7	+20	+38	+.6	+10.08	+7	+.16	+.17	-.005	+.18	+.08	+.17	-.002
45%	+5	+2.2	+38	+72	+.4	+.37	+7	+19	+34	+.5	+9.25	+6	+.14	+.14	-.003	+.14	+.06	+.14	+0
50%	+4	+2.4	+37	+70	+.4	+.31	+6	+19	+31	+.5	+8.47	+4	+.12	+.13	+0	+.09	+.04	+.11	+.002
55%	+4	+2.6	+36	+68	+.4	+.25	+6	+18	+28	+.4	+7.63	+3	+.09	+.10	+.001	+.05	+.02	+.08	+.004
60%	+3	+2.9	+35	+66	+.3	+.19	+5	+17	+24	+.4	+6.75	+2	+.07	+.08	+.004	+0	+0	+.06	+.006
65%	+2	+3.1	+34	+64	+.3	+.13	+5	+16	+20	+.3	+5.96	+1	+.05	+.06	+.007	-.04	-.02	+.03	+.008
70%	+2	+3.4	+33	+62	+.2	+.06	+4	+15	+16	+.2	+5.10	+0	+.03	+.03	+.010	-.09	-.04	+0	+.010
75%	+1	+3.6	+31	+60	+.2	-.01	+4	+14	+12	+.2	+4.15	-1	+0	+0	+.014	-.14	-.06	-.04	+.012
80%	+0	+3.9	+30	+57	+.1	-.09	+3	+13	+7	+.1	+3.06	-3	-.03	-.02	+.018	-.20	-.08	-.07	+.015
85%	-1	+4.3	+28	+54	+.1	-.18	+2	+12	+2	+0	+1.86	-4	-.06	-.06	+.023	-.26	-.11	-.11	+.018
90%	-2	+4.8	+25	+49	+0	-.29	+1	+10	-5	-.1	+.31	-7	-.11	-.10	+.027	-.37	-.14	-.16	+.022
95%	-4	+5.5	+21	+42	-.1	-.47	+0	+8	-14	-.3	-1.91	-12	-.18	-.19	+.037	-.52	-.19	-.25	+.028
100%	-28	+16.3	-26	-42	-1.1	-1.58	-19	-17	-73	-1.2	-20.86	-36	-.65	-.61	+.086	-1.20	-.69	-.80	+.075
Total Animals																			
	21,770	21,784	21,981	21,981	7,806	10,913	21,770	21,981	2,208	2,208	21,992	1,622	1,622	1,622	1,622	1,622	13,943	13,943	13,943
Avg	**+4**	**+2.4**	**+37**	**+69**	**+.4**	**+.33**	**+6**	**+18**	**+32**	**+.5**	**+8.74**	**+5**	**+.13**	**+.13**	**+.000**	**+.09**	**+.05**	**+.12**	**+.002**

*Current Sires (at least one calf recorded in herd book within the past two years)

Website: http://www.angus.org/sireeval/brekdown.html

Change and Accuracy

- Will change with additional information with new analysis
- Will change with an adjustment to scaling or base definition
- Accuracy values are associated to reflect the reliability of an EPD based on the amount of information available for its calculation and reflect the extend of possible change in the future (range of Acc values 0-1)

Young non-parent animals have low EPD accuracies

- <.20 indicates EPD is primarily a pedigree estimate based information on parents
- .20 -.30 indicates EPD also includes the animal's own performance information
- >.30 indicates at least some progeny information, GRP/PRG designates number of progeny and number of herds
- <.40 unreliable but our best guess
- .60 -.80 make comparison with limited confidence
- >.80 compare with confidence

	Production						Maternal				Carcass					Ultrasound			
Accuracy	CED	BW	WW	YW	YH	SC	CEM	Milk	MW	MH	CW	Marb	RE	Fat	% RP	IMF	RE	Fat	% RP
.05	7.8	2.49	11.01	16.17	.41	.70	9.3	9.21	38	.62	15.42	.25	.27	.034	.53	.17	.31	.022	.37
.10	7.2	2.36	10.43	15.32	.39	.66	8.8	8.73	36	.58	14.61	.23	.26	.032	.51	.16	.30	.021	.35
.15	6.7	2.23	9.85	14.47	.37	.62	8.3	8.24	34	.55	13.80	.22	.25	.030	.48	.15	.28	.019	.33
.20	6.2	2.10	9.27	13.62	.35	.59	7.8	7.76	32	.52	12.99	.21	.23	.028	.45	.14	.26	.018	.31
.25	5.8	1.97	8.69	12.77	.32	.55	7.3	7.27	30	.49	12.17	.19	.22	.027	.42	.13	.25	.017	.29
.30	5.4	1.84	8.12	11.92	.30	.51	6.8	6.79	28	.45	11.36	.18	.20	.025	.39	.12	.23	.016	.27
.35	5.1	1.71	7.54	11.06	.28	.48	6.3	6.30	26	.42	10.55	.17	.19	.023	.36	.12	.21	.015	.25
.40	4.7	1.58	6.96	10.21	.26	.44	5.8	5.82	24	.39	9.74	.16	.17	.021	.34	.11	.20	.014	.23
.45	4.3	1.44	6.38	9.36	.24	.40	5.4	5.33	22	.36	8.93	.14	.16	.020	.31	.10	.18	.013	.21
.50	3.9	1.31	5.80	8.51	.22	.37	4.9	4.85	20	.32	8.12	.13	.14	.018	.28	.09	.17	.011	.20
.55	3.5	1.18	5.22	7.66	.19	.33	4.4	4.36	18	.29	7.30	.12	.13	.016	.25	.08	.15	.010	.18
.60	3.2	1.05	4.64	6.81	.17	.29	3.9	3.88	16	.26	6.49	.10	.12	.014	.22	.07	.13	.009	.16
.65	2.7	.92	4.06	5.96	.15	.26	3.4	3.39	14	.23	5.68	.09	.10	.012	.20	.06	.12	.008	.14
.70	2.4	.79	3.48	5.11	.13	.22	2.9	2.91	12	.19	4.87	.08	.09	.011	.17	.05	.10	.007	.12
.75	2.0	.66	2.90	4.26	.11	.18	2.4	2.42	10	.16	4.06	.06	.07	.009	.14	.04	.08	.006	.10
.80	1.6	.53	2.32	3.40	.09	.15	2.0	1.94	8	.13	3.25	.05	.06	.007	.11	.04	.07	.005	.08
.85	1.2	.39	1.74	2.55	.06	.11	1.5	1.45	6	.10	2.43	.04	.04	.005	.08	.03	.05	.003	.06
.90	.8	.26	1.16	1.70	.04	.07	1.0	.97	4	.06	1.62	.03	.03	.004	.06	.02	.03	.002	.04
.95	.4	.13	.58	.85	.02	.04	.5	.48	2	.03	.81	.01	.01	.002	.03	.01	.02	.001	.02

Website: http://www.angus.org/sireeval/accuracy.htm

Some Thoughts on the EPD Backlash

… there is no escaping that the use of EPDs, almost exclusively in some cases, has inevitably led to some problems. Producers are asking how much growth is enough? Its led them to focus on things that aren't measured by the most widely used EPD sets.

Troy Marshall

Angus Genetic Trend EPD by Birth Year																			
	Production						Maternal				Carcass					Ultrasound			
Year	CED	BW	WW	YW	YH	SC	CEM	Milk	MW	MH	CW	Marb	RE	Fat	% RP	IMF	RE	Fat	%RP
1972	+3	-2.0	-8	-14	+0	+.01	+0	+0	-3	-.1	-1	+.03	+0	+.001	-.01	-.09	-.05	-.003	+.07
1973	+3	-1.9	-7	-12	+0	+0	+0	+0	-2	-.1	+1	+.01	+.03	-.002	+.02	-.09	-.05	-.003	+.06
1974	+3	-1.8	-6	-10	+0	+0	+0	+0	-2	-.1	-1	+.02	-.01	+0	-.01	-.09	-.05	-.003	+.06
1975	+2	-1.7	-4	-8	+0	+0	+0	+0	-1	+0	-2	+.02	-.03	+0	-.01	-.09	-.05	-.003	+.06
1976	+2	-1.5	-3	-6	+0	+0	+0	+0	-1	+0	+0	+.01	+0	+.001	-.02	-.09	-.05	-.003	+.06
1977	+2	-1.3	-2	-4	+0	+0	+0	+0	-1	+0	+0	+.02	+0	-.002	+0	-.09	-.05	-.003	+.06
1978	+1	-1.1	-1	-2	+0	+0	+0	+0	-1	+0	-2	+.05	-.04	+.003	-.07	-.09	-.05	-.003	+.06
1979	+1	-.9	+0	+0	+0	+0	+0	+0	+0	+0	+0	+0	+0	+0	+0	-.09	-.05	-.003	+.06
1980	+1	-.7	+1	+2	+0	+0	+0	+0	+1	+0	+0	+.03	-.01	+.003	-.05	-.09	-.06	-.003	+.06
1981	+0	-.4	+3	+5	+.1	+.01	+0	+0	+4	+.1	+1	+.02	+.02	+0	+.01	-.09	-.06	-.003	+.06
1982	+0	+0	+5	+9	+.1	+.01	+0	+0	+5	+.1	+0	+.04	+.01	+.002	-.01	-.09	-.06	-.003	+.06
1983	+0	+.4	+7	+12	+.2	+.01	+0	+1	+9	+.2	+0	+.04	+.02	-.003	+.05	-.08	-.06	-.003	+.05
1984	-1	+.8	+10	+16	+.2	+.01	+0	+1	+11	+.3	+0	+.03	+.01	-.002	+.03	-.09	-.07	-.004	+.06
1985	-1	+1.2	+11	+19	+.3	+0	+0	+2	+15	+.4	+0	+.03	+.03	-.001	+.03	-.08	-.07	-.005	+.06
1986	-1	+1.5	+13	+22	+.3	+.01	+0	+2	+17	+.4	+0	+.04	+.03	-.001	+.04	-.08	-.07	-.005	+.06
1987	-2	+1.9	+15	+25	+.4	+.01	+1	+3	+20	+.5	+0	+.04	+.04	-.003	+.06	-.09	-.06	-.005	+.06
1988	-2	+2.1	+17	+28	+.4	+.03	+1	+4	+23	+.5	+1	+.04	+.05	+0	+.05	-.08	-.06	-.005	+.06
1989	-1	+2.3	+18	+31	+.5	+.03	+1	+5	+26	+.5	+0	+.06	+.04	+.001	+.03	-.07	-.05	-.005	+.05
1990	-1	+2.5	+20	+34	+.5	+.05	+2	+6	+29	+.6	+1	+.06	+.06	-.001	+.06	-.07	-.05	-.005	+.05
1991	-1	+2.6	+21	+37	+.5	+.06	+2	+7	+30	+.6	+2	+.07	+.06	-.001	+.06	-.06	-.06	-.005	+.03
1992	-1	+2.6	+23	+40	+.5	+.08	+2	+8	+30	+.6	+1	+.07	+.07	-.002	+.08	-.05	-.05	-.005	+.03
1993	+0	+2.6	+24	+42	+.5	+.08	+3	+9	+29	+.6	+3	+.06	+.08	+.003	+.02	-.04	-.05	-.004	+.02
1994	+0	+2.5	+25	+44	+.5	+.09	+3	+10	+30	+.6	+3	+.09	+.08	+.001	+.05	-.03	-.04	-.003	+.01
1995	+0	+2.5	+26	+47	+.4	+.10	+3	+11	+29	+.5	+3	+.10	+.08	+.002	+.04	-.02	-.03	-.001	+0
1996	+0	+2.5	+27	+50	+.4	+.11	+4	+12	+30	+.5	+4	+.11	+.11	+.001	+.07	-.01	-.01	-.001	+.01
1997	+1	+2.5	+29	+52	+.4	+.14	+4	+13	+30	+.5	+4	+.11	+.12	+0	+.07	+0	+0	+0	+0
1998	+1	+2.4	+30	+55	+.4	+.18	+4	+14	+31	+.5	+5	+.15	+.15	-.001	+.12	+0	+0	+0	-.01
1999	+2	+2.5	+31	+58	+.4	+.23	+5	+14	+31	+.5	+5	+.18	+.17	-.002	+.14	+.01	+.02	+0	+0
2000	+2	+2.5	+33	+60	+.4	+.26	+5	+15	+31	+.5	+4	+.19	+.18	-.003	+.18	+.02	+.04	+.001	+.01
2001	+2	+2.5	+34	+63	+.4	+.26	+5	+16	+32	+.5	+6	+.21	+.20	-.005	+.20	+.05	+.08	+.002	+.03
2002	+3	+2.4	+35	+66	+.4	+.30	+5	+17	+32	+.5						+.07	+.11	+.002	+.05
2003	+3	+2.4	+36	+68	+.4	+.29	+5	+18								+.10	+.16	+.003	+.09
2004	+3	+2.3	+38	+71	+.4	+.34	+6	+19								+.10	+.19	+.004	+.09

Economically Relevant vs Indicator Traits

- ERTs
  - Calving Ease
  - Weaning Weight
  - Pregnancy Rate
  - Stayability
  - Marbling
- Indicator Traits
  - Birth Weight
  - Gestation Length
  - Scrotal circumference
  - Hip Height
  - Milk

Select a bull to increase weaning weight sold

- WW EPD - 0

- WW EPD - +30

Influence of example EPDs on a number of ERTs on sale weight at weaning from 1000 cow herd

	EPD				Performance		
Bull	WW	Stay	HPG	CED	Wean Wt	# Sold	Extra Wt/cow
A	0	0	0	0	451	744	
B	+30	0	0	0	481	744	22
C	+30	+8	0	0	482	759	30
D	+30	+8	+12	0	482	765	33
E	+30	+8	+12	+11	482	766	34

Multi-trait selection when many traits contribute to profit

- Independent Culling Levels
  - Sire sort
- Economic Selection Index
  - Generalized Indexes
  - Customized Indexes

Sign Up To Be Notified When New Sire Evaluation Information Is Released.

Select the radio button next to desired epd trait to sort by that trait.
Click here for **instructions.**

List to Search Main Supp	**Who qualifies?**			
Selection Trait Asc Desc	Valid Range	Minimum	Maximum	Mininum Accuracy .00 to .99
Production				
Calving Ease Direct	-33 to 17			
Birth Weight	-5.6 to 16.3			
Weaning Direct	-20 to 83			
Yearling Weight	-19 to 136			
Yearling Height	-1.1 to 2.0			
Scrotal Circum.	-1.58 to 2.52			
Maternal				
Calving Ease Maternal	-19 to 17			
Milk	-16 to 44			
Mature Weight	-56 to 137			
Mature Height	-1.0 to 2.6			
Cow Energy ($EN)	-20.86 to 42.21			
Carcass				
Carcass Weight	-31 to 53			
Marbling	-.65 to .88			
Ribeye Area	-.61 to .82			
Fat	-.112 to .086			
% Retail Product	-1.16 to 1.51			
Ultrasound				
Intramuscular Fat	-.57 to .98			
Ribeye Area	-.80 to 1.17			

Website: http://www.angus.org/sireeval/se_epd_search.cfm

I = V1ERT1+V2ERT2+……..VnERTn

- I = Index value relating to selection objective
- V = economic weighting (linear vs non-linear)
- ERT = relevant trait
- 1 to n = array of included traits
- Objective = goal of selection
  productivity, profit, economic merit, ….

Across Breed Comparisons

- Angus Bull
- Breed YW EPD +65
- AB YW EPD +65
  - (65+0) = 65

- Simmental Bull
- Breed YW EPD +58
- AB YW EPD +80
  - (58+22) = 80

Table 1. Adjustment Factors to Estimate across-breed EPDs.

Breed	Birth Wt	Weaning Wt	Yearling Wt	Milk
Angus	0.0	0.0	0.0	0.0
Hereford	2.9	- 1.8	- 14.2	- 18.8
Red Angus	3.1	- 1.0	0.7	- 6.8
Shorthorn	7.3	32.0	44.7	12.9
South Devon	6.2	21.9	41.0	4.5
Brahman	12.5	35.6	- 4.9	24.9
Limousin	4.0	1.8	- 20.8	- 16.2
Simmental	5.9	22.8	21.8	10.1
Charolais	10.0	38.8	53.2	1.8
Gelbvieh	4.7	6.3	- 22.3	2.4
Maine Anjou	6.3	- 5.3	- 41.7	- 9.4
Salers	4.2	29.0	42.3	9.9
Tarentaise	3.1	30.6	13.1	18.3
Braunvieh	6.0	30.2	12.8	22.4
Brangus	5.1	19.6	19.9	- 3.6
Beefmaster	9.2	39.5	37.5	- 4.6

(Van Vleck and Cundiff, 2005 BIF Proceedings, Billings, MT)

Website:http://www.angus.org/sireeval/Across_breed_adj_factor.html

Crossbreeding Complications

Sire Breed			**Offspring Performance by Cow Breed**			
	EPD	ABC	Ang	Sim	Her	Ang-Sim
Ang	65	65	850	863	873	857
Simm	58	80	878	865	878	872

We are overwhelmed with data and lacking information

Some breeds now publish over 20 EPDs on individual animals

Corona

AMERICAN ANGUS SIRE SUMMARY FALL 2005

TRAIT	CED	BW	WW	YW	YH	SC	CEM	MILK	Hd/Dts	MW	MH	$EN
EPD	+7	+2.2	+49	+94	+0.7	+.59	+8	+28	0	+62	+0.8	-5.01
ACC	.39	.60	.58	.56	.40	.38	.19	.26	0	.05	.05	

TRAIT	CW	MARB	REA	FAT	%RP	Grp/Pg
EPD	+4	+.37	+.21	-.004	+.22	0
ACC	.05	.05	.05	.05	.05	0

TRAIT	IMF	uRE	uFAT	u%RP	Grp/Pg
EPD	+.71	+.78	-.001	+.73	5
ACC	.56	.57	.57	.57	25

	$W	$F	$G	$B
INDEXES	+25.28	+34.22	+32.81	+58.81

Individual Performance		
BW	72	
205	661	100 ratio
365	1,242	105 ratio
SC	40.71	12 Mo.
YFS/FS	6.2	
Weight	N/A	
Height	51.5	12 Mo
Born: 1/4/02		

Angus

- Mature Weight (MW)
- Mature Height (MH)
- Ultrasound Ribeye Area (uRE)
  - Square inches based on ultrasond data
- Cow Energy ($EN)
  - Dollars per year per cow feed savings of daughters based requirements estimated from mature weight and milk production
- Weaned Calf Value ($W)
  - Bio-economic value expressed in $ per head in future progeny preweaning performance
  - Assumptions $105 calf price, $.055 feed cost, 1300 lb cow, 80/20 cow and heifer mix

Angus

- Feedlot Value ($F)
  - Expressed in $ per head relating to differences in returns of progeny in feedlot incorporating feedlot gain, feed costs, and cattle prices
  - Assumptions 160 days on feed, $150/t feed, $78 per cwt.
- Grid Value ($G)
  - Expressed in $ per head relating to differences in carcass value attributable to grade and yield premiums and discounts
  - Three year industry average grid values assumed
- Beef Value ($B)
  - Expressed as $ per head due to combination of feedlot performance and carcass value

767G

NORTH AMERICAN CATTLE EVALUATION FALL 2005

TRAIT	CED	BW	WW	YW	MILK	M&G	CETM	SC
EPD	+9.8	-1.4	+34	+70	+40	+57	+4.4	+0.8
ACC	.63	.91	.87	.86	.75		.53	.72

TRAIT	FAT	REA	IMF
EPD	+0.012	-0.09	+0.13
ACC	.81	.79	.79

	BMI	CEZ	BII	CHB
INDEXES	15	23	11	19

Calving Ease: ★ ★ ★ ★

Carcass Merit:

Individual Performance		
BW	84	
205	694	N/A ratio
365	1,310	N/A ratio
SC	45	Mature
YFS/FS	N/A	
Weight	2,520	Mature
Height	58.25	Mature
Born: 1/19/97		

Hereford

- Intra muscular fat (IMF)
  - Ultrasound scan estimated, percentage REA fat (slight =3.83, small = 5.04, modest = 6.72)
- Indexes
  - Baldy Maternal Index (BMI)
    - Net return when Her bull used in rotational crossing with Angus and calves sold at finish through CHB grid
  - Calving Ease Index (CEZ)
    - Net return when sires mated to heifers
  - Brahman Influence Index (BMI)
    - Net return when Her bull used in rotational crossing with Brahman
  - Certified Hereford Index(CHB)
    - Net return when Her bull used as terminal sire on British breed cows and calves fed out and sold on CHB grid

Romeo

ANGUS SIRE SUMMARY FALL 2005

TRAIT	BW	WW	YW	MILK	TM	ME	CED	HPG	CETM	STAY
EPD	-1.8	+33	+66	+16	+33	+0	+12	+13	+8	+16
ACC	.92	.87	.84	.34		.58	.60	.48	.35	.34

TRAIT	MARB	REA	FAT
EPD	+.11	+.09	+.00
ACC	.55	.51	.32

Calving Ease: ★ ★ ★

Carcass Merit:

Individual Performance		
BW	74	
205	667	112 ratio
365	1,312	122 ratio
SC	40	12 Months
YFS/FS	N/A	
Weight	1,536	21 Months
Height	54	21 Months
Born: 3/2/01		

Red Angus

- Stayability (STAY)
  - Percentage of daughters remaining in the herd at six years of age
- Heifer Pregnancy (HPG)
  - Probability yearling heifer will concieve
- Mature Cow Maintenance Energy (ME)
  - Mcal/month based on mature weight and milk production (hay = .86 Mcal)
- Marbling (MRB)
  - Units of marbling score (slight =4-4.9, small = 5-5.9,modest 6-6.9)


Calving Ease Direct
• Percent difference of calves unassisted at birth
CED

Stayability

Stay

- Percent difference of daughters staying in a herd until six years of age

Heifer Pregnancy *HPG*

- Percent difference of daughters conceiving


Marbling
• Abbreviation: MARB
• Units: marbling score
• Min/Avg/Max: -0.48/0.04/0.70

Macho

AMERICAN SIMMENTAL SIRE SUMMARY FALL 2005

TRAIT	CED	BW	WW	YW	MCE	MILK	MWW	DWT	DHT
EPD	+8.0	+2.7	+50.7	+88.7	+1.3	-0.5	+24.8	+11.0	-0.01
ACC	.26	.71	.60	.51	.18	.27	.28	.10	.08

TRAIT	CW	YG	MARB	BF	REA
EPD	-17.3	-.01	-.01	+.01	-.14
ACC	.25	.25	.22	.29	.22

Calving Ease: ★ ★

Individual Performance		
BW	96	
205	787	125 ratio
365	1,356	111 ratio
SC	41	12 Mo
YFS/FS	6.8	
Weight	1,240	12 Mo
Height	56.5	20 Mo
Born: 4/17/02		

Simmental

- Yield Grade (YG)
  - Units of USDA yield grade
- Warner-Bratzler Shear Force (WBSF)
  - Pounds of force to shear steak
- All-Purpose Index (API)
  - net dollars returned per cow exposed
  - Bred to both heifers and cows
  - Portion of daughters retained for replacement
  - Remaining progeny finished and sold grade and yield
- Terminal Index (TI)
  - Net dollars returned per cow exposed
  - Bred to mature Angus cows
  - All offspring placed in feedlot and sold grade and yield

Moderator

AMERICAN GELBVIEH ANIMAL EVALUATION FALL 2005

TRAIT	CE	BW	WW	YW	MILK	TM	GEST	CED	SC	STAY
EPD	+,116	-4.8	+27	+71	+27	+41	-3.6	+,101	-0.4	-1
ACC	.60	.81	.71	.48	.22		.74	.22	.43	I

TRAIT	CW	REA	MARB	FAT	GM	FM
EPD	-1	-.04	+.06	+.01	+14.78	+23.31
ACC	.39	.39	.36	.36		

Calving Ease: ★ ★ ★ ★

Individual Performance		
BW	69	
205	729	103 ratio
365	1,276	107 ratio
SC	34.5	12 Months
YFS/FS	6.2	
Weight	1,445	19 Months
Height	54	14 Months
Born: 2/19/99		

Gelbvieh

- Grid Merit (GM)
  - $ per head carcass value
- Feedlot Merit (FM)
  - $ per head due to feedlot performance
- Gestation Length (GEST)
  - Days of gestation

Wind Star

TRAIT	BW	WW	YW	MILK	TM	SC	CW	REA	FAT	MARB
EPD	+1.9	+23	+27	+6	+18	+0.4	-4	-.02	+.007	+.21
ACC	.90	.83	.80	.68		.55	.46	.52	.46	.50

Calving Ease: ★ ★

Carcass Merit:

Individual Performance		
BW	92	
205	887	124 ratio
365	1,301	115 ratio
SC	40	Adj. 365
YFS/FS	N/A	
Weight	N/A	
Height	N/A	
Born: 3/14/96		

Charolais

- Terminal Sire Profitability Index (TSPI)
  - Net return per progeny finished and marketed on carcass value
  - Web based custom index
  - Utilizes economic and management descriptions of individual operations

Animal Traits	Default Values
Cow Size, lbs	1200
Weaning Weight	550
Backgrounding Phase ADG	2.05
Length of background phase, days	104
Growing Phase ADG	3.86
Length of growing phase, days	69
Finishing Phase ADG	2.75
Length of finishing phase, days	47
Marbling Score	5.5
USDA Yield Grade	2.5

Live Pricing		
Cull Cows, $/cwt	43.40	
Weight Range, lbs	**Weaning Price $/lb**	**Backgrounding Price $/lb**
Less than 350	1.02	
351-400	0.98	
401-450	0.96	0.85
451-500	0.95	0.95
501-550	0.89	0.89
551-600	0.88	0.88
601-650	0.80	0.83
651-700		0.83
701-750		0.81
751-800		0.79
801-850		0.75

Carcass Pricing				
Base Price, $/CWT	104			
	Weight	**Discount, $/cwt**		
Light Carcass	550	-19.90		
Heavy Carcass	950	-16.80		
Quality Grade	**Premium/Discount, $/cwt**		**Yield Grade**	
Prime	6.50	Yield Grade 1	3.1	
High Choice	1.30	Yield Grade 2	2.00	
Choice	0.00	Yield Grade 3	-1.00	
Select	-6.20	Yield Grade 4	-14.50	
Standard	-17.00	Yield Grade 5	-19.50	

Number of bulls to view: 10 50 100 200

Crown'n 7

GENETIC EVALUATION FALL 2005

TRAIT	CED	BW	WW	YW	MILK	CEM	SC	DOC
EPD	+8	+3.6	+51	+100	+18	+8	+0.0	-19
ACC	.41	.83	.72	.55	.21	.31	.46	.24

TRAIT	CW	REA	YG	MARB
EPD	+43	+.18	+.01	-.03
ACC	.47	.42	.42	.42

Calving Ease: ★ ★

Carcass Merit:

Individual Performance		
BW	90	
205	839	118 ratio
365	1,246	N/A
SC	N/A	
YFS/FS	N/A	
Weight	1,830	27 Mo
Height	57.5	20 Mo
Born: 2/21/01		

Limousin

- Docility (DOC)
  - Units of docility score
- Mainstream Terminal Index

National Beef Cattle Evaluation Consortium (NBCEC) is currently working on a multibreed analysis

- Analyses will produce EPDs for all breeds that are comparable on the same base
- 14 breed associations are participating
- EPDs will be produced for mixed breed composites
- Complex still in accounting for and adjusting for heterosis

Stabilizer 4199B

✔ The Leachman Stabilizers are a 50/50 British/continental composite

ACROSS BREED EPDS (ANGUS BASE)FALL 2001

TRAIT	BW	WW	YW	MILK	TM
EPD	+5.6	+44.0	+86.0	+25.0	+47.0
ACC	P	P+	P+	P	

Calving Ease: ★ ★

Individual Performance		
BW	N/A	
205	730	121 ratio
365	1,305	125 ratio
SC	44.5	Mature
YFS/FS	7	
Weight	2,320	Mature
Height	58.5	Mature
Born: 2/16/92		

Direct Draft

Individual Performance		
BW	96	
205	713	100 ratio
365	1,340	115 ratio
SC	N/A	
YFS/FS	N/A	
Weight	N/A	
Height	N/A	
Born: 2/20/01		

NBCEC is developing a web-based decision support tool at http://ert.agsci.colostate.edu

- Customized to producers situation, ie. Nutritional and financial implications
- Direct comparison of animals across breeds and accounting for heterosis in breeding systems
- More accurate interpretation of threshold traits as stayability, calving ease, and pregnancy
- Accounts for interactions between traits and risk associated with low accuracy bulls

Formulating and Using EPDs to Improve Feed Efficiency

- Feed requirements are a major component of stocking rate and finishing cost
- Common measure is feed per unit of gain
- Observed feed intake measures are difficult to obtain
- Calan gate, Pinpointer, and GrowSafe technologies limit number of animals
- Feed requirements can be predicted on basis of maintenance, growth rate, composition of gain, pregnancy, and lactation
- RFI measures difference between expected and known feed intake
- RFI is not correlated with ADG, REA,or MA
- Biological type differences favor differening endpoints

Marker Assisted Selection

- Genetic Markers are commercialized for several carcass traits
  - Marbling
  - Tenderness
  - Fat deposition
- Information is not being kept at most breed associations
- Single genes seldom account for anymore than 10% of variation

- Inclusion of genetic marker data in multi-trait analysis including pedigree, individual, and progeny ultrasound and carcass information would provide best estimates of genetic merit

Producers who continue to embrace and utilize EPDs and the latest technologies will continue to shape the future of the industry and keep it competitive

… the future promises to allow us to more accurately gauge differences between breeds and incorporate marker–assisted selection into EPDs for improved accuracy, and a myriad of new selection indexes will allow us to make better decisions in the context of our own production systems

…which means EPDs' value will only grow as the industry completes the continuum of any new technology

Troy Marshall

Crossbreeding the Forgotten Tool

- Crossbreeding can potentially result in a 25% advantage in lifetime productivity yet many producers have opted to move closer to pure breeding to simplify breeding programs, try produce more uniformity and consistency, use hide color for market advantage, …

» Jim Gosey University of Nebraska

Expected Levels of Heterosis

- Crossbred Calf
  - Survival 3
  - Weaning weight 5
  - Weight weaned per cow exposed 8
  - Yearling weight 4
- Crossbred Cow
  - Fertility 9
  - Survival 1
  - Weaning weight 8
  - Weaning weight per cow exposed 19
  - Longevity 38
  - Maternal heterosis accounts for 2/3 of crossbreeding advantage

What is a workable breeding system ?

- Retained heifers vs purchased
- Number of breeding groups
- Straight breeding
- Designed Crossbreeding
  - True rotation
  - Sire rotation
  - Terminal crossing
- Composite breeding

Crossbreeding Systems

System	%Heterosis	%Advantage
2 breed rotation	67	16
3 breed rotation	87	20
Rotation terminal	67 + 100	24
AB Composite	50	12
AABC Composite	63	15
ABCD Composite	75	17

Rotational–terminal systems are extremely effective with

rotational breeding of heifers and young cows, terminal mating once 5 or 6 years of age but hard to implement in small herds

Composite breeding does not have as high of level of heterosis but is simpler and allows for more breed complimentarity

Composites 101

- Definition
  - Are hybrids of two or more breeds expected to be bred to their own kind
  - When used so are expected to achieve much of the benefit associated with traditional crossbreeding
- Why
  - Simplicity
    - breeding composites is like straight breeding
    - Composites produces their own replacements
  - Hybrid vigor
    - 4 breed composites expected to retain 75% of potential heterosis
    - Future loss would be proportional to inbreeding

Composites - continued

- Why
  - Consistency
    - While greater variation for simple traits as color there is no greater variation for production traits than for purebreds
  - Complimentarity
    - Some opportunity to select breed combinations that minimize weakness
- Why Not
  - Finding the right breed mix
  - Limited sources
  - Questionable merit of foundation animals
  - Complexity and time to create
  - Maintaining hybrid vigor
    - Composite breeding herds should be over 500
    - Reconstitute from time to time

Coefficients of Variation

Trait	Purebreds	Composites
– Birth wt	.12	.13
– Wean wt	.10	.11
– Carc wt	.08	.09
– % retail prod	.04	.06
– Marbling	.27	.29
– Shear Force	.22	.21

Conformance of Breed Types to Carcass Targets

Trait	British	Cont	MarcI	MarcII	MarcIII
– YG 1&2	38	89	83	56	53
--%CH	70	30	43	55	66

Composites and crossbreeding offer opportunity to counter antagonism between Quality and Yield grades

It is difficult to maintain calf crops of 75% British and 25% Continental breeds without composite breeding

What is your breeding objective?

- “profit driven vs production driven”
  - Measure to manage
  - Breakeven cost
- Herd reproduction a key indicator
  - Pregnancy and culling rate
  - Calving distribution
- best animal for specific situation
  - Size, milk, lean/marbling
  - Match cow to resources

Body Size – Frame Score

- Larger animals need and eat more
  - Stocking rate changes 100-1100lb = 88- 1300lb
- Weights are correlated at all stages
  - Larger animals tend to gain faster
- Differences in efficiency are small
  - If fed to same grade and fatness
  - If adequate feed for reproduction
- Packers prefer carcasses 600 to 900 lbs
  - Frame score 4 to 7

Milking Potential

- Higher milk requires more nutrients
- High productivity means higher maintenance
- High milking cows need better feed
  - 1200 lb low milk cow 26 lbs 53 TDN 8 CP
  - 1200 lb high milk cow 29 lbs 60 TDN 11 CP
- High milk increases weaning weight
- With high quality feed high milk is efficient

Cow Size:
weight and milk to stocking rate

Cow Weight – Peak Milk		AU	Herd Size	Calf Wt
1100		1.07	100	
1200		1.14	94	
1300		1.21	88	
1400		1.29	82	
1170 – 18			96	540
1170 – 24			87	595
1320 – 18			86	605
1320 – 24			79	655

Cow-Calf Production Goals

- Cows breed at an early age and regularly thereafter
- Calve unassisted and raise a healthy calf
- Cows live and stay productive for a long time
- Cows efficiently use ranch forage and require minimal supplementation
- Calves gain fast and efficiently
- Calves produce high yielding, high quality carcasses, of desired weight, with high marketability

THE END

Cheyenne

ANGUS SIRE SUMMARY FALL 2005

TRAIT	BW	WW	YW	MILK	TM	ME	CED	HPG	CETM	STAY
EPD	+0.2	+43	+87	+23	+44	+7	-1	+16	-3	+12
ACC	.91	.86	.82	.28		.62	.44	.38	.29	.27

TRAIT	MARB	REA	FAT
EPD	+.25	+.07	-.01
ACC	.54	.49	.30

Calving Ease: ★ ★

Carcass Merit:

Individual Performance		
BW	89	
205	684	117 ratio
365	1,257	109 ratio
SC	37	12 Months
YFS/FS	N/A	
Weight	1,646	30 Months
Height	52	19 Months
Born: 2/10/01		

Hi Country

ANGUS SIRE SUMMARY FALL 2005

TRAIT	BW	WW	YW	MILK	TM	ME	CED	HPG	CETM	STAY
EPD	+0.9	+40	+71	+25	+46	+3	+1	+6	+5	+8
ACC	.84	.77	.73	.56		.57	.59	.34	.55	.55

TRAIT	MARB	REA	FAT
EPD	+.11	+.15	+.01
ACC	.47	.43	.26

Calving Ease: ★ ★ ★

Carcass Merit:

Individual Performance		
BW	89	
205	822	113 ratio
365	1,334	113 ratio
SC	36	12 Months
YFS/FS	N/A	
Weight	1,888	Mature
Height	58	Mature
Born: 2/17/99		

Vaquero

ANGUS SIRE SUMMARY FALL 2005

TRAIT	BW	WW	YW	MILK	TM	ME	CED	HPG	CETM	STAY
EPD	-0.7	+52	+101	+18	+44	+11	+7	+10	+10	+11
ACC	.75	.68	.65	.56		.56	.57	.34	.55	.55

TRAIT	MARB	REA	FAT
EPD	+.00	-.22	+.00
ACC	.37	.34	.23

Calving Ease: ★ ★ ★

Individual Performance		
BW	84	
205	835	117 ratio
365	1,417	118 ratio
SC	37	12 Months
YFS/FS	N/A	
Weight	2,650	Mature
Height	59.3	Mature
Born: 3/5/99		