

**Expected Progeny Differences
(EPD's) & Indexes**

*Louisiana-Mississippi-Alabama Beef Cattle Genetics
Short Course, November 1, 2005*

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Bull Selection- Job #1



**Most genetic progress is made
through sire selection.**

Economically Important Traits

- Reproductive efficiency
- Calving ease
- Calf survival
- Weaning Wt.
- Post-weaning growth
- Feed efficiency
- Mature size
- Red meat yield
- Palatability



Sire Selection

- Infrequent occurrence for many cow-calf producers
- Decisions have long-term impact
 - Calving ease
 - Maternal ability
 - Growth
 - Carcass merit

Understanding EPD's

- What they are
- What they are not
- Key considerations
- Steps for effective use

Expected Progeny Difference

Bull	Weaning Wt. EPD	Avg. Progeny Weaning Wt.
A	+30	600 lbs.
B	+10	580 lbs.
	Difference	20 lbs.

Components of Performance

- Performance= Genetics + Environment
- Calf Weaning Wt.=
“Growth Genes” +
 - a. Management
 - b. Milk
 - c. Weather
 - d. Health

Where the Numbers Come From

- Example: Yearling Weight
- Yearling bull in test group
 - Bull “VT” Adj. Yearling Wt. = 1200 lb.
 - Test average Adj. Yearling Wt. = 1100 lb.
- Heritability = .40

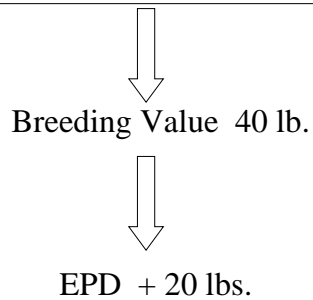
Estimated Breeding Value (BV)

- BV = Genetic worth of an animal
- BV = heritability x (Individual - Test Avg.)
- BV for Yearling bull “VT”
 - = .40 x (1200 - 1100)
 - = 40 lb.

Breeding Value to EPD

- Bull transmits 1/2 of his Breeding Value to his offspring
- Yearling Weight EPD = $1/2 \times BV$
= $1/2 \times 40$
= +20 lb.

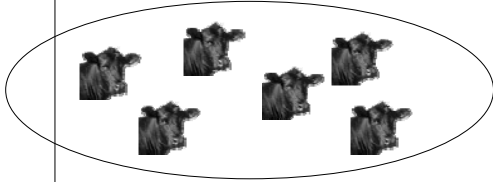
Individual Performance 1200 lb.



Final Step

- National Cattle Evaluation
 - Accounts for all pedigree relationships
 - parents, sibs
 - Accounts for herd location differences
 - Accounts for management differences
 - Accounts for relationships between traits

Contemporary Groups



Animals Reared Together:
Same Sex, Same Herd, Same Year

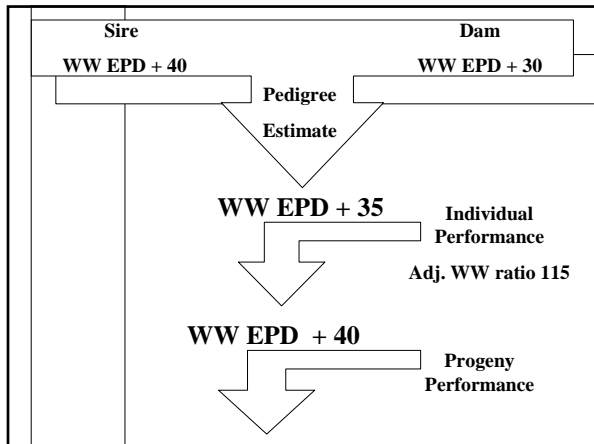
Sire Comparisons



VA Herd Louisiana Herd
Sire A Calves Sire B Calves Sire C Calves

EPD Calculation Steps

- **National Cattle Evaluation**
 - Accounts for all pedigree relationships
 - parents, sibs
 - Accounts for herd location differences
 - Accounts for management differences
 - Accounts for relationships between traits



Growth EPD's

Bull	Birth Wt. EPD	Weaning Wt. EPD	Yearling Wt. EPD
A	+4.5	+30	+55
B	+1.5	+10	+25
Diff.	3.0 lb.	20 lb.	30 lb.

Calving Ease EPD's:
% Unassisted Births

Bull	CE EPD
A	+6.0
B	+1.0
Diff.	5 %

When mated to heifers, 5% less of the calves born out of bull A should require assistance compared to calves sired by bull B.

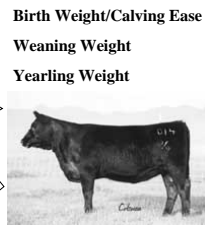
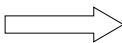
Maternal EPD's

- Sire's Milk EPD is expressed as additional pounds of calf weaned by his daughters due to milk
- Expressed in sire's grand-progeny

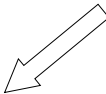
Milk EPD's

Bull	Milk EPD
A	+15
B	+5
Diff.	10 <u>lbs.</u>

Daughters of Bull A should wean calves that are 10 lbs. heavier than calves from daughters of Bull B (due to superior milking ability)



Birth Weight/Calving Ease
Weaning Weight
Yearling Weight



Maternal Milk
Maternal Weaning Weight

EPD's

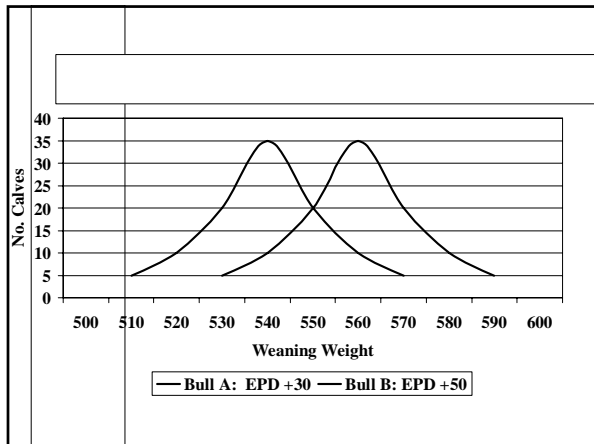
- Calving Ease
- Birth Weight
- Maternal CE
- WW
- YW
- Milk
- Maternal WW
- Scrotal
- Mature Wt.
- Mature Ht.
- Stayability
- Heifer Pregnancy
- Carcass
 - Wt.
 - MB
 - REA
 - FT
 - %RP
 - Tenderness
- Ultrasound
 - IMF
 - REA
 - FT
 - %RP
- INDEXES

What EPD's are Not

- *Predict average differences between sires- not actual performance*
- *EPD's do not predict uniformity or variation in calf crop*
- *Not an absolute guarantee*

Expected Progeny Difference

Bull	Weaning Wt. EPD	Avg. Progeny Weaning Wt.
A	+30	600 lbs.
B	+10	580 lbs.
	Difference	20 lbs.



Accuracy

- Measure of reliability
- Indicator of risk
- Increases as more information is used to calculate EPD

Possible Change
Angus Fall 2005

Accuracy	Possible Change In BW EPD
.10	±2.4
.30	±1.8
.50	±1.3
.75	±0.8
.90	±0.3

Accuracy
Angus Fall 2005

Bull	Birth Wt. EPD	Acc.	Range in "true" EPD
A	+2.0	.20	-0.1 to +4.1
B	+2.0	.95	+1.9 to +2.1

What EPD's are Not

- *Not static*
- *Breed average EPD for any trait is not necessarily 0*
- *Not directly comparable across breeds*

Angus Genetic Trend

Birth Year	BW EPD	WW EPD	Milk EPD	YW EPD
1979	0	0	0	0
1985	+1.7	+11	+2	+19
1990	+2.7	+19	+6	+33
1995	+2.6	+25	+11	+46
2000	+2.6	+32	+15	+60
2004	+2.5	+37	+19	+67

Breed Average EPD's (non-parents)

Fall 2005

	CE	BW	WW	Milk	YW
Angus	+4	+2.3	+39	+19	+72
Charolais		+1.3	+20	+6	+34
Gelbvieh	104	+1.9	+41	+18	+73
Hereford	-0.3	+3.7	+36	+14	+61
Limousin	+5.7	+2.0	+37	+19	+68
Simmental	+5.9	+1.8	+34	+6	+58

Effective Use of EPD's

- Know Breed Average EPD's
- Understand Percentile Rankings

Angus Percentile Rankings

Fall 2005

Top	BW EPD	YW EPD
10%	+0.2	+88
30%	+1.5	+79
50%	+2.3	+72
70%	+3.2	+65
90%	+4.4	+54

Breed Comparison

Fall 2005

Breed	WW EPD	Percentile Rank
Angus	+39	Top 50%
Charolais	+37	Top 1%

Interpreting EPD's

Bull	Birth Wt. EPD	Weaning Wt. EPD	Yearling Wt. EPD
A	+4.5	+30	+55
B	+1.5	+10	+25
Diff.	3.0 lb.	20 lb.	30 lb.

How do they translate to \$\$\$\$?

Challenges with EPD's

- **Balanced trait selection**
 - Which traits??
 - Proper weighting
- **Economic value of each EPD**
 - Relative to a unit change
 - Relative to its importance in selection

Index EPD's

- **Index = a combination and weighting of multiple traits and their relative economic impact, into one value that can be used to rank animals**
 - Challenging to develop (calculate)
 - Simple to use
 - Result in directional change in multiple traits

Angus Feedlot Value (\$F)

- **Components:**
 - WW and YW EPD's
 - Estimated ADG and FE
 - Cost and value differences
 - Estimated feed consumption

Angus Grid Value (\$G)

- **End Product Traits**
 - Carcass EPD's
 - Ultrasound EPD's
- **Quality Grade**
- **Yield Grade**

- **Price differentials (grid)**

Angus Beef Value (\$B)

- Includes both Feedlot Value and Grid Value
- Expressed in dollar value per head difference for progeny for post-weaning profitability when fed and marketed on value-based system
- Accounts for feedlot and carcass components

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New Search | More Info

G A R Pinnacle - 13200618 **Beef Value (\$B) : +60.80**

Feedlot Value (\$F) +32.74 per head

Feedlot Assumptions		Difference in Value of Weight Gain	
Time on Feed	180 days		\$ per head
Ration Cost	\$1.50 dry ton		41.24
Fed Market	\$78 cwt. live		
		Difference in Cost of Feed Consumed	
			\$ per head
			8.50

Grid Value (\$G) +29.13 per head

Quality Grade Schedule		Yield Grade Schedule	
Prime (above Choice)	\$6.00	YG 1 Premium	\$3.00
CAB (above Choice)	\$3.00	YG 2 Premium	\$1.50
Choice-Select Spread	\$10.00	YG 3 Discount	\$0.00
Standard Discount	\$-15.00	YG 4 & 5 Discount	\$-25.00
		Average Carcass Weight	816
Grid Impact	\$ per cwt. \$ per head	Grid Impact	\$ per cwt. \$ per head
Quality Grade	3.21 26.17	Yield Grade	.36 2.95

Click [here](#) for Search Results.

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Angus Weaned Calf Value (\$W)

- Predicts differences in expected \$/hd for future progeny pre-weaning performance
- Impacted by:
 - Birth weight
 - Weaning Weight
 - Milk
 - Mature size
- Assumptions for calf price, cow/heifer mix, cow weight, energy costs

Angus Cow Energy Value (\$EN)

- Predicts differences in cow energy requirements, expressed in dollars per cow per year, as an expected dollar savings difference in future daughters of sires
- Impacted by:
 - Cow maintenance energy requirements
 - Mature size and milk
- Higher \$ Values more favorable (more savings)

- Simmental
 - API = All purpose index
 - TI = Terminal index
- Gelbvieh
 - Grid Merit
 - Feedlot Merit
- Charolais
 - Terminal Sire Profitability Index

Utilizing Index EPD's

- Combines several EPD's into one simple, economically relevant number
- Favorable change in several traits simultaneously
- Very useful for carcass traits
- Index can change if economic weightings change
 - i.e., grid pricing schedules (QG vs. YG)

EPD's

- Calving Ease
- Birth Weight
- Maternal CE
- WW
- YW
- Milk
- Maternal WW
- Scrotal
- Mature Wt.
- Mature Ht.
- Stayability
- Heifer Pregnancy
- Carcass
 - Wt.
 - MB
 - REA
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 - Tenderness
- Ultrasound
 - IMF
 - REA
 - FT
 - %RP
- \$G
- \$F
- \$Beef Value

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Fall 2005
 Current Sires Percentile Breakdowns
 Current Dams Non-Parent Bulls Non-Parent Cows

Top Pct	CED	Percentile Breakdown Non-Parent Bulls										SValues						
		WW	YW	YH	SC	CEM	MMK	SEN	IMF	RE	Fat %RP	SW	MF	SG	SB			
1%	+1.3	-1.9	+57	+102	+1.2	+1.60	+12	+21	+22.60	+54	+74	+020	-78	+29.97	+61.17	+20.95	+60.65	
2%	+1.2	-1.3	+55	+98	+1.0	+1.42	+12	+20	+20.63	+47	+67	+024	-69	+29.06	+37.30	+27.26	+46.79	
3%	+1.1	-0.9	+53	+96	+1.0	+1.32	+11	+20	+19.20	+43	+63	+022	-64	+28.57	+35.47	+26.24	+45.70	
4%	+1.1	-0.7	+52	+94	+0.9	+1.26	+11	+20	+18.36	+40	+60	+020	-60	+28.20	+34.12	+25.44	+44.75	
5%	+1.1	-0.5	+51	+93	+0.9	+1.19	+11	+20	+17.61	+38	+57	+018	-57	+27.69	+33.03	+24.77	+43.94	
10%	+0.9	+0.2	+49	+88	+0.8	+0.99	+10	+20	+15.15	+30	+48	+014	-45	+26.79	+29.44	+22.25	+41.14	
15%	+0.8	+0.8	+47	+85	+0.7	+0.86	+9	+20	+13.46	+25	+42	+010	-38	+26.07	+27.01	+20.41	+39.21	
20%	+0.8	+0.9	+45	+83	+0.6	+0.76	+9	+24	+12.23	+22	+37	+008	-33	+25.46	+25.08	+18.96	+37.60	
25%	+0.7	+1.2	+44	+81	+0.6	+0.68	+8	+23	+11.19	+19	+33	+005	-28	+24.95	+23.48	+17.74	+36.18	
30%	+0.6	+1.5	+43	+79	+0.5	+0.60	+8	+22	+10.24	+16	+30	+004	-23	+24.49	+21.95	+16.70	+34.85	
35%	+0.6	+1.7	+42	+77	+0.5	+0.53	+7	+21	+9.40	+14	+26	+002	-20	+24.03	+20.56	+15.81	+33.85	
40%	+0.5	+1.9	+41	+75	+0.5	+0.46	+7	+21	+8.55	+12	+23	+0	-16	+23.59	+19.28	+14.94	+32.47	
45%	+0.5	+2.1	+40	+74	+0.4	+0.40	+7	+20	+7.74	+10	+20	+002	-12	+23.17	+18.03	+14.17	+31.35	
50%	+0.4	+2.3	+39	+72	+0.4	+0.34	+6	+19	+6.96	+08	+18	+000	-09	+22.74	+16.78	+13.40	+30.33	
55%	+0.4	+2.5	+38	+71	+0.4	+0.28	+6	+19	+6.22	+06	+16	+005	-05	+22.30	+15.49	+12.69	+29.10	
60%	+0.3	+2.7	+37	+69	+0.3	+0.21	+6	+18	+5.46	+05	+12	+007	-02	+21.83	+14.19	+11.96	+27.90	
65%	+0.3	+2.9	+36	+67	+0.3	+0.15	+5	+17	+4.70	+03	+09	+009	-02	+21.35	+12.88	+11.24	+26.64	
70%	+0.2	+3.2	+35	+65	+0.2	+0.08	+5	+17	+3.92	+01	+06	+011	-06	+20.83	+11.38	+10.50	+25.30	
75%	+0.1	+3.4	+33	+63	+0.2	+0.01	+4	+16	+3.04	-01	+02	+013	-10	+20.28	+9.79	+9.68	+23.77	
80%	+0.1	+3.7	+32	+61	+0.1	-0.07	+4	+15	+2.09	-03	-01	+015	-15	+19.81	+8.05	+8.78	+22.06	
85%	+0.0	+4.0	+30	+58	+0.1	-0.17	+3	+14	+1.90	-06	-06	+010	-20	+18.82	+5.96	+7.76	+20.04	
90%	-0.1	+4.4	+28	+54	+0.0	-0.29	+2	+13	+0.49	-09	-11	+022	-27	+17.78	+3.18	+6.47	+17.37	
95%	-0.3	+5.0	+25	+48	-0.1	-0.48	+1	+11	-2.56	-13	-19	+028	-38	+16.18	+1.14	+4.52	+13.08	
100%	-0.30	+5.51	-8	+13	-0.30	-2.14	-14	-9	-17.99	-48	-93	+084	-1.56	-9.10	+3.29	+1.03	+53.85	
Total Animals			182,050	183,284	105,479	105,479	11,388	27,275	182,958	105,479	111,771	49,844	49,844	49,844	110,957	111,771	79,411	79,411
Avg	+0.4	+2.3	+39	+72	+0.4	+0.34	+6	+19	+7.22	+10	+18	+004	+09	+22.47	+16.47	+13.88	+29.57	

Effective Use of EPD's

- Set selection goals
 - Determine Acceptable EPD ranges
 - Prepare to make trade-offs

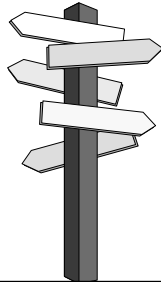
Major Constraints for Balanced Trait Selection

Genetic Antagonisms:

- Calving Ease and Growth
- Growth and Mature Size
- Carcass Cutability and Marbling
- Carcass Cutability and Maternal Traits/Reproduction

Genetic Improvement Goals

- Where have we been?
- Where are we now?
- Where are we going?
- How do we get there?



Cow Herd Performance

- Pregnancy rate ?
- Calving % ?
- Weaning % ?
- Weaning Wt. ?
- Death Loss ?
- Cow costs ?
- Post-weaning performance ?
- Carcass merit ?

Genetic Progress in Multiple Traits

- Application of well-designed crossbreeding system
 - Heterosis
 - Breed Complimentarity
- Effective use of EPD's
 - Within Breeds
 - Across Breeds

Utilizing the Correct Bull

- No Breed Can Be Everything To Everybody!
- Utilize a particular breed for its intended purpose
- Recognize EPD's reflect differences within a particular breed

Breed Differences: Growth Performance

Sire breed of calf	Gestation length, d	Unassisted calvings, %	Birth weight, lb.	Survival to wean., %	200-d wean. wt., lb.
Hereford	284	95.6	90.4	96.2	524
Angus	282	99.6	84.0	96.7	533
Red Angus	282	99.1	84.5	96.7	526
Simmental	285	97.7	92.2	96.7	553
Gelbvieh	284	97.8	88.7	97.1	534
Limousin	286	97.6	89.5	96.9	519
Charolais	283	92.8	93.7	97.1	540

Source: Cundiff et al., 2001, Germplasm Evaluation Program Progress Report No. 21

Breed Differences:

Post-weaning Performance & Carcass Merit

Sire breed of calf	Post-wean. ADG, lb/d	Slaughter wt., lb.	Carcass weight, lb.	Marb. score, %	USDA Choice, %	Yield Grade	Fat Th., in.	REA, sq. in.
Hereford	3.46	1363	832	538	79.1	3.35	.55	12.74
Angus	3.40	1375	846	577	93.6	3.32	.58	13.48
Red Angus	3.40	1362	839	589	96.0	3.76	.60	12.21
Simmental	3.47	1390	854	536	61.2	2.95	.42	13.71
Gelbvieh	3.33	1348	826	514	63.0	2.80	.39	13.43
Limousin	3.30	1308	815	507	44.8	2.63	.41	14.02
Charolais	3.43	1370	843	517	75.7	2.77	.43	14.01

source: Cundiff et al., 2001, Germplasm Evaluation Program Progress Report No. 21

Bull Buying- What's the Target?

- Heifer Bull?
- Keep Replacements?
- Sell Feeders?
- Retain Ownership?



Specification Bull Buying-

- Terminal Sire
 - Calving ease, Optimum growth, Carcass merit
- Rotational Sire
 - Calving ease, Optimum Maternal Performance, Optimum Growth, Carcass Merit
 - Produce females than match environment

Performance Specifications

- Calving ease > breed avg.
- Growth > breed avg.
- Milk = breed avg. (??)
- Carcass
 - Quality: > breed avg.
 - Retail yield: > breed avg.

Setting EPD Specifications

- Accurate record-keeping is key
- Track level of performance that results from bull EPD
 - Calving ease
 - Milk
 - Growth (including cow size)
 - Carcass Merit

Common Misconceptions

- Bigger is not always better
 - Milk EPD's
- Negative is not necessarily bad
- Need to determine “optimum”

EPD's Do Not Tell Us....

- Reproductive Efficiency
- Environmental Adaptability
 - hardiness/adaptability
 - structural soundness
 - fleshing ability
- Health
- Disposition

Important Bull Selection Data

- Individual EPD's
- Individual Performance
 - BW, WW, YW, test ADG, Ultrasound data
- Son of High Accuracy, Proven Sire
- Pedigree- Dam performance

- REPUTABLE BREEDER/SOURCE

Putting it All Together

- EPD's
- Individual Performance
- Conformation/Type
- Structural soundness
- Reproductive soundness

Selection Strategies

- Define goals and objectives, identify strengths and weaknesses
- Utilize EPD's as selection tool
- Select for traits of economic importance (calving ease, growth, maternal), including cow size and reproductive efficiency
- Track performance and know your market
- Take steps to positively impact end product acceptability (carcass with consumer appeal)

119 RITO GRID MAKER 3G22 QHF 14608721 146700 3G22
 PI ANGLS
 Consigned by Quaker Hill Farms, Charles & Lee Rosen
 CEDAD: 9/19/2003

EP	MP	MA	MR	MS	MI	MO	MP	MR	MS	MI	MO
141	142	143	144	145	146	147	148	149	150	151	152

120 QUAKER HILL OBJECTIVE 3J15 14608693 146700 3J15
 PI ANGLS
 Consigned by Quaker Hill Farms, Charles & Lee Rosen
 CEDAD: 8/8/2003

EP	MP	MA	MR	MS	MI	MO	MP	MR	MS	MI	MO
141	142	143	144	145	146	147	148	149	150	151	152

124 PINE HILL BOB 306 14608678 146700 306
 PI ANGLS
 Consigned by Pine Hill Farms, Stephen Jones
 CEDAD: 10/22/2003

EP	MP	MA	MR	MS	MI	MO	MP	MR	MS	MI	MO
141	142	143	144	145	146	147	148	149	150	151	152

126 PINE HILL ALLIANCE 307 14701405 146700 307
 PI ANGLS
 Consigned by Pine Hill Farms, Stephen Jones
 CEDAD: 10/22/2003

EP	MP	MA	MR	MS	MI	MO	MP	MR	MS	MI	MO
141	142	143	144	145	146	147	148	149	150	151	152
