

Herd Bull Selection

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The Bull is More than 50% of the Herd.

- Settle the female
- Improve herd genetics
- If replacements are placed in the herd, the bull may be **87%** of the herd.
- In the Tale of Two Bulls study conducted by TAMU Extension in 1978, one bull netted over \$12,000 in a 40 head cow herd over 4 years over the lesser performance bull.

Bull Selection Is the Foundation for Building a Profitable Beef Herd.

- Bull selection must be:
 - Accurate
 - For Heritable Traits
 - For Traits of Economic Value



Tools for selection

- Objective – data
- Subjective – visual

Use a combination for best results, and it is still an estimate or prediction of expected value.

$$P = G + E$$

Beef Cattle Traits & Characteristics

- Body Size
- Milking Potential
- Age at Puberty
- Adaptability
- Conditioning
- Growth
- Muscling
- Cutability
- Marbling



Economic Effects for Genetic Trait Selection and Management Practice Application

$$\text{Profit or Loss} = \text{Weaned Calf Crop} \times \text{Pounds at Weaning} \times \text{Price per pound} - \text{Annual Production Costs}$$

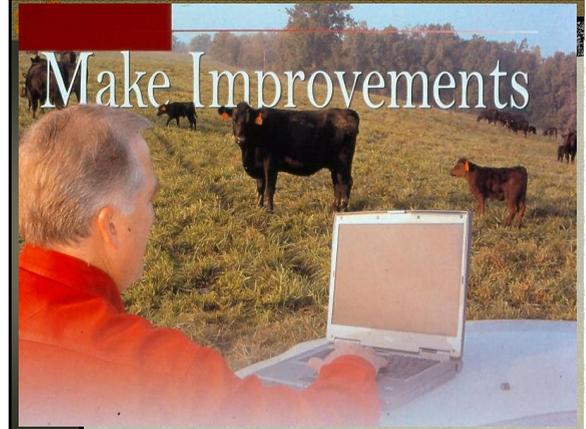
$$-\$6450 = 85\% \times 450 \text{ lbs} \times \$1.40 - \$600$$



Economic Effects for Genetic Trait Selection and Management Practice Application

$$\text{Profit or Loss} = \text{Weaned Calf Crop} \times \text{Pounds at Weaning} \times \text{Price per pound} - \text{Annual Production Costs}$$

$$\$17500 = 90\% \times 500 \text{ lbs} \times \$1.50 - \$500$$



Bull Selection Goals for Economically Important Traits

Traits	Optimum	Target
Reproduction		
Age at Puberty (mos)	12-16	14
Serotal Circumference (cm)	30-40	35
Body Condition Score (BCS)	4-7	5
Growth		
Birth Weight (lbs) – Cows	60-90	85
Birth weight (lbs) – Heifers	60-90	70-75
Weaning weight (lbs)	425-600	560
Feedlot gain (lbs/day)	2.5-4.0	3.5
Yearling weight (lbs)	900-1200	1120
Frame Score	5-8	7
Carcass		
Carcass weight (lbs)	600-800	700
Carcass Quality Grade	Select-Choice	Choice
Intramuscular Fat (IMF) %		4.0
Carcass Yield Grade	1.5-3.5	2.5
Ribeye Area (in ² /cwt live wt)	1.0-1.4	1.2
Fat thickness (in/cwt live wt)	.02-.03	.025
Dressing Percent	60 or higher	63

Objective Measurements

Individual and Progeny Records

- Birth Weight
- Weaning Weight
- Average Daily Gain
- Feed Efficiency
- Yearling Weights
- Quality and Yield Grades



Expected Progeny Difference (EPD)



Understanding EPDs

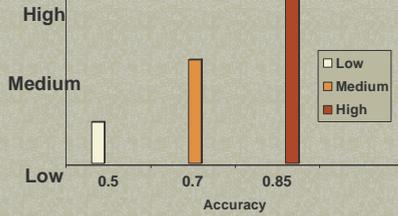
- Sophisticated tool to objectively evaluate economically important traits or differences in genetic ability of cattle.
- Like visual appraisal, it is one more supplementary selection tool available to producers that will increase predictability in the progeny.

Predictability = Performance

- One should know the breed average to determine if the animal being evaluated is above or below the breed averages for the trait being evaluated.
- Accuracy Values for each trait are important and express the estimated accuracy of repeatability for the trait.

EPD's Accuracy

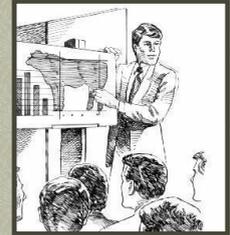
Reliability



Subjective Evaluations

Visual Appraisal

- Composition of Gain
- Structural Soundness
- Muscling Quantity
- Temperament
- Balance
- General Eye Appeal
- Reproductive Soundness



Subjective Technology

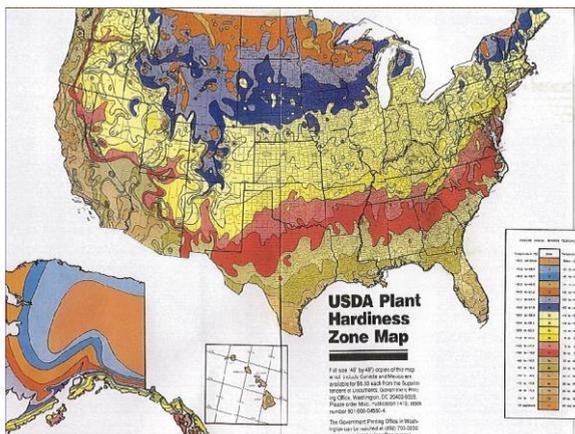
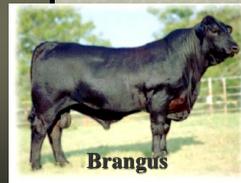
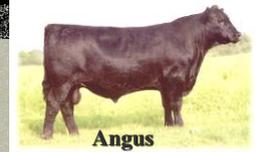
Support

- Ultrasound
 - Muscling (REA)
 - Fat Measurements
 - Marbling Scores
- Breeding Soundness
 - Semen Evaluation
 - Scrotal Circumference
 - Libido or Sex Drive



Breed Types

- British
- American
- Continental
- Specialty
- Dairy



Breed Selection

- Environmental Resources
 - Land
 - Feed
 - Labor
 - Facilities
 - Water
 - Weather
- Marketing Environment
 - Cow Herd
 - Breeding or Slaughter
 - Market Demand
 - Breeding Plan

Goal:

Select a bull from a breed or breed combination that best combines functionality in an environment that is capable of siring calves with **several traits** that will contribute to overall herd profitability.

Where to Buy Bull?

- Reputable Sources That Provide:
 - Complete Individual Performance Records
 - EPD
 - Breeding Soundness Evaluation Results
 - Guarantee of Fertility
 - Guarantee that Ancestors are not Known Carriers of Genetic Defects
- Herds Actively Involved In:
 - Performance Evaluation Programs
 - Central Bull Test Stations
 - Consignment Sales
 - Private Treaty

Transportation

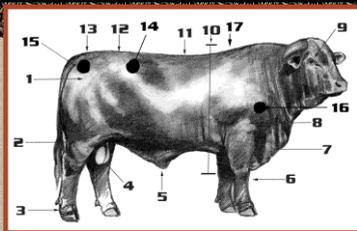


Evaluation of Bulls For Economical Traits and Performance

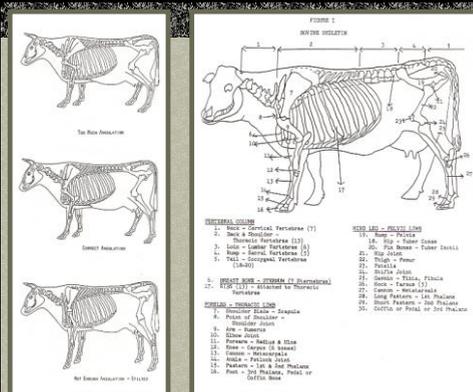
- Structural Soundness
 - Fertility
 - Growth
 - Calving Ease
 - Frame Size
- Maternal Performance
- Carcass Characteristics

Structural Soundness

- Determined by subjective visual evaluation
 - Also evaluates disposition
 - Unruly Progeny = Reduced Gains & Quality Grades
- Functionally Sound
- Free From Structural Defects that Limit:
 - Feeding
 - Walking
 - Breeding Cows
 - Maintain Healthy Condition
 - Longevity
- Physical Impairment Ultimately Reduces Profits



- | | |
|--|---------------------------|
| 1. Round – Deep Muscular | 9. Eye – Bold, Pigmented |
| 2. Hock – Correct Set | 10. Heart Girth – Deep |
| 3. Foot – Tough, Disease Free | 11. Top – Level, Strong |
| 4. Testicles – Equal, Adequate Dimension | 12. Loin – Long, Muscular |
| 5. Sheath – Trim | 13. Rump – Lean, Bulging |
| 6. Legs – Set Squarely, Ruggedly Made | 14. Hook Bone |
| 7. Brisket & Dewlap – Waste Free | 15. Pin Bone |
| 8. Shoulder – Smooth, Gentle Slope | 16. Point of Shoulder |
| | 17. Top of Scapula |



Structural Problems

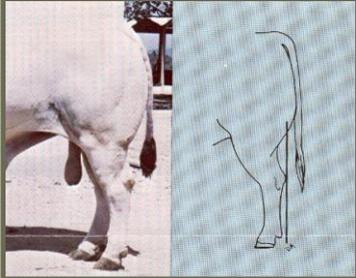
- Bad Feet
- Curled/Twisted Toes
- Pigeon Toed
- Splay Footed
- Long Toes
- Coon Footed
- Short Straight Pasterns
- Weak Pasterns
- Bow Legged
- Knock-Kneed
- Buck-Kneed
- Straight Hocks
- Post Legged
- Sickle Hocked
- Straight Shoulders
- Weak Back or Loin



Visual Structure Evaluation

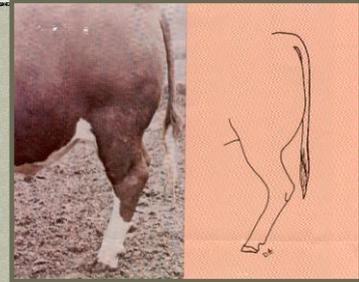
- Best Evaluated from the Ground Up
 - Hoofs
 - Heels
 - Pasterns
 - Knees
 - Hocks
 - Shoulders
 - Hooks
 - Pins
 - Rump
 - Back
- Watch for Freedom of Movement
 - Each Hoof Should Strike Ground Evenly

Rear Leg Conformation



- Desirable Conformation of the rear legs as seen from the side.

Rear Leg Conformation



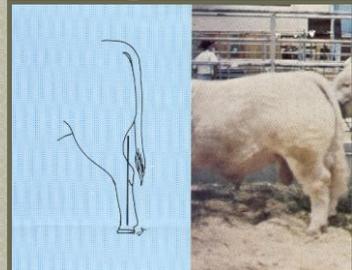
- Sickle hock conformation. This fault can lead to swollen hocks and lameness. The sire of the bull shown had an excellent early performance record, but had the sickle-hock defect. At an early age, the sire became lame and unable to mount. Most of his male offspring inherited the sickle hock conformation.

Rear Leg Conformation



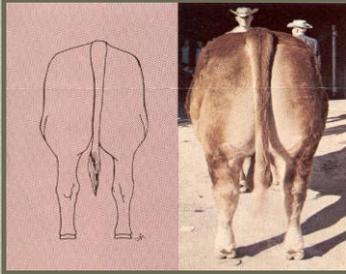
- Post Leg. Bulls with this fault lack proper angulation of the hock and stifle joint. These animals may "stifle" (rupture cruciate ligament and meniscus). They may also break down in their pasterns.

Rear Leg Conformation



- Camped Behind. With this defect bulls shift their rear legs frequently in an effort to find a comfortable stance. They are usually sway backed.

Rear Leg Conformation



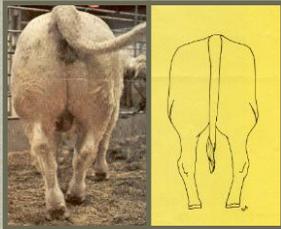
- Desirable Conformation of hind legs as seen from the rear.

Rear Leg Conformation



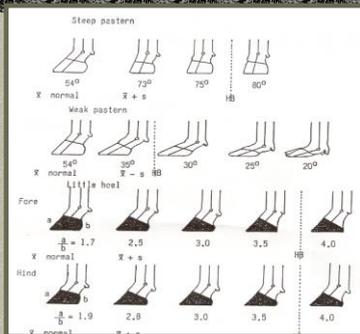
- Toed out (wide base). This fault is usually seen in conjunction with the sickle-hock conformation.

Rear Leg Conformation

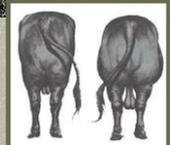


- Bow Legged (narrow base). The outside wall of the hoof is compressed. The outer toe may curl upward, growing over the inside toe and requiring frequent trimming. Bulls with the fault show various degrees of lameness.

Common Foot Problems



Visual Fertility Indicators



Comparison of non-fertile (left) vs. fertile (right) bull. Bonsma, 1966.



Example of bull displaying good fertility indicators. Bonsma, 1966

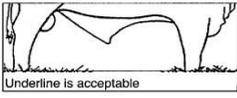


Example of bull displaying poor fertility indicators. Bonsma, 1966

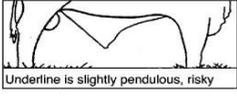


Visual Fertility Evaluation

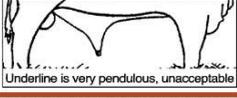
- Testicles
 - Greasy, Oily Appearance vs. Scaly, Dry
- Sheath
 - Especially Brahman and Brahman Derivative Cattle
 - Select for Tighter, Less Pendulous Sheaths



Underline is acceptable

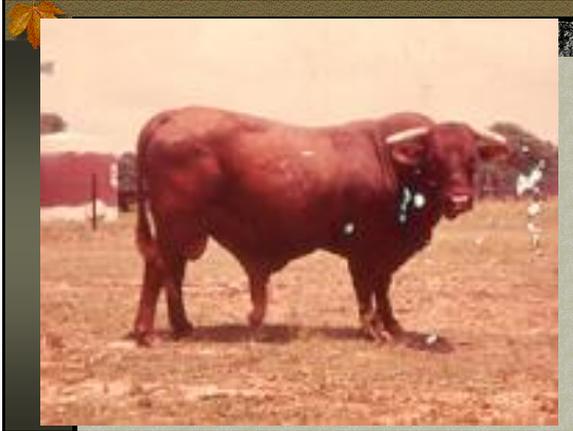


Underline is slightly pendulous, risky



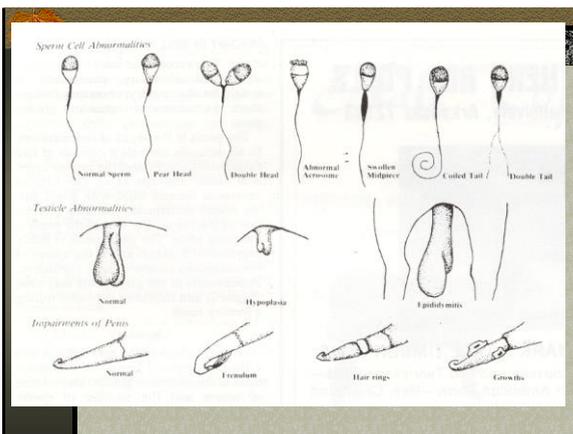
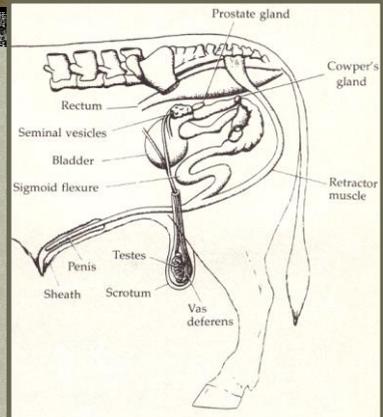
Underline is very pendulous, unacceptable





Breeding Soundness Evaluation (BSE)

- More Objective and Accurate Approach
- Taken the Guesswork out of a Bull's Fertility Status
- Includes:
 - Semen Evaluation for Motility and Morphology
 - Scrotal Circumference Measurement
 - Physical Examination of Reproductive Tract
- Scrotal Circumference
 - Minimum of 30 centimeters in 1 year old bulls
 - Minimum of 34 centimeters in 2 year old bulls





Bull Breeding Soundness Evaluation

Motility			Scrotal Circumference	
Gross Activity	Individual Activity	Rating	Bull's Age (Month)	Minimal Scrotal Circumference
Rapid Swirling	Above 70%	Very Good	Under 15	30 cm
Slower Swirling	50-69%	Good	15 – 18	31 cm
Generalized Oscillation	30-49%	Fair	18 – 21	32 cm
Sporadic Oscillation	Under 30%	Poor	21 – 24	33 cm
			Over 24	34 cm

Morphology
Minimum is 70 percent normal spermatozoa

Source: Society of Theriogenology

Correct Method for Measurement of Scrotal Circumference

The testes are pulled firmly into the lower part of the scrotum by encircling its base with the hand and pulling down on the testes.
The scrotal tape is formed into a loop and slipped over the scrotum and pulled up snugly around the greatest diameter of the scrotal contents.

The thumbs and fingers should be located on the side of the scrotum rather than between the testes to prevent separation of the testes and inaccurate measurement.

Adapted from: *Breeding the Modern Spermator of Bulls*, Hovde, D. C. DVM, University of Illinois

Scoring system and recommended scrotal circumference for bulls of various ages (except Brahman.)

Age	Very good	Good	Poor
12-14 months	>34 cm	30-34 cm	<30 cm
15-20 months	>36 cm	31-36 cm	<31 cm
21-30 months	>38 cm	32-38 cm	<32 cm
over 30 months	>39 cm	34-39 cm	<34 cm

Adapted from the Society of Theriogenology

Scoring system and recommended scrotal circumference for Brahman and Brahman crossbred bulls.

Age	Very good	Good	Poor
12 months	>22 cm	18-22 cm	<18 cm
13 months	>24 cm	20-24 cm	<20 cm
14 months	>26 cm	21-26 cm	<21 cm
15 months	>30 cm	26-30 cm	<26 cm
16-20 months	>31 cm	28-31 cm	<28 cm
21-24 months	>32 cm	29-32 cm	<29 cm
25-31 months	>35 cm	31-35 cm	<31 cm
Over 31 months	>39 cm	34-39 cm	<34 cm





Fertility / Reproductive Soundness



The Barren Cow

This kind of cow should have been eliminated through production records long before her infertility became visually obvious. She may not have looked infertile as a calf, but she became this way because she failed to produce and her hormones failed to develop. She is heavy in the brisket, thick in her neck, heavy in her jaw, and fat and deep in her flank. She may have a crest in her neck, and be coarse haired. On top of her hip there may be a large fold of fat, and her shoulder will be coarse because of fat deposits. She is short from her hooks to her pins and from her hooks to her strile joint. Sometimes heifers can also be eliminated if they are extremely small in their vulva, have no udder development, or are masculine headed and thick necked, but this is not always evident in the barren cow.

Maternal Performance

- Cow's Milk Performance and Calving Characteristics**
- Basic formula for EPD: Measuring additional pounds of weaning weight from daughters due to genes for milk.**



Maternal Traits



- A sire's milk EPD is expressed as the additional pounds of weaning weight of calves (grand progeny of sire) from daughters, due to genes for milk production passed on from sire to his daughters. Similarly, a dam's milk EPD indicates additional pounds of calf weaning weight (grand progeny of dam), from their daughters, due to inherited genes for milk.

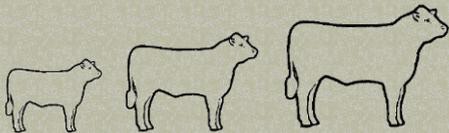
Milking Ability EPDs

Bull	Milking Ability EPD
A	+8.0
B	-2.0

- So, which bull has a more desirable MA EPD?



Growth Rate



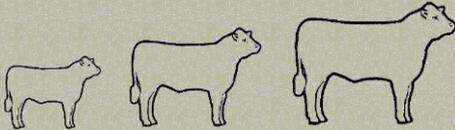
Growth

As Growth Traits Increase,
CAUTION
Birth Weights Increase!

- Measured by:
 - Adjusted Weaning Weights
 - Average Daily Gain
 - Yearling Weights and Ratios
 - Estimated Breeding Values for Same Measurements
- A Good Breeding Bull:
 - 560-600 pound Weaning Weight
 - 3.5 or better ADG
 - 1120-1200 pound Yearling Weight

Growth Data

- Weaning Weight and Yearling Weight EPD are Commonly Referred to as "**Growth Data**".
- Emphasis on positive growth EPD selection = heavier calves = **More Dollar Value**.
- Thus, Larger WW and YW EPD have a positive economic impact on selection.



What do you think???

Bull	Weaning Weight EPD	Yearling Weight EPD
A	+12.0	+23.0
B	+6.0	+10.0
C	-8.0	-4.0

- If production goals dictate that the offspring of these bulls will be sold at weaning, which bull is the most desirable?
- Answer: **Bull A**
 - Highest WW EPD
 - If you compared Bull A and Bull B's WW EPD, Bull A's offspring would be (on average) 6 pounds heavier than the average offspring from Bull B at weaning.

What do you think???

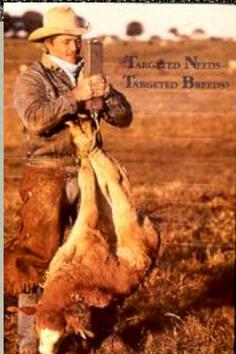
Bull	Weaning Weight EPD	Yearling Weight EPD
A	+12.0	+23.0
B	+6.0	+10.0
C	-8.0	-4.0

- What if the goal was to retain ownership of the bull's offspring and they would be fed in the feedlot and marketed as finished cattle?
- Answer: **Bull A**
 - Highest YW EPD
 - Bull with highest YW EPD will sire heavier offspring.

Calving Ease



- Birth weight is a major contribution factor associated with calving difficulty.
- Ask for **records** on prospective sires indicating birth weight and calving ease as well as his relatives' data (EPD).



Birth Weight EPDs

- Birth weight is single most influential factor contributing to calving difficulty.
- Based on studies with birth weight data, EPD of sire for birth weight is single most accurate predictor of calf birth weight.



Birth Weights

Bull	Birth Weight EPD
A	+5.0
B	+0.0
C	-5.0

- Imagine that a situation calls for these bulls to be mated to **first calf heifers**. Which bull would you likely prefer if this was all the information you were provided?

- Answer: **Bull C**
 - Lowest BW EPD
 - Bull C would have calves that will average 5 pounds lighter than Bull B and 10 pounds lighter than Bull A.



Frame Size

- Very effective measurement for estimating rate of maturity, mature size, and general carcass composition at a given live weight.
- Acceptable calves at the markets are medium framed and consist of frame scores 5, 6, and 7.



Carcass Characteristics



- Past method: Progeny Carcass Evaluation**
 - Still effective to evaluate cutability and quality grades and is the **only way to evaluate tenderness.**
- New Method: Ultrasound Technology**
 - Live Bull Evaluation for
 - Ribeye Area
 - Fat Thickness
 - % Fat in the Ribeye (equated to Marbling Score)

LEAN ON LIMOUSIN

Be Genetically Trimmed, Not Hot Trimmed.

Muscling



The Value of Muscle

Feeder Steers

(Medium and Large Frame: 500-550#)

Muscle Score	Avg. Price
1	\$85.71
2	\$77.66
3	\$72.41

Muscling

- Ribeye Area
- Visual Evaluation of Muscle Shape



Muscling

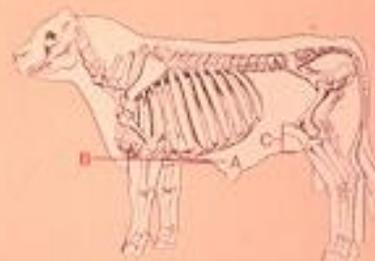
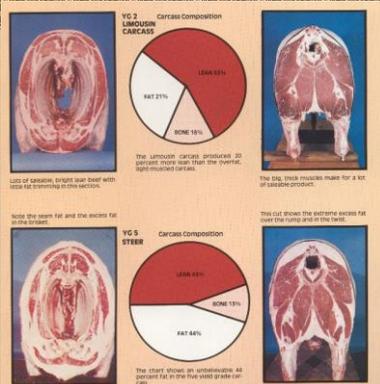
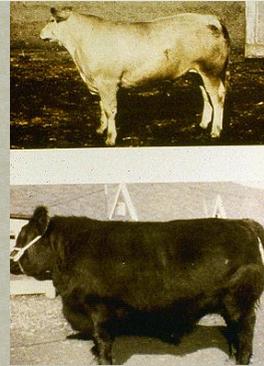
- Larger Birth Weights
- Increased Incidence of Dystocia
- Decreased Marbling
- Smaller Pelvic Area



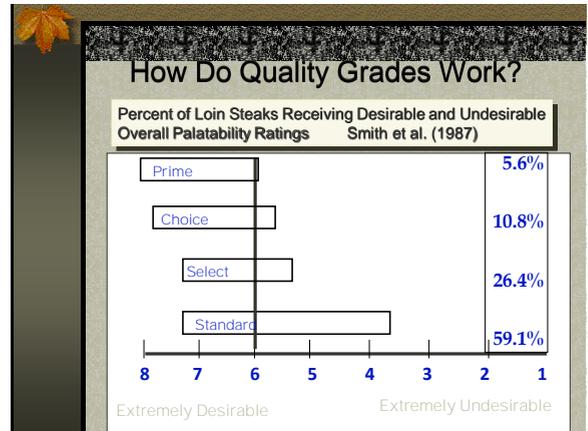
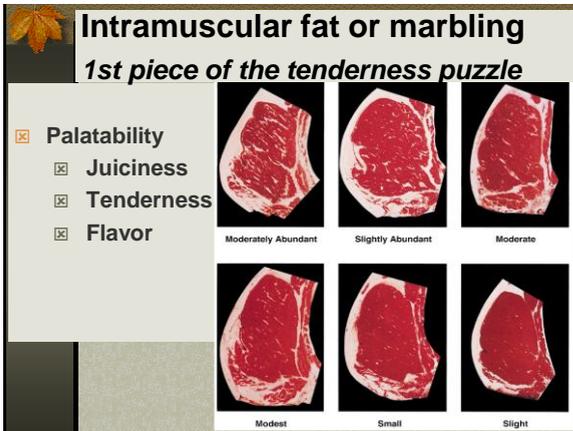
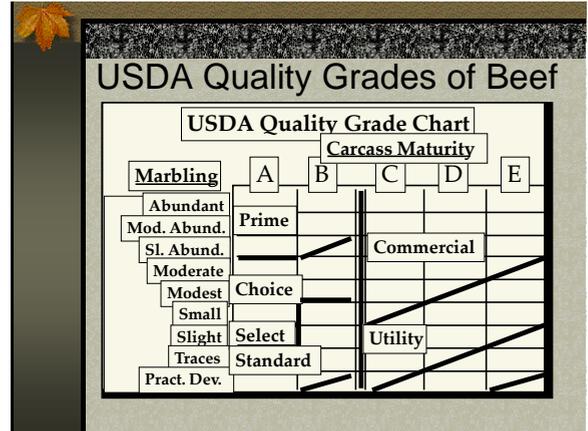
Composition of Gain



Yield Grade Differences



Trim Bull



Carcass Evaluation

Carcass Weight EPD (CW), expressed in pounds, is a predictor of the differences in hot carcass weight of a sire's progeny at a give end point compared to progeny of an average sire.

Marbling EPD (Marb) is an expression, as a fraction, of the difference in a subjective USDA marbling score of a sire's progeny at a give end point compared to progeny of an average sire.

Carcass Evaluation, continued

Ribeye Area EPD (RE), expressed in square inches, is a predictor of the difference in ribeye area of a sire's progeny at a given end point.

Fat Thickness EPD (Fat), expressed in inches, is a predictor of the difference in external fat thickness at the 12th - 13th ribs of a sire's progeny at a given end point compared to progeny of an average sire.

Carcass Evaluation, continued

Percent Retail Product EPD (%RP) is a predictor of the difference in pounds of salable retail product of a given sire's progeny compared to the progeny of an average sire in the breed.

Subjective Technology Support-Carcass

- Ultrasound
 - Muscling (REA)
 - Fat Measurements (FAT)
 - Marbling Scores (%IMF)
 - Percent Retail Product (%RP)



Ultrasound Body Composition EPD

Intramuscular Fat (%IMF) is a predictor of the difference in a sire's progeny for percent intramuscular fat in the ribeye muscle compared to an average sire.

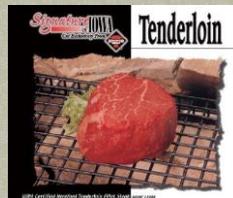
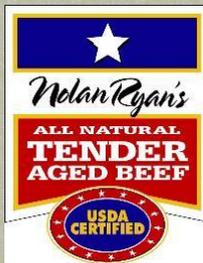
Ribeye Area (REA) is a predictor of the difference in square inches of ribeye area of a sire's progeny compared to the progeny of an average sire.

Ultrasound Body Composition EPD

Fat Thickness (Fat), expressed in inches, is a predictor of the difference in an external fat thickness at the 12th - 13th ribs of a sire's progeny compared to the progeny of an average sire.

Percent Retail Product (%RP) is a predictor of the difference in pounds of salable retail product of a sire's progeny compared to the progeny of an average sire.

Branded Beef Products



Disposition



Docility EPDs



- NALF developed docility scoring system to make genetic predictions on docility.
- Threshold model
 - 1 (docile)
 - 2 (restless)
 - 3, 4, 5, 6 (nervous to very aggressive)
- Predict genetic differences in probability that offspring will be scored 1 (docile) or 2 (restless) as opposed to 3, 4, 5, 6 (nervous to very aggressive).
- Higher EPD values for docility represent genetics for calmer behavior.



	Docility EPD
Sire A	+ 20%
Sire B	+ 5%
Difference	15%

- Would expect 15% more of Sire A's offspring to be scored either 1 (docile) or 2 (restless) as compared to the percent of Sire B's offspring scored 1 or 2. Docility EPDs can be used to minimize the proportion of animals produced and perhaps culled due to unacceptable behavior.

Maternal vs. Terminal



Balance and Eye Appeal



Today's Cattlemen...

- Today's business-minded progressive cattlemen concern themselves with the application of *research-proven, efficient and profitable* beef production and management practices.

