

Pasture-Based Beef

Presented by

John & Mary Ellen Wozny

Spectrum Farm, Coolville, OH 45723-0112

In collaboration with

Rory Lewandowski

OSU Extension, Athens County

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Pasture-Based Beef

➤ Why Would Anyone Want to do This?

- ✓ Health and Nutrition - CLA's and Vitamins
- ✓ Farm Assets
- ✓ Time Input vs. Output

➤ Mechanics

- ✓ Grass Effects
- ✓ Breed and Within-Breed Selection
- ✓ Animal Quality Management
- ✓ Harvest Point

➤ Marketing

- ✓ Consumer Preferences
- ✓ Consistent Quality and Quantity
- ✓ Aging and Cooking Aspects

➤ References and Resources

- ✓ Cool Web Sites
- ✓ USDA Grade and Yield Info
- ✓ Tables and Charts



CLA's and Vitamins

- **Conjugated linoleic acid = CLA** - collective term used to describe derivative mixture of nine isomers/forms of conjugated linoleic acid
 - Occur in nature in food (animal fat and dairy products) from ruminants (cattle, sheep)
 - Pasture-based cattle tissues contain 3X (to 5X) as much CLA's as grain-fed cattle
 - Humans must obtain CLA's from diet; can not make by ourselves
 - Most important/active forms:
 - cis-9, trans-11* = rumenic acid (75-90%) *trans-10, cis-12* *trans-9, trans-11*
 - cis-9, cis-12* = 18:2 linoleic acid (~3%) 18:3 = α -linolenic acid, "omega-3"
 - Anti-carcinogenic effects demonstrated (mammary and colon tumors)
 - Other benefits/properties: hypocholesterolemic, anti-atherogenic and anti-diabetic properties, enhanced immune response, and positive effects on energy (fat) partitioning and bone formation in growth
 - Pasture-based beef has 1/3 to 1/2 less fat, lower calories per g than grain-based beef
 - Pasture-based beef contains 2X (to 6X) more omega-3 than grain-based beef
 - Atkins Diet - high content of CLA's in foods recommended in program
- **Vitamins**
 - Fat-soluble vitamins (A, D, E) and selenium mineral (Se)
 - Scientific evidence accumulating that meat from pastured animals demonstrates
 - More prolonged resistance to oxidation

Pastured Beef Contains Higher CLA Content

Land and Feedstuff Situations

- Capable of
 - Year-round grazing?
 - Grazing plus hay?
 - Grazing plus graining?
 - Grazing plus hay plus graining?
- Depends on soil and sward conditions
- Lowest cost situation usually year-round grazing
 - Uniform grazing spreads manure as a natural fertilizer
- Depending on land resources, harvest time for beef might be affected
 - Consistency of beef products sold to established customers needs to be maintained!

Equipment

- “The less heavy metal the better”
- Approach: “Cattle will be the equipment”
- Usually cheaper in the long run to buy hay, rather than invest in lightly-used equipment

***Strive for Land and Equipment Management
that will Produce a Consistent Product***

Cattle Time

- Plan potential harvest time targets and work on tactics to meet targets
- Need balance of forages/feeds that can give minimum ADG of about 1.7 lbs/day to obtain ~1300 lb animal by age 24 months
- In times of poor forage quality or availability, need to supplement forage with other feeds

Human Time

- To produce a steady customer base, marketing time \geq production time
 - Market 12 months a year
 - Whet the appetite
- Satisfied, sustained customers critical to success
 - Customer base tends to be mobile, affluent
 - Need to be developing additions all the time

Essential to Know Your Market and Plan Accordingly

Legumes (Stockman Grass Farmer, 1994, strictly grass, start to finish)

- The higher the legume content, the more yellow the fat in the meat
- Need balance of forages that can give minimum ADG of about 1.7 lbs/day

Grasses (Iowa State Univ., 2000, backgrounding on grass, then to feedlot)

- Time on grass during backgrounding affected meat quality
 - Although all cattle in test graded at least Choice -, the longer the cattle were on grass, the poorer the quality grade
 - Tenderness was not affected by time on grass

Treatment for Fall-Born Calves	Hot Carcass Wt., lb.	Quality grade	KPH Fat, %	WBS, kgf	Average of Juiciness, Flavor, Flavor Intensity by Panel Test
Direct to Feedlot @ age 7 mos (weaning)	747 ^a	6.1 ^{ad}	2.4 ^a	2.3	5.3 ^a
Bromegrass @ age 7 - 10 mos	737 ^a	6.1 ^{abde}	2.7 ^{bc}	2.4	5.3 ^a
Bromegrass @ age 7 - 10 mos PLUS ionophore	734 ^a	6.1 ^{abde}	2.7 ^{bc}	2.2	5.5 ^b
Bromegrass + Switchgrass @ age 7 - 13 mos	670 ^b	6.7 ^{ac}	2.2 ^{ad}	2.5	5.4 ^b
Bromegrass + Switchgrass @ age 7 - 13 mos PLUS ionophore	710 ^{ab}	6.8 ^{bc}	1.9 ^d	2.7	5.1 ^c

a, b, c, d, e Means within same column with different letters are significantly different, P<0.05

Quality Grade: Choice + = 4; Choice 0 = 5; Choice - = 6; Select + = 7

KPH Fat: Kidney, Pelvic, and Heart Fat

WBSF: higher the number, tougher the meat

Sensory Panel Score: Excellent = 8; Acceptable = 5; Very Poor = 1

If WBS value for steak is ≤ 4.1 , 98% of consumers will rate steak as "Acceptable for Tenderness"

Overall "Acceptability" is a function of

- Tenderness
- Juiciness
- Flavor
- Flavor Intensity

Forage Type and Grass Time, even in Backgrounding, Could Affect Beef Quality

Which Breed Should It Be?

- **Capable of Finishing CHOICE on Grass Alone**
 - *Stockman Grass Farmer Study*
 - Wagyu, Jersey, Angus, Polled and Horned Hereford, Murray Grey
 - Wagyu and Murray Grey most consistent
- **Genetics that Provide Reasonable Chance of**
 - Meeting production goals and industry standards
 - Industry REA standard: ≥ 1.0 sq.in./100 lb live wt. or ≥ 2.0 sq.in./100 lb hanging weight
 - Satisfying customers
- **Genetics that are Highly Likely to Carry Tenderness and Marbling Genes**
 - Tenderness quantitatively measured by Warner-Bratzler Shear Force Test
 - Marbling scored and related to eating experience by taste panel
 - Ability to maintain appetite, deposit back fat; possibly correlated to marbling

Genetics will Affect Beef Quality

What Characteristics Should Individual Animals Have?

• Type

- Deep-bodied, high capacity, walking fermentation chambers
- Long-spined to give “an extra steak” from the loin area
- Sound feet and legs, not post legged or sickle-hocked
- Proportionality (linear measurements) of skeletal structure
 - Size of cannon bone in proportion to overall body size



• Pasture and Meat EPD's and EBV's

- No “Pasture” EPD's or EBV's for any of the above traits
- Some breeds have EPD's/EBV's for REA (EMA), IMF, Carcass Wt., Rib/Rump Fat, Retail Beef Yield, \$Index Values – relate to meat yield and quality

• DNA Markers for Tenderness

- Calpastatin – regulator gene governing calpain protein activity
- Calpain – SNP316 and SNP530 – genes for proteins that tenderize meat during aging

• DNA Markers for Marbling

- Thyroglobulin – gene that creates fat cells within muscle fibers
- Leptin - gene for regulating appetite, energy, fat deposition and fat cover

Genetics will Affect Ability to Deal with Environment

Animal Quality Management

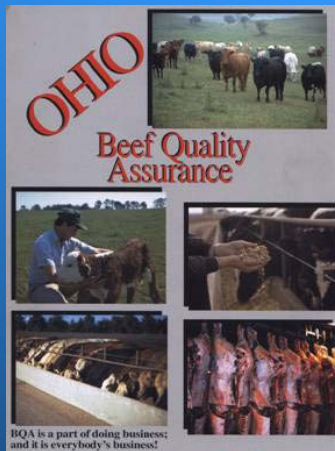
“Do you want access to the competitive value-based market of the future? Better start getting together a resume for your cattle.”

John Sticka, CAB

What is in an Animal Resume?

Documentation of

- Genetic history
- Health and vaccination history
- Growth performance history
- Management practices
- Feeding history
- Finishing history
- Carcass management



Environment and Genetics will Affect Beef Quality

What Age at Harvest Should be the Target?

- **Less than 30 months of age**
 - Keep within A Maturity age bracket to reduce costs and eliminate need for backbone removal at packer
- **Three general harvest age brackets with forage-fed beef**
 - **Baby Beef**
 - Live weight usually ~ 800 pounds
 - Aged ~ 9 to 13 months
 - Can be done generally with medium-framed dairy and beef breeds
 - Advantages vs. disadvantages
 - Quickest return with lowest feed/grass input
 - Meat light colored and tender (WBSF < 4.0 kg), but lacking marbling
 - Meat has light, mild taste, but possibly “too light” for some palates
 - Meat has “No Forgiveness” if overcooked
 - Not many pounds of beef per side
 - Dress-out typically ~ 50 – 55%, meat yield ~ 65%
 - REA generally 10 sq. inches or smaller with no back fat

***For Quickest ROI, Aim for Baby Beef
Ultimate Tenderness Market***

What Age at Harvest Should be the Target?

• Lean-fed Beef

- Live weight usually less than 1300 pounds
- Aged ~ 13 to 18 months at harvest, depending on breed
- British breeds “easier” to do than continental
- Advantages vs. disadvantages
 - Meat light colored and still very tender (WBSF < 4.0 kg)
 - Dress-out typically ~ 60 – 62%, with good meat yield ~ 65 - 70%
 - REA generally ~ 10 – 12 sq. inches with very little back fat
 - Possibly qualifies for SELECT, but generally not graded at all
 - Depending on genetics between and/or within breed, may see various degrees of marbling
 - Actually difficult to maintain consistency unless supply genetics are uniform
 - Customer expectations may be difficult to meet

Can be “Tricky” to Accomplish

What Age at Harvest Should be the Target?

• Finished “Fat” Beef

- Live weight usually 1200 - 1400 pounds
- Aged ~ 18 to 28 months at harvest, depending on breed
- British breeds “easier” to do than continental, due to basic genetics
- Advantages vs. disadvantages
 - Need to keep animals on farm for longest time period
 - Need to manage grass to optimize growth, fat quantity and quality
 - Need good grass cattle genetics that will marble easily on grass
 - Meat can begin to toughen in certain breeds at 22 – 28 months of age
 - Dress-out typically ~ 58 - 60%, with good meat yield ~ 65 - 70%
 - REA generally ~ 12 – 14 sq. inches
 - Industry REA standard: ≥ 1.0 sq.in./100 lb live wt. or ≥ 2.0 sq.in./100 lb hanging weight
 - Depending on genetics between and/or within breed, may see various degrees of marbling and varying degrees of back fat
 - Quality grade essentially LOW CHOICE

Meat Quality and Size Similar to “Super Market” Beef



Great Lakes Family Farms Beef Co-Op

- Four marketing studies done throughout Ohio to answer these questions
 - Who is our market?
 - Where are they located?
 - What do they desire in a product that they can't already obtain?
 - Can we provide these product preferences?
 - Can we make a reasonable profit providing these products?
- Studies done by
 - Ohio Cattlemen's Association - Wholesale Retail Study
 - University of Dayton/Marketing Department - Consumer Preference Study (Funded by FSMIP Development Grant)
 - National Cattlemen's Association Beef Quality Audit
 - Toledo Farmers Market Consumer Study

Whether grain- or forage-fed, answers are the same!

Results of Market Studies

Targets?

- Higher income households, \$90,000 per year or higher
- E-Commerce sales
- Direct home delivery
- Health-conscious markets (baby boomers and those younger than 65)
- Specialty restaurants
- Institutions involved in health care
- Corporate gifting

Locations and Customers?

- Direct sales
- Farmers' markets

Product Specs?

% of Respondents Importance Ranking:

Fresh	32.5%
Lean	31.0%
Tender	20.0%
Wholesome	12.5%
No Hormones/ Growth Promoters	11.5%
No Additives/Preservatives	8.5%
Grain Fed	8.3%
No Antibiotics	5.0%
Price	4.3%
Ease of preparation (< 20 min)	3.3%

(36 possible observations; more than one observation could be chosen by respondents)

Added Expectation Post-Dec, 2003

- ✓ Young animals (less than 30 months old)
- ✓ No BSE if locally bred and grown!

Why Buy Ohio Beef?

- 66% to 80% of respondents support local economy and farmers
- 25% to 80% want “higher quality and freshness”
- Born and raised in OHIO = Fresh, Lean
- Wholesome/Safe –
 - No hormone implants, no feed additives, no unnecessary drug use



Most Important Attributes?

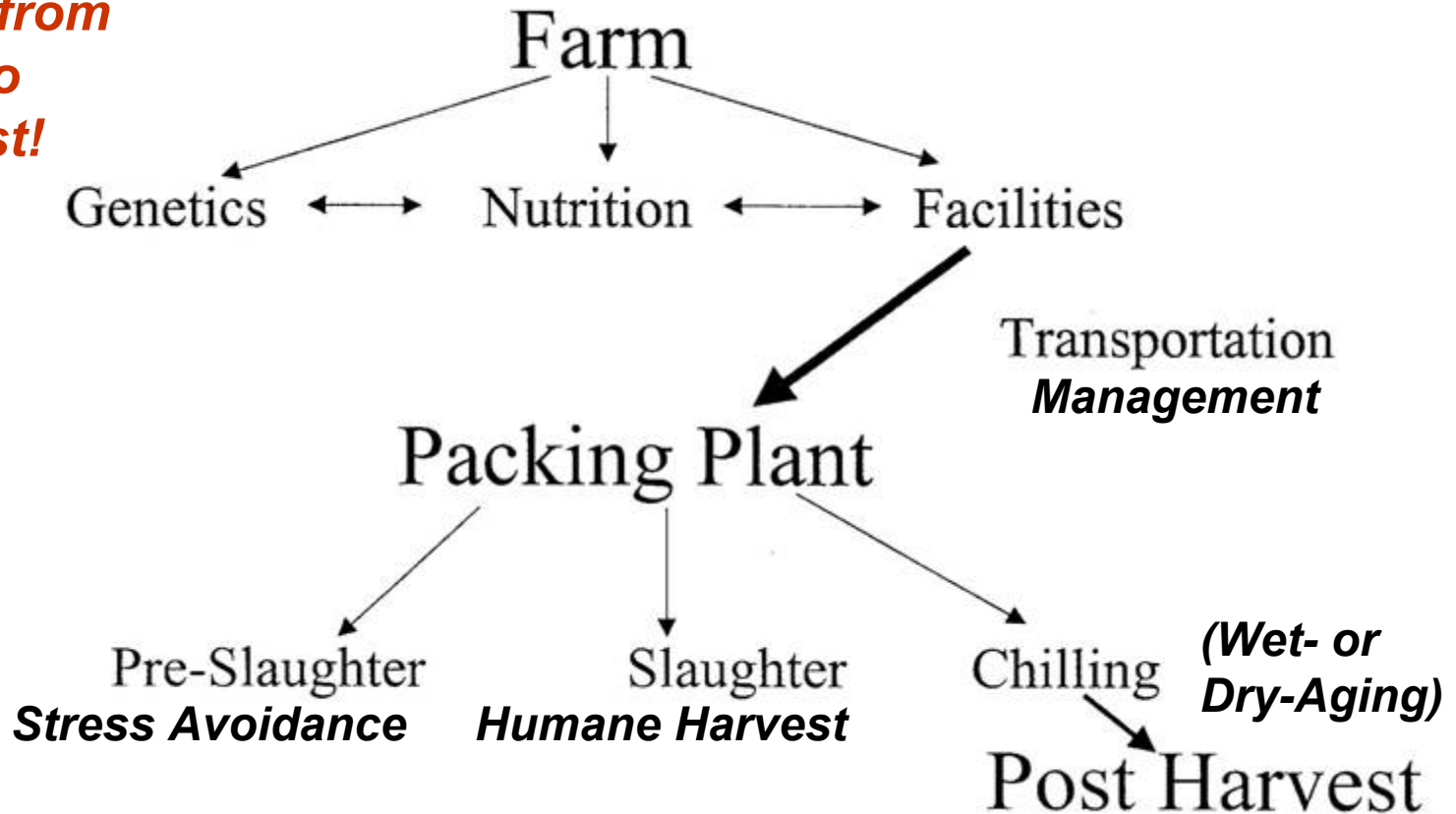
Merchandizing Success depends on

- ✓ Consistent Quality, including Safety & Wholesomeness
- ✓ Consistent Quantity



Critical Control Points for Consistent Quality

**Track from
birth to
harvest!**



It's All Part of the Animal Resume

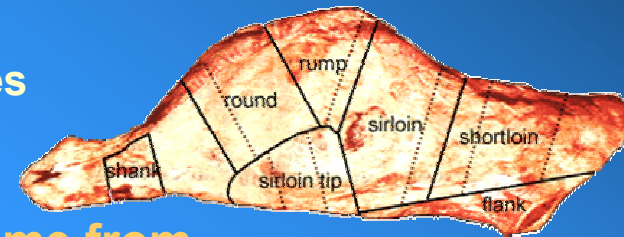
Wet- or Dry-Aging

- **Dry – largely disappearing option**
 - Meat hangs in locker at constant temp. for 7-21 days prior to cutting
 - Concentrates flavor through moisture loss of up to 18% (shrinkage)
 - Allows fat to become distributed throughout muscle matrix
 - Allows calpastatin/calpain natural tenderization process time to proceed in presence of air (oxygen) to give light red color
- **Wet – the industry norm “aging in the bag”**
 - 90% of aged beef now aged this way
 - Beef vacuum-packed in plastic and maintained at 34-38 °F for 7-28 days
 - Beef looks “dark” in bag due to absence of air (oxygen)
 - When bag is opened, meat will lose some of the dark color through re-oxidation
 - Inside plastic, meat ages and becomes tender with no moisture loss
 - No moisture loss = no flavor concentration = selling water wt. as meat wt.

Dry-Aging Enhances and Concentrates Flavor
Most Customers Accustomed to Wet-Aged Beef Flavor

Long and Slow or Fast and Quick?

- Depends on **MARBLING**, **CUT**, and **TASTE PREFERENCE**
- Extent of marbling gives beef its unique flavor
 - Marbling = little flecks of fat inside beef muscle, not external fat cover
 - The more marbling present, the more “Punishment” the meat can take
 - At high temp. marbling melts and makes meat juicy
 - Quick high temp frying or braising helps to seal in juices
 - Slow cooking used to make tougher cuts more tender
- Depends on **CUT** – Location on animal that muscle came from
 - Example: loin (back muscle) more tender than round (used for walking)
 - Tougher cuts require longer, slower cooking
- Depends on individual taste preference



Discuss Preferences with the Customer

www.integratedhealth.com/infoabstracts/claab.html - abstracts of scientific papers about CLA research studies

www.healthybeef.iger.bbsrc.ac.uk/ - research project to enhance the content of beneficial fatty acids in beef and improve meat quality

<http://www.csuchico.edu/agr/grsfdbef/ben.cla.html> - California State University, Chico College of Agriculture and Univ. of California Coop. extension web site; info on grass-fed beef and CLA's, and references therein

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=201014> – Reprint of article from *Lipids Health Dis.* 2003; 2 (1): 6 – “...CLA vs. saturated fats/cholesterol: their proportion in fatty and lean meats may affect the risk of developing colon cancer”

www.sciencedirect.com/science - reference article by M. W. Pariza, Y. Park, and M. E. Cook, in *Progress in Lipid Research*, 40, July 2001, pages 283-298 – “The biologically active isomers of conjugated linoleic acid”

www.wisc.edu/friclarefs.htm - web site of the University of Wisconsin providing 34 pages of references on CLA

The Stockman Grass Farmer Magazine, Volume 51, No. 7, July 1994, p.1 article – “Kiwis Find USDA Choice is Possible form Grass”

National Cattlemen’s Beef Association Fact Sheet/N 016, 1995 and updated 1999, “Beef Facts: Nutrition Conjugated Linoleic Acid and Dietary Beef – An Update” and references therein

Grass & Forage Science, Volume 58, Issue 1, p. 50, March 2003: article by R. W. J. Steen and M. G. Porter. “The effects of high-concentrate diets and pasture on the concentration of CLA in beef muscle and subcutaneous fat”

Proceedings, 12th Annual Florida Ruminant Nutrition Symposium, Univ. of Florida, 2001: article by L. Badinga and C. R. Staples, “CLA: More Than an Anticancer Factor”

Extension Service West Virginia University: Fact Sheet – Pasture-based Beef Systems for Appalachia, August, 2003: M. S. Whatsell, E. B. Rayburn and J. D. Lozier, “Human Health Effects of Fatty Acids in Beef”

www.askthemeatman.com - a unique meat processing site with many charts, links, and meat for sale

<http://ianrpubs.unl.edu/beef/rp357.htm> - North Central Regional Extension Publication #357 on Quality and Yield Grades

<http://www.grazeonline.com/index.html> - *Graze* is a monthly publication serving graziers.

www.eatwild.com – self-described as “The Clearinghouse for Information about Pasture-based Farming”

<http://www.geneticsolutions.com.au> - Genetic Solutions Pty. Ltd, DNA Marker Testing Co. with proprietary methods for tenderness and marbling testing

www.igenity.com – DNA marker testing for Leptin fat deposition alleles, parent company is Merial.

<http://savell-j.tamu.edu/shear.pdf> - Study of Method for Warner-Bratzler Shear Force Test for Meat Tenderness and Variations in Results due to TM Factors

http://meats.marc.usda.gov/MRU_WWW/Protocol/WBS.pdf - Method for conducting Method for Warner-Bratzler Shear Force Test for Meat Tenderness from MARC

http://meats.marc.usda.gov/MRU_WWW/Protocol/RMC97.pdf - Official protocol for WBSF Test

<http://jas.fass.org/cgi/reprint/74/7/1553.pdf> - Effect of various methods of cooking on WBSF

<http://www.iowabeefcenter.org/pdfs/tendersum/tendersumm.pdf> - Iowa Beef Center Tenderness and Carcass Evaluation Summary

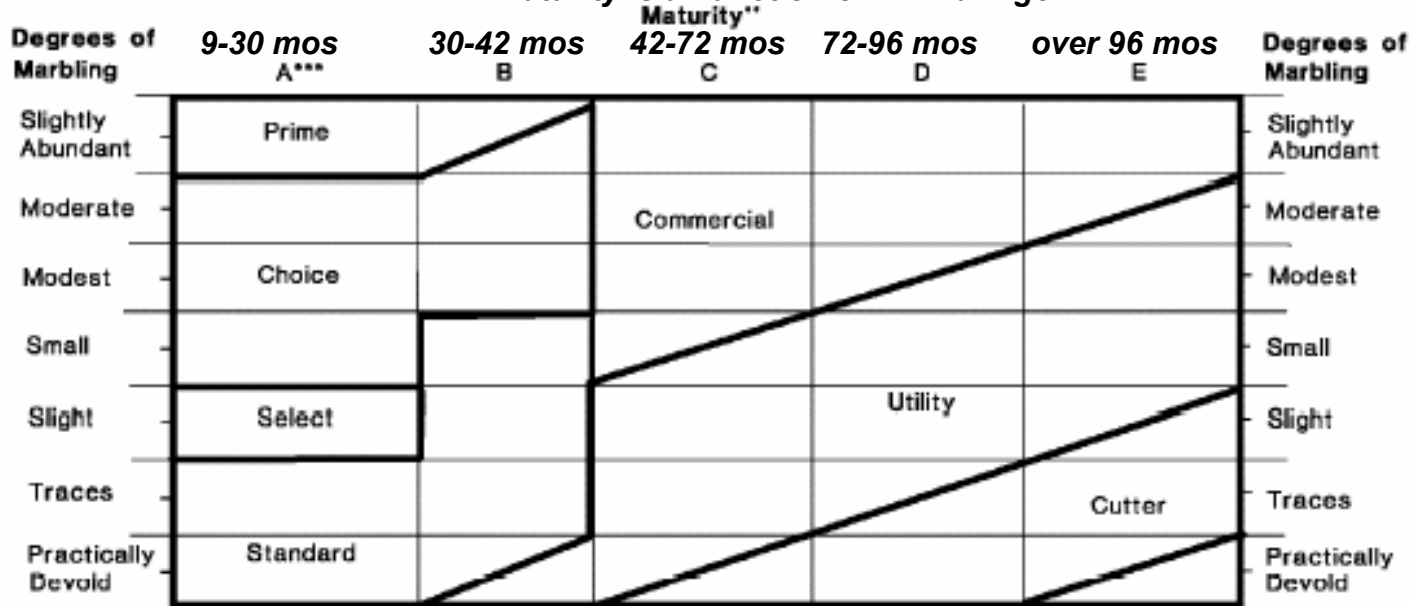
<http://www.ag.iastate.edu/farms/2000reports/western/EffectonMeatQualityofI.pdf> - *Iowa State Univ. Western Res. & Demo. Farm Bulletin ISR F00-10*: report by T. A. Williams and M. P. Hoffman, “Effect on Meat Quality of Integrating Pasturing Systems into Cattle finishing Programs”

<http://www.ams.usda.gov/lsq/stand/standards/beef-car.pdf> - USDA Beef Carcass Manual Standards for Grades

Excerpted from <http://ianrpubs.unl.edu/beef/rp357.htm>

Relationship Between Marbling, Maturity, and Carcass Quality Grade*

Maturity is a Function of Animal Age



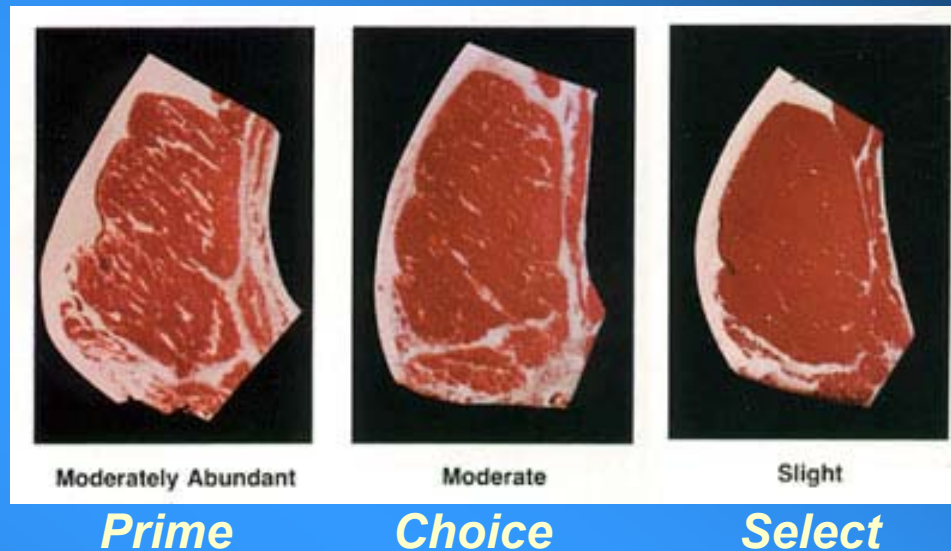
* Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."

** Maturity increases from left to right (A through E).

*** The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

Figure 1

**Beef is Graded for Quality by U.S. Department of Agriculture (USDA)
According to Established Standards, Revised in 1997**



Excerpted from www.askthemeatman.com

Grades are based on the amount of **MARBLING** (flecks in fat within the lean) and the age of the animal.

PRIME contains the greatest degree of marbling (small flecks of fat that are interspersed with the lean muscle, which contributes to tenderness, juiciness and flavor). It is generally sold to finer restaurants and to some selected meat stores. It is usually higher priced because it is produced in very limited quantities.

CHOICE is the grade preferred by many consumers because it contains sufficient marbling for taste and palatability. It is usually less costly than U.S. Prime. Choice falls between Prime and Select.

SELECT has the least amount of marbling, making it leaner than, but often not as tender, juicy and flavorful as, the other two top grades.

These Quality Grades are an Indication of Palatability Characteristics such as Texture, Tenderness, Juiciness, and Flavor

Excerpted from <http://www.ag.iastate.edu/farms/2000reports/western/EffectonMeatQualityofI.pdf>

Table 1. Least square means and SEM of carcass composition and meat eating qualities of steers in year one.

Variable	Treatments						
	Fall born calves				Spring born calves		
	Direct to drylot (1)	Pasture to July 28		Pasture to Oct. 16		Pasture to Oct. 16	
	No ionophore (2)	Ionophore (3)	No ionophore (4)	Ionophore (5)	No ionophore (6)	Ionophore (7)	
Hot carcass wt., lb	747.1 ^a ±13.5	737.2 ^a ±19.1	734.0 ^a ±19.1	670.0 ^b ±19.8	710.0 ^{ab} ±19.1	721.9 ^{ab} ±19.1	733.6 ^a ±19.1
Backfat, in.	0.6 ^a ±0.03	0.5 ^{abc} ±0.1	0.6 ^{abc} ±0.1	0.4 ^{bc} ±0.1	0.4 ^{bc} ±0.1	0.5 ^{abc} ±0.1	0.5 ^{abc} ±0.1
Ribeye area, in. ²	13.1±0.2	12.4±0.3	12.7±0.3	12.4±0.3	12.6±0.3	12.9±0.3	12.9±0.3
Kidney, pelvic, heart fat, %	2.4 ^a ±0.1	2.7 ^{bc} ±0.1	2.7 ^{bc} ±0.1	2.2 ^{ad} ±0.1	1.9 ^d ±0.1	3.0 ^{bc} ±0.1	2.9 ^{bc} ±0.1
Yield grade ^f	2.7±0.1	2.6±0.2	2.6±0.2	2.4±0.2	2.4±0.2	2.5±0.2	2.6±0.2
Quality grade ^g	6.1 ^{ad} ±0.2	6.1 ^{abcde} ±0.2	6.1 ^{abcde} ±0.2	6.7 ^{ac} ±0.3	6.8 ^{bc} ±0.2	5.8 ^d ±0.2	5.5 ^{de} ±0.2
Warner Bratzler shear, kgf ^h	2.3±0.1	2.4±0.1	2.2±0.1	2.5±0.1	2.7±0.1	2.4±0.1	2.3±0.1
Tenderness ⁱ	5.7±0.1	5.4±0.2	5.9±0.2	5.8±0.2	5.4±0.2	5.7±0.2	5.6±0.2
Juiciness ⁱ	5.3 ^{bc} ±0.1	5.1 ^b ±0.2	5.4 ^{bc} ±0.2	5.3 ^{bc} ±0.2	5.2 ^{bc} ±0.2	5.7 ^c ±0.2	5.6 ^{bc} ±0.2
Flavor intensity ⁱ	5.2 ^{bd} ±0.1	5.3 ^{bcd} ±0.1	5.4 ^{bc} ±0.1	5.3 ^{bc} ±0.1	5.0 ^d ±0.1	5.5 ^{bc} ±0.1	5.5 ^c ±0.1
Flavor ⁱ	5.4 ^{bc} ±0.1	5.3 ^{bc} ±0.1	5.5 ^{bc} ±0.1	5.4 ^{bc} ±0.1	5.2 ^c ±0.1	5.6 ^b ±0.1	5.6 ^b ±0.1

^{a,b,c,d,e} Means within the same row with different letters are different, P<0.05.

^fYield grades were called by the USDA Meat Grading Service.

^gQuality grade was converted to a number system: Choice⁺=4; Choice⁰=5; Choice⁻=6; Select⁺=7; etc.

^hWarner Bratzler shear measured by kilograms of force (kgf).

ⁱSensory panel scores based on eight point scale (8=excellent; 1=very poor).

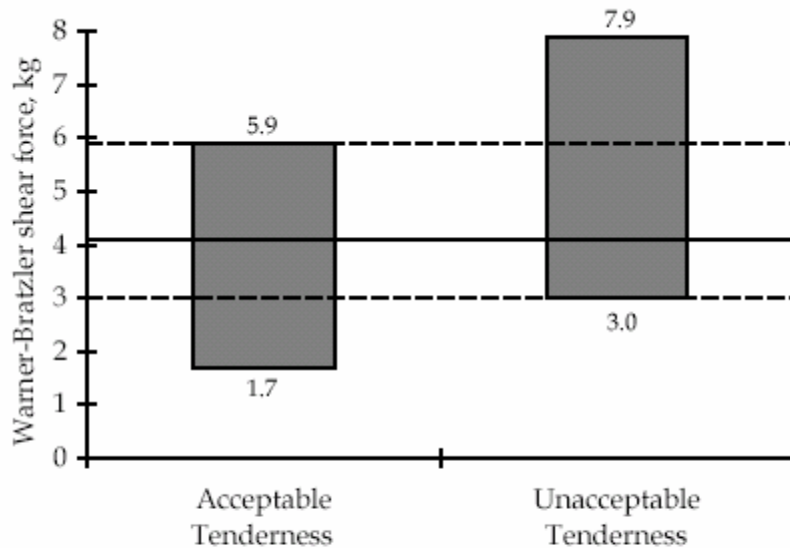


Figure 5. The range in Warner-Bratzler shear force for steaks consumers identified as unacceptable in tenderness and those identified as acceptable in tenderness. The proposed tenderness acceptability threshold was 4.1 kg. Adapted from Huffman et al. (1996).

If WBS value for steak is ≤ 4.1 , then 98% of consumers will rate steak as “Acceptable for Tenderness”

“Palatability” = Overall Acceptability is a function of

- *Tenderness*
- *Juiciness*
- *Flavor*
- *Flavor Intensity*

Huffman, K.L.; Miller, M.F.; Hoover, L.C.; Wu, C.K.; Brittin, H.C.; Ramsey, C.B. 1996. Effect of beef tenderness on consumer satisfaction with steaks consumed in the home and restaurant. *J. Anim. Sci.* 74:91-97.

- Expected Progeny Differences and Estimated Breeding Values not equal
- EBV = estimated value of an individual as a parent and its ability to transmit trait
- EPD = Expected Progeny Difference = 1/2 of the EBV
- EPD's and EBV's Related to Meat Quality
 - REA (EMA), IMF, Carcass Wt., Rib/Rump Fat, Retail Beef Yield, \$Index Values

2004 SUMMER MURRAY GREY GROUP BREEDPLAN EBVS

	Calv. Ease Direct (%)	Calv. Ease Dtrs (%)	Gest. Len. (days)	Birth Wt. (kg)	200 Day Wt. (kg)	400 Day Wt. (kg)	600 Day Wt. (kg)	Mat. Cow Wt. (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calv.	Carcass Wt. (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF %
EBV	-2.6	-0.6	+1.3	+4.6	+20	+35	+49	+54	+5	+0.2	+0.8	+29	+0.7	-0.7	-0.9	+1.1	-0.5
						BLUE BOX = Trait Leader											
Acc	49%	35%	64%	85%	80%	77%	75%	61%	47%	46%	35%	63%	36%	45%	45%	42%	39%
<i>Breed Avg. EBVs for 2002 Born Calves (Click for Percentiles)</i>																	
EBV	-0.3	-1.3	0.0	+2.1	+12	+19	+29	+29	+3	0.0	-0.6	+16	+0.7	0.0	0.0	+0.3	0.0

GROUP BREEDPLAN estimates the breeding values for individual animals (Estimated Breeding Values - EBVs) using all available information on the animal as well as its progeny and close relatives. The calculation of EBVs takes into account the influence of management, environmental effects and the non-genetic effects. GROUP BREEDPLAN provides the best possible estimate of an animal's breeding value, that is, the animal's EBV.

Carcass Weight EBV: is an indicator of the genetic difference in carcass weight at a standard age of 650 days.

Eye Muscle Area EBV: indicates an animal's genetic potential for eye muscle area on a standard 300kg carcass. Sires with relatively higher EMA EBVs are expected to produce better muscled and higher percentage yielding progeny at the same carcass weight than will sires with lower EMA EBVs.

EMA usually called rib eye area (REA) in USA

Rib and Rump Fat EBVs: are indicators of an animal's genetic potential for subcutaneous fat depth on a standard 300kg carcass. Sires with low, or negative, fat depth EBVs are expected to produce leaner progeny at any particular carcass weight than will sires with higher EBVs.

Retail Beef Yield Percent EBV: indicates genetic differences between animals for retail yield percentage in a standard 300kg carcass. Sires with larger EBVs are expected to produce progeny with higher yielding carcasses.

Intra Muscular Fat Percent EBV: indicates genetic differences between animals for intra muscular fat percentage (marbling) in a standard 300kg carcass. Sires with positive EBVs are expected to produce progeny with higher average marbled scores.

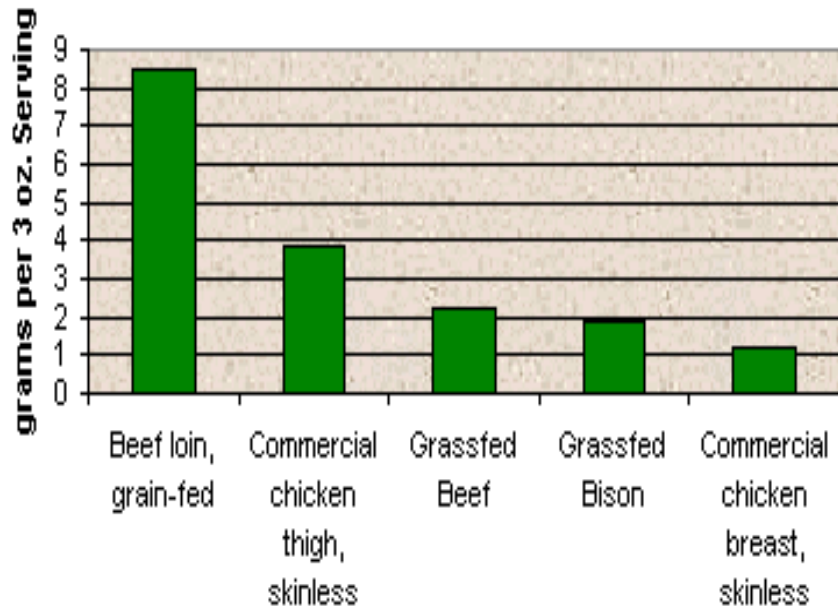
SELECTION INDEX VALUES

Market Target	\$ Index Value	Breed Average
Long-Fed Export Index (\$)	+\$15	+\$18
Super market Index (\$)	+\$24	+\$16

The \$Index describes how each animal is expected to benefit commercial herd profitability when the production purpose is as described. The \$Index is an EBV for profit for performance in the commercial herd. Ranking seedstock on their \$Index sorts them for their progeny's expected profitability for the production purpose chosen.

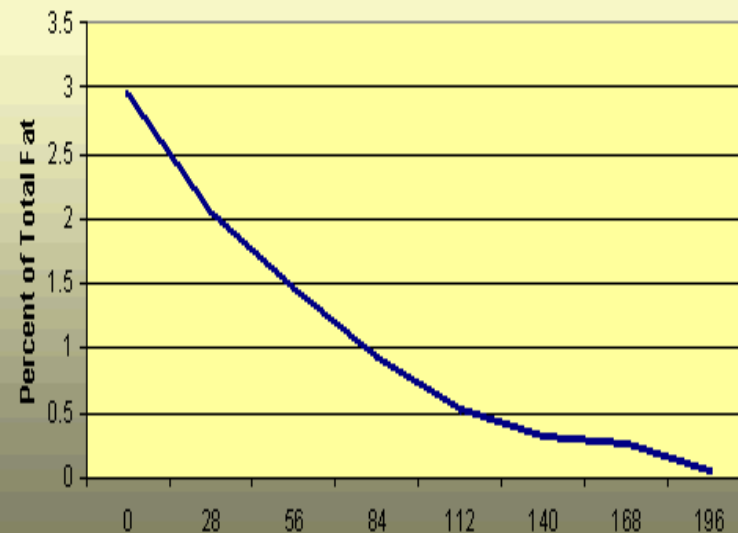
EBV's and reference info from <http://abrl.une.edu.au/online/> and <http://www.murraygrey.com.au/pdf/2003-winter-sire-summary2.pdf>

Total Fat



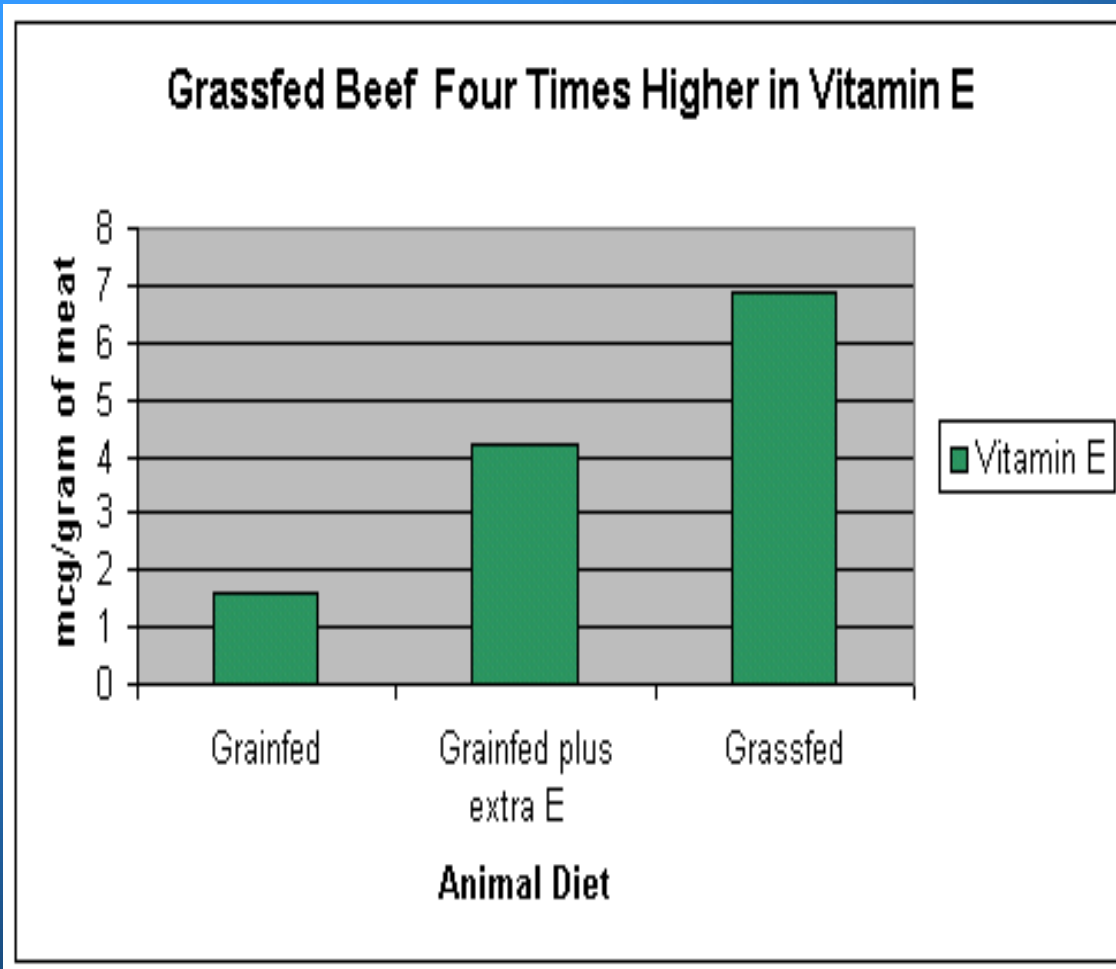
Data from *J. Animal Sci* 80(5):1202-11

Omega-3s Vanish in the Feedlot



Data from: *J Animal Sci* (1993) 71(8):2079-88.

Reference info from www.eatwild.com



Data from Smith, G.C. "Dietary supplementation of vitamin E to cattle to improve shelf life and case life of beef for domestic and international markets." Colorado State University, Fort Collins, Colorado