

The Effect of Finishing Beef on Meat Quality: The Grain vs Grass Discussion



Locally Produced Red Meat
Workshop
6/28/11



The University of Georgia

Meat Science Technology Center – Dr. Alex Stelzleni

THERE IS NO MAGIC BULLET

Questions?

Personal Claim: I don't have a "steer" in the fight, if a consumer is willing to buy it we need someone to produce it!!!



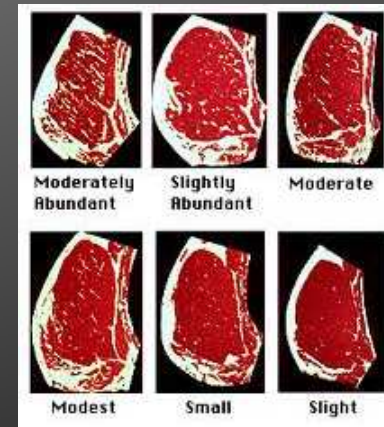


- Grass *vs* grain is not a new concept
 - Scientific literature dates to 1880's
 - Mixed results then and now
 - Focus on color and quality 1920's
- Main issues since that producers deal with
 - Definitions
 - Age of animal
 - Genetics
 - Nutritional composition of diet, others?



Where to start with quality

- USDA-AMS uses qualitative measures
 - Marbling and Maturity (color, firmness, texture)
 - Typically reserved for young beef through “traditional” feeding systems
 - Information is used to facilitate trading and market price establishment
 - Prime (+,-,o), Choice (+,-,o), Select, Standard (+,-)
 - Must pay for service!!!!



So what's the difference?

- Grass finished beef can be USDA graded
 - Large operations may chose this route when marketing through brands
 - Typically not due to...
 - Small packers involved \$\$
 - Lower fat levels and greater maturity levels
 - Not concerned with pricing beef on commodity market
 - Quite frankly most consumers don't understand USDA Grading anyway



So how is quality defined for small/local grass fed operations?

- Consumers of grass finished beef tend to have a non-USDA definition of quality
- It's an IDEOLOGY
 - They judge quality based the *story* and keywords
 - Grass fed
 - Local, Natural, Organic
 - Hormone, Antibiotic Free
 - Sustainable
 - Do they understand these terms, and...



...will they pay?



- We will look at this more in a minute
 - Typically not as cost conscious
 - Say they are willing to pay premiums above Ch
 - But saying and doing are two different things
 - Typically don't have beef as the central protein option
 - Per person consumption is typically lower than average (cost, perceived health, other)





Production Claims

- **Organic** - www.ams.usda.gov/AMSV1.0/nop
 - Not going to spend much time here due to regulations, time and cost
 - Most start “natural” with other third party claims and convert over time if market signals are there
 - Does this mean
 - Grass fed
 - Grass finished
 - Locally produced



Natural

- USDA Natural – not consumers' view
 - Minimally processed, no preservatives or artificial ingredients
- Consumer view is aligned with branded claims
 - Must be verified
 - No antibiotics given*, vegetarian diet, no ADDED hormones, may have welfare standards (*The Story*)
 - Does this mean
 - Local
 - Grass fed



Locally Produced

- What is locally produced
 - To you
 - To the consumer
 - What is the region
 - Community, miles, state, multi-state
 - Many say 500 miles, DC, STL, West Palm, NOLA
 - What does it mean
 - Grass fed
 - Grain fed
 - Hormones
 - Antibiotics
 - Welfare
 - Natural/Organic



Grass-fed/Finished

- Aren't most beef cattle grass fed?
 - What kind of grass
 - Time of year
 - Drought
 - Supplementation
 - Age/Weight
 - True consumer desire
- Does this mean...
 - Local
 - Natural
 - Organic
 - Hormones
 - Antibiotics
 - Welfare



Problems defining grass-fed/finished

- **Grass (Forage) Fed** – Grass and forage shall be the feed source consumed for the lifetime of the ruminant animal, with the exception of milk consumed prior to weaning. The diet shall be derived solely from forage consisting of grass (annual and perennial), forbs (e.g., legumes, *Brassica*), browse, or cereal grain crops in the vegetative (pre-grain) state. Animals cannot be fed grain or grain byproducts and must have continuous access to pasture during the growing season. Hay, haylage, baleage, silage, crop residue without grain, and other roughage sources may also be included as acceptable feed sources. Routine mineral and vitamin supplementation may also be included in the feeding regimen. If incidental supplementation occurs due to inadvertent exposure to non-forage feedstuffs or to ensure the animal's well being at all times during adverse environmental or physical conditions, the producer must fully document (e.g., receipts, ingredients, and tear tags) the supplementation that occurs including the amount, the frequency, and the supplements provided.

USDA Voluntary Grass
Fed/Finished Standards
(2007) 7CFR part 62



Quality Truths

- No matter what consumers use to define quality, there are some inherent truths that affect quality perceptions
 - Tenderness
 - Juiciness
 - Color
 - Flavor
- Highly influenced by
 - Age, fat, genetics, and diet



Eating Satisfaction

RELATIONSHIP BETWEEN MARBLING, MATURITY, AND CARCASS QUALITY GRADE ¹					
DEGREES OF MARBLING	MATURITY ²				
	A ³	B	C	D	E
Abundant					
Moderately Abundant	PRIME				
Slightly Abundant				COMMERCIAL	
Moderate					
Modest	CHOICE				
Small				UTILITY	
Slight	SELECT				
Traces					
Practically Devoid	1 : 2			CUTTER	

¹Assumes that firmness of lean is completely developed with the degree of marbling and that the carcass is not a "dark cutter."

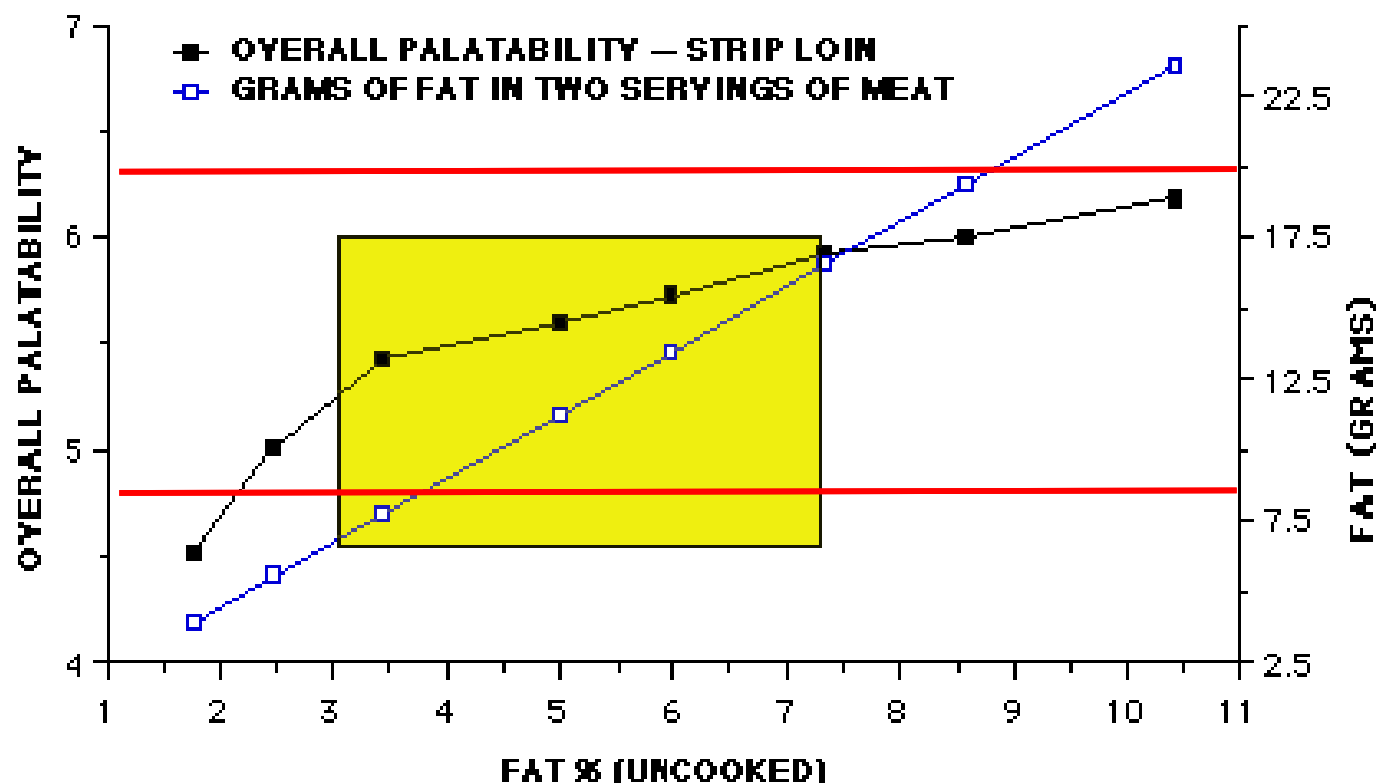
²Maturity increases from the left to right (A through E).

³The A maturity portion of the figure is the only portion applicable to bullock carcasses.



Fat and Acceptability

WINDOW OF ACCEPTABILITY FOR FAT IN MEAT PALATABILITY VERSUS GRAMS OF FAT (TWO SERVINGS)



SAYELL, J.W. AND CROSS, H.R. (1988). THE ROLE OF FAT IN THE PALATABILITY OF BEEF, PORK AND LAMB. NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC.



Grain vs Grass on Quality

- Lots of data
- Very contradictory through the years
 - Diet, location, age ect
- Will discuss major trends instead of individual studies

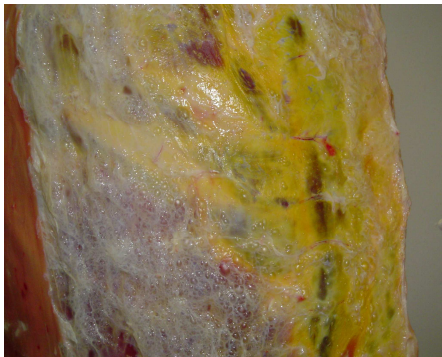


Fat



- Grain has more total per serving
 - Saturated =, mono ↓ in grass, poly ↑ in grass
- Grain have greater USDA QG
 - Age issues as well
- A lot of consumers say they want less fat for health reasons (cholesterol =)
 - After cooking tend to pick product with more fat
 - Fat isn't bad, HDL, hormone production, taste





Fat

- Do all beef fatten as they get older or is this a nutrition issue as well?
- Can beef be grass fat?
- Yellow fat in grass, consumer implications
- Controlling issues
 - Breed (within breed), Nutrition



Health and Fat

- Grass has more favorable n6:n3 and higher CLA per 100g of fat, but... (Grass = 1.0g/100g, Grain = 0.6g/100g CLA)
 - Fish oil is a much better source of n3 than any beef product (35x more)
- 3.6g CLA for biological effect, grass has less fat, most studies say 60% but we will use 50% for ease (Parodi, 1997; Sugano et al., 1998)
 - 1 serving is 85g, NCBA lean cuts range from 4-10 g/85g, we will use 10g for grain finished for benefit of the doubt
- To get 3.6g CLA from beef with 10g/serving of grain fed you would have to consume **9.66 pounds of beef/d**
 - For grass finished (assuming 10g/serving) you would have to consume **6.38 pounds/d**
 - CLA is a fat and only found in fat, therefore if we go with a verified claim of 50% less fat in a grass fed steak (5g/serving) you would have to consume **12.76 pounds/d** to get the same CLA from 9.66 pounds of grain fed
 - Most verified claims are actually around 2-4g/serving in grass fed



Color



- Grass tends to be darker in color
 - Age and myoglobin issue
 - Animals of same age fed grass or grain tended to be similar in color for Strip steaks
 - Fed to same weight grass was older and darker
- Fat was more yellow in grass fed
 - Yellow fat has been highly correlated to tenderness and juiciness issues, why?



Shelf-life

- Highly dependant on forage type/quality
 - Forages have antioxidants in them (tocopherols)
 - Depending on forage, limited oxidation
 - Dried/older forage has less available tocopherols
 - Grass has more PUFA, susceptible to oxidation
 - Darker color turned consumers away in side by side comparison
- Feed Vit. E to grain or co-product fed beef
- Non-issue with vacuum packaged product



Tenderness

- When fed to similar age, tenderness not as much of an issue, similar weight favors grain
 - Connective tissue effects
 - Fat effects (perceptions)
 - Breed can have large impact
- Sensory
 - Cooking can be a major issue
 - Med-rare similar, med to WD grass less tender



Juiciness

- In non-marinated samples grain tended to be juicier
 - Higher fat content, acts like insurance
 - Increases mouth feel
- Grass fed, lower fat higher moisture
 - Slightly overcooking removes moisture
 - Feels drier, less tender
 - Have to watch closer, no diff. in enhanced steak



Flavor

- THE REAL ISSUE
- Most say more off-flavor and gamey flavor in grass fed
- High quality forage reduces this effect (Larick et al)
 - High quality forage then poor hay will have bad effect, high quality during finishing phase
- ~90 d supplementation greatly reduces (even in 6 yr old cows)



Flavor

- Poor input equals poor end product
- Fat has big influence (specie flavor)
- Dried forage, wild garlic, onion, draught, age ect add to problem
- What is the consumer used to
 - Most people prefer the flavor they remember
 - How much beef do they eat



Proper Cooking Helps!!!

- Grass fed beef
 - Marinate with spice for flavor, acid for tenderness, oil for lubrication
 - Use a fork or Jaccard to help tenderness
 - Do not over cook, actually may need to cook to slightly rarer degree than used to
 - Don't put a cold steak on the grill



The Consumer

The following is a partial summary from Dr.
Curt Lacy, UGA-Tifton

Used Georgia and South Carolina consumers

Full document can be found at:

<http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5064925>

Or go to www.ams.usda.gov and search Curt
Lacy

Steers were fed grass or grain (corn) until similar
weight



The Consumers

- 225 participants
- 57% Female
- 79% White
- 41 yrs of age, some college (average)
- 59% married
- 85% single income
- Mean income HH \$40,000 – 49,999
- 1.85 adults in HH
- 38% children under 18 in HH
- 1.5 children/HH



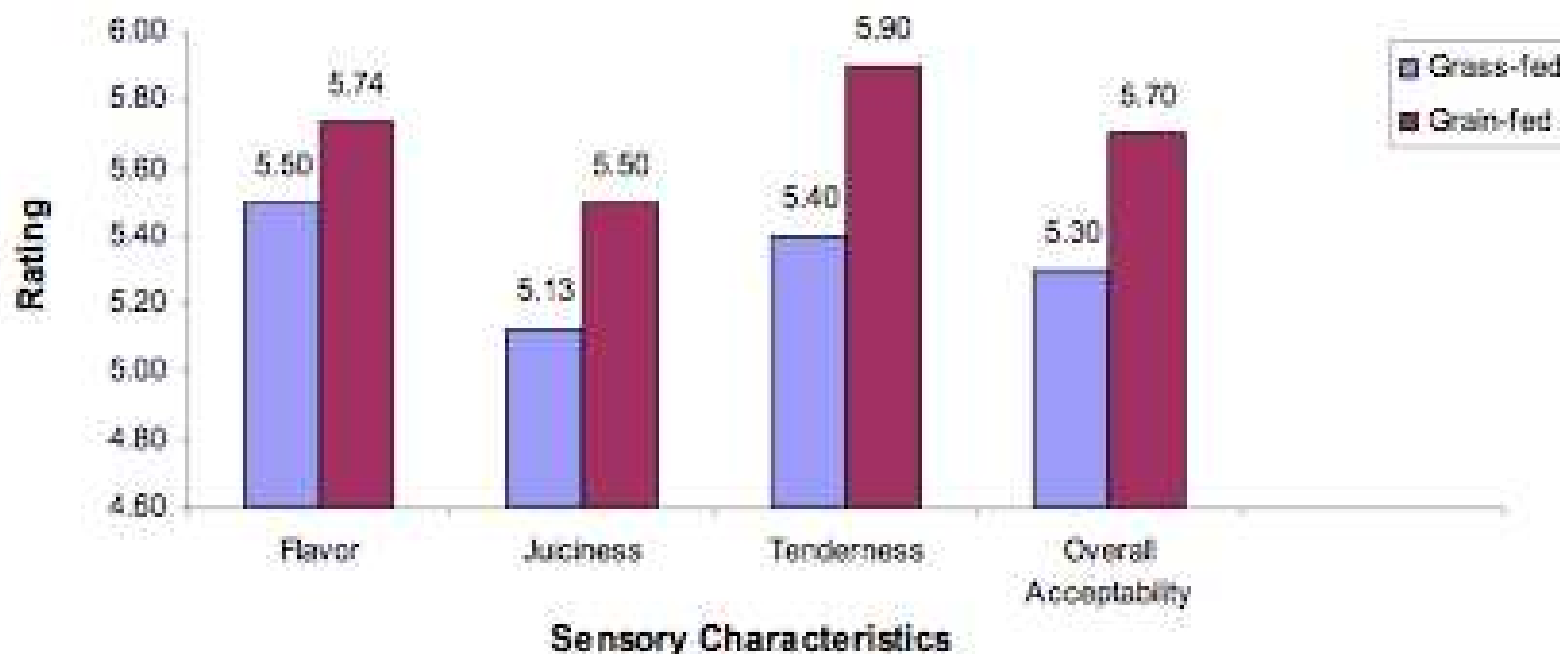
The Data

- Sensory panel
- Willing to pay auction
 - 6 auctions with varying information
- All steaks were paired with WBS so panelists ate similar samples at all times
- Attributes of concern to consumers
- Willingness to pay for known attributes



Sensory Traits

Figure 1. Average Taste Panel Ratings for Grass-fed and Grain-fed Beef Steaks Experimental Auction Procedures.



*Significant difference for all traits ($P < 0.05$)



Panel 1 & 2

- WTP Blind taste test – No info, similar QG & WBS

Table 2. Average GRASS Bids, GRAIN Bids, and *GrassPremiums*.

	Standard				
	Mean	Deviation	Minimum	Maximum	N
PA1: Taste Tests					
GRASS BID	4.141	2.060	0	10	213
GRAIN BID	4.336	2.154	0	10	213
AVERAGE <i>GrassPremium</i>	-0.194	1.818	-6	10	213
Average <i>GrassPremium</i> bid by GRASS-Preferring Consumers (35.7%)	0.543	1.161	0	10	213
PA2: Taste Tests					
GRASS BID	4.089	2.200	0	12	213
GRAIN BID	4.446	2.301	0	15	213
AVERAGE <i>GrassPremium</i>	-0.357	2.006	-10	7	213
Average Premium for GRASS bid by GRASS-Preferring Consumers (36.6%)	0.491	1.006	0	7	213



Panel 3

- Visual WTP – No info, similar QG

containers. The steaks in each pair consisted of a GRASS and a GRAIN steak of similar USD/Quality grades. In the first visual paired auction, Paired Auction 3 (PA3), no information was provided – consumers only visually evaluated and bid on the steaks in the clear over-wrapped containers. Thus, in PA3 consumers were not told of any possible differences between the two steaks.

PA3: Visual Evaluations with No Information

GRASS BID	4.615	2.086	0	10	213
GRAIN BID	5.021	2.080	0	12	213
AVERAGE <i>GrassPremium</i>	-0.409	1.656	-9	5	213
Average <i>GrassPremium bid</i> by GRASS-Preferring Consumers (37.1%)	0.421	0.762	0	5	213



Panel 4

consumers were informed that both steaks were USDA inspected and that the GRAIN steak was *"Corn-fed beef, USDA inspected"* while the GRASS steak was *"Natural, Grass-Fed Beef, raised without supplemental hormones or antibiotics; traceable to the farm where it was produced; and USDA Inspected."*

PA4: Visual Evaluations with Production Information

GRASS BID	5.132	1.993	0	11	213
GRAIN BID	5.092	1.978	0	12	213
AVERAGE <i>GrassPremium</i>	0.041	1.719	-6	5	213
Average <i>GrassPremium</i> bid by GRASS-Preferring Consumers (53.1%)	0.678	0.932	0	5	213



Panel 5

In the third paired visual evaluation, Paired Auction 5 (PA5), consumers were given the following *additional* health information about the GRASS beef steak: “62% lower in fat content than Corn-fed beef, 65% lower in saturated fat than Corn-fed beef, Greater concentrations of Omega-3 Fatty Acids and Conjugated Linoleic Acid (CLA’s).” The omega-3 fatty acids and

PA5: Visual Evaluations with Production and Health Information

GRASS BID	5.724	2.169	0	13	213
GRAIN BID	5.055	1.909	0	10	213
AVERAGE <i>GrassPremium</i>	0.669	1.873	-6	7	213
Average <i>GrassPremium</i> bid by GRASS-Preferring Consumers (62.9%)	1.100	1.297	0	7	213



Panel 6

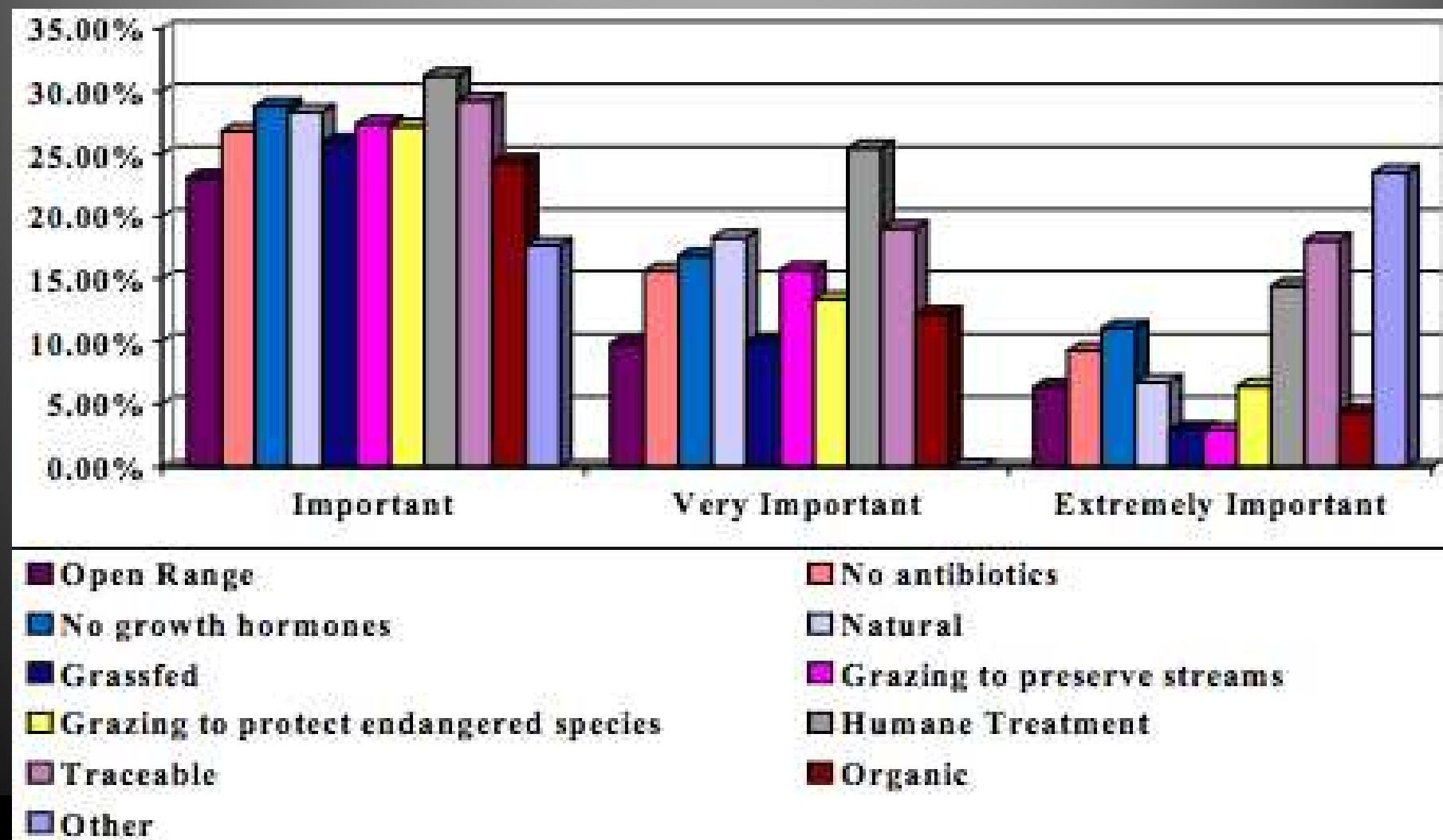
provided with a pair of steaks to taste using methods similar to those in PA1 and PA2. However, consumers were also provided with complete information regarding the production practices, traceability and health information relevant for each steak, similar to PA5. Furthermore, the steaks they tasted were from the same strip loins as those visually evaluated in PA5. Thus, while tasting the steaks, consumers were again shown the steaks and reminded of the information that matched each steak. Therefore, in this final evaluation step consumers bid on steaks after both visual and taste evaluation and with all available information.

PA6: Visual Evaluation, Production, Health Information and Taste Test

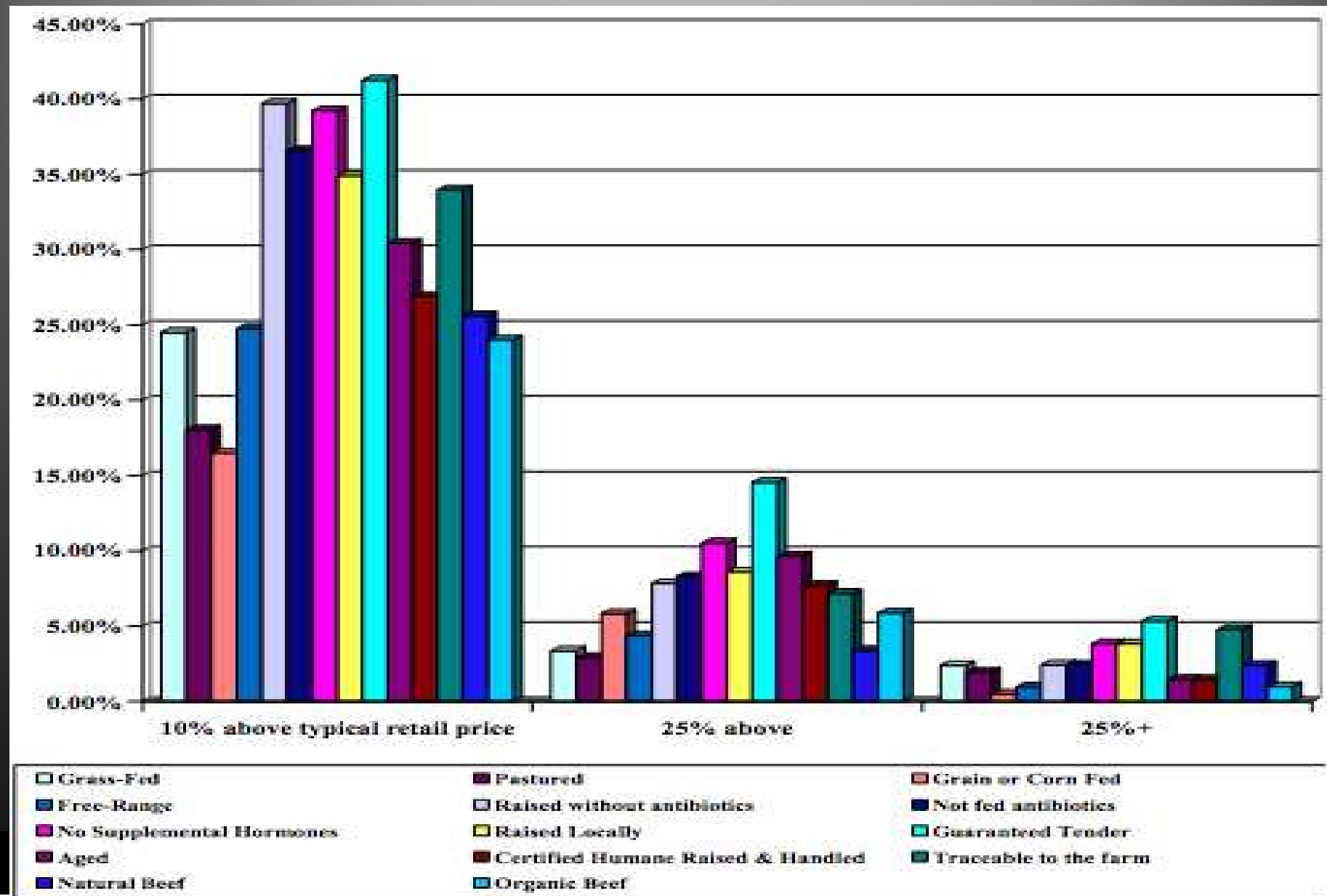
GRASS BID	5.196	2.153	0	11	213
GRAIN BID	5.162	1.960	0	11	213
AVERAGE <i>GrassPremium</i>	0.034	1.866	-10	8	213
Average <i>GrassPremium</i> bid by GRASS-Preferring Consumers (46.0%)	0.668	1.094	0	8	213



What's Important to Consumers



WTP for Claims



Grass vs. Grain

- It takes ~16% premium for grass over grain to be profitable (Lacy 2007, Berthiaume 2006)
 - Not everyone will pay this, but approx. 30-45% might pay some premium
- What matters
 - Age
 - Nutrition
 - How to prepare
 - Genetics
 - Taste (flavor, tenderness)
 - Production claims



Questions?

- Stay away from the internet for information
- It is up to you properly and truthfully educate your consumers

