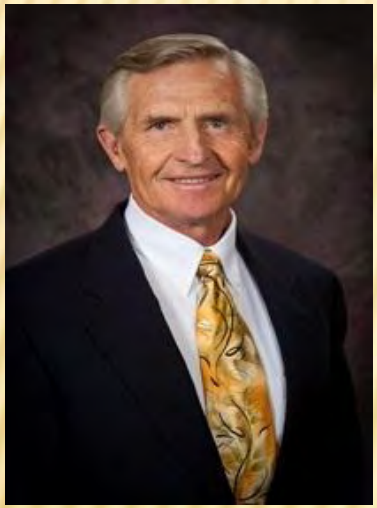
GENETICS AND MANAGEMENT OF LIVESTOCK PRODUCTION TO MEET WORLD FOOD DEMAND FOR 2025



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See handout for Speaker Bios

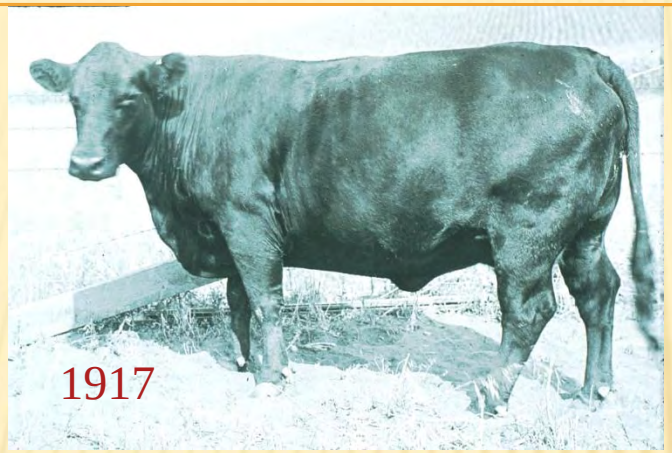
PRIMARY PURPOSE OF PRODUCING CATTLE

- To convert grass, forages, and various by-products, plus some human-edible protein and energy, into high protein, highly nutritious, tasty beef.
  - Beef should be safe, affordable, attractive, nutritious, and highly palatable
  - Carcasses should yield a high percentage of meat
  - Both cattle production and beef processing must be profitable, sustainable, and socially responsible

K·STATE
Research and Extension

CHANGE


1839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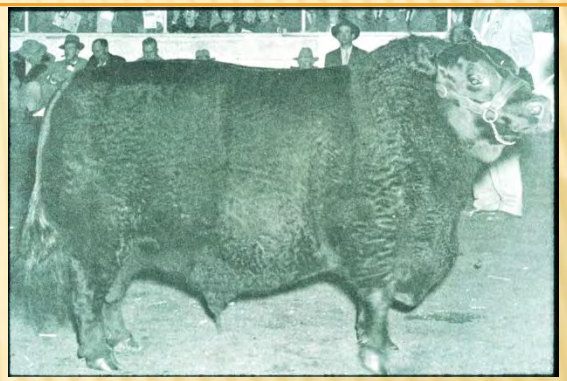
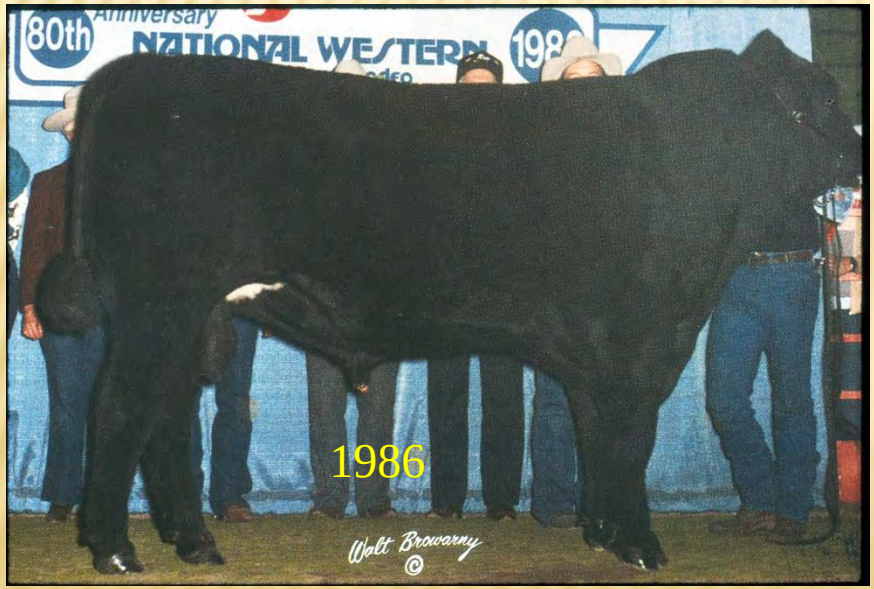

1950


80th Anniversary
NATIONAL WESTERN
1986
Walt Browarny ©


Christy Collins
2000

2011 DROUGHT EFFECTS

- Severe drought and heat of 2011 → long lasting effects on beef cattle production
- A dramatic reduction in cow numbers & only modest retention of heifers has resulted in decreased breeding herd numbers to 1950's level
- And, the drought might not be over! Grass has been significantly damaged.
  - Convert to "drought" stocking rates

FUTURE LAND AND FEED RESOURCES FOR CATTLE

According to Joyce Turk, Bureau of Food Security, US AID:

- To sustainably feed a growing population to 9 billion by 2050, resources of water, fossil fuel, and grain must be used more efficiently
- Global land area available for grazing livestock is close to its biological limit, putting pastoral systems under pressure

WORLD FOOD SUPPLY AND LIVESTOCK PRODUCTION

- Nearly 1 billion people are starving, malnourished, or ‘food insecure’
- Livestock production is critical to food security & livelihood of world’s population
  - Might be more important in the poorest countries.
- Livestock sector employs 1.3 billion people, either directly or indirectly, and responsible for up to 50% of global agriculture GDP. (Joyce Turk, U.S. AID)

DEMAND FOR HIGH QUALITY BEEF

- Demand for "high quality" beef <u>increased</u> during the current economic recession (Scott Brown, Univ. MO; John Stika, CAB)
- Brown: Potential for significant industry expansion **if** more herds produce "Premium Choice" or Prime beef.
  - **If** producers do <u>not</u>, recovery might be modest (< 2 million head increase in 5-6 years)
  - **If** they <u>do</u>, ≈ 4 million head increase in 5-6 years
- Could mean "a 10% increase in overall demand for beef" and long term expansion

GENETIC IMPROVEMENT OF MEAT YIELD AND QUALITY

- Too much emphasis is placed on attaining ‘premium’ marbling by feeding cattle to undesirable fatness levels
- Angus, Simmental, and some other breeds have EPDs for fatness, marbling, and ribeye area; the Simmental breed also has EPDs for WBSF
- These traits are moderately high in heritability!
- Selecting for these EPDs allows for management of the genetic antagonism between % meat yield and marbling

AI SIRES EXCELLING IN BOTH MUSCLING AND MEAT QUALITY

- Example of 2 Simmental sires in 2 major AI studs:
  - Sire #1 = top 1% Marbling, Ribeye, and WBSF
  - Sire #2 = top 1% Marbling, top 5% for Ribeye, and top 10% for WBSF
  - Both = above average Growth Rate; Top 2% for All Purpose and Terminal Indexes
- Based on traditional EPD calculations without DNA information incorporated

ANGUS SIRES EXCELLING IN BOTH MUSCLING AND MARBLING

- One AI sire has EPDs of +1.3 of a marbling score, +0.6 in^2 for ribeye, and -0.04 in. for fat thickness
- Another sire has EPDS of +0.8 for marbling, +0.7 for ribeye, and -0.04 in. for fat thickness
- However, the genetic range for fat thickness for about 99% of ≈ 400 Angus sires in major AI studs is -.04 to +0.08 in. = only 0.30 of a yield grade difference
  - Breeders generally have not emphasized fat thickness

U.S. CONSUMER DEMAND FOR BEEF

- Record high prices for feeder cattle are great for cow-calf producers, but not feedlots and beef processors (Dr. Mike Sands, Informa Economics, Inc.)
- A significant proportion of feedlots are running at 62-75% capacity. Not sustainable!
  - In 2012, several weeks of $100+ losses/head
- Possibly 1 or 2 beef processing plants could close
- Beef reached **record retail high $5.09/lb** in January
  - With high unemployment and recession, consumers' budgets are strained
  - Consumers have/will shift away from beef

FUTURE OF BACK-GROUNDING GOOD CATTLE ON FORAGE?

- Some research shows that months of back-grounding before grain finishing can be somewhat negative toward marbling deposition
- Forage is extremely short in a significant portion of the US because of recent droughts
- An increase in cow numbers will require a significant portion of available grass and forage to be used by cows, not backgrounding

NCA "WAR ON FAT"

- In late 1970s, NCA emphasized the industry needs to "win the war on fat"
- > 30 years later, the industry is <u>not</u> winning
- Upper yield grade 3 carcasses have ≈ 24% fat trim, depending on trim level
- "Premium Choice" programs allow yield grade 4 carcasses (≈ 28% fat trim)
- Too many cattle breeders and/or breeds have not been responsible for genetic improvement of meat yield **and** marbling

MEAT YIELD VALUE DIFFERENCES

- Feeding cattle to YG 3+ and YG 4 endpoints is not efficient
- Instrument grading can accurately predict % meat yield
- But, meat yield data typically not used for premiums and discounts
  - The industry continues to use the 'crude' yield grade system, with only 'token' premiums for YG 1s and 2s
  - Using an $180/100 lb base price and 3.5% meat yield difference, here can be up to $16/100 lb difference between a typical YG2 and YG3 carcass
  - For 850 lb. carcasses of the same quality grade → $136 difference in total value.
- Premiums and discounts based on **% meat yield** differences would be a **'milestone'** for the industry

CATTLE BUYERS: "FEED 30 MORE DAYS"

- U.S. MARC Cycle IV data (Wheeler et al., 1997) from different biological types of 'calf-fed' steers used for illustration
- Feeding 30 more days (after 426 days of age) resulted in a net decrease of 2% retail product because of increased fat trim
- Resulted in an 8% increase in % Choice (62 to 70%) for all breeds combined
  - 6% for *Bos indicus* (48 to 54%) and 10% for Hereford, Angus, Shorthorn (76 to 86%).

ECONOMICS OF FEEDING 30 MORE DAYS?

- I assumed 100 cattle gained 100 lb. live weight that cost $125 (10% higher than prior to 426 days)
- I assumed 75 lb carcass gain.
  - Cattle gained 37 lb. fat; 32 lb. meat
- I assumed 65% base meat yield and wt. of 850 lb
- Value of 32 lb. meat + choice white grease = $104. Minus $125 cost of gain = <$21/head>
  - for 100 cattle = <$2,100>
- Using a generous $10 spread, 8% more Choice = +$85/carcass for 8 cattle = $680
- <$2,100> + $680 = <$1,420> for 100 cattle

ECONOMICS OF CHANGING GENETICS?

- What if the 100 cattle had genetics for equal % Choice AND increased meat yield and no extra fat?
- Using efficiency of energy utilization for lipid deposition of 0.75 and 0.20 for protein deposition results in ≈ 1.72 times more muscle deposition than fat deposition on the same amount of energy
  - 1.72 x 37 lb. = 63 lb.
  - 63 lb. of muscle replaced 37 lb. of fat
- = net increase in value of $60.85/carcass, or **$6,085** for the pen
- Producers need to be rewarded!

TECHNOLOGY IN BEEF PRODUCTION

- Implants are very cost effective for improving efficiency
  - They need to be used properly!
- Optaflexx™ is used rather widely to improve production efficiency and has no negative effect on meat quality when used as recommended
- Zilmax™ is more aggressive and distinctly improves production efficiency, but **must** be used properly to avoid negative effects on marbling and tenderness
- Technology + genetics!

ROLE OF NUTRITION ON MARBLING

- Three studies show some improvement in marbling by not supplementing finishing diets with vitamin A during last 120-150 days on feed

ROLE OF NUTRITION ON MARBLING DEVELOPMENT

- Clinton Krehbiel - Effects of Nutrition and Management During the Stocker Phase on Marbling
- Brad Johnson, and Stephen Smith - Role of Fatty Acids in Enhancing Marbling Development

TENDERNESS ASSURANCE

- USDA AMS developed:
  - “Standard Practice for Verifying Tenderness Marketing Claims Associated with Beef Cuts” (based on WBSF or SSF)
- Categories of:
  - “USDA Certified Tender”
  - “USDA Certified Very Tender”
- Should be very beneficial to the industry

NATIONAL BEEF TENDERNESS SURVEY 2010-11

- 10-point scale; avg. ≈ 6
- Is a score of 6 out of 10 encouraging?
- A score of 6 out of 10 would <u>not</u> earn a faculty salary increase or a promotion!

Cut	Overall Like/Dislike	Tenderness Like/Dislike
Top blade	6.4	6.8
Ribeye , bnls	6.3	6.2
Ribeye, bone-in	5.9	6.1
Top Loin	6.1	6.2
T-bone	5.9	5.8
Top Sirloin, bnls	5.7	5.6

NATIONAL BEEF TENDERNESS SURVEY (2010-2011)

- 36% of beef was aged less than 14 days (double from 2005-06)
- The industry should “sell no beef before its time”!

Beef Flavor

BEEF FLAVOR

- Beef often is the “celebration” meat because of its excellent flavor
- Highly marbled beef was recently described as having a “buttery” flavor (great for me!)
- 2012 NCBA winner of National Food Service Beef Backer Award serves ‘premium Choice’ beef, but does not serve butter!
  - Retail sales of butter ≈ ½ of margarine sales
- What flavor descriptors best promote the excellent flavor of beef?

‘LEAN’ BEEF IN A HEALTHY DIET

- There is somewhat of a conflict between producing high marbling through long feeding versus ‘lean beef’ in a healthy diet.
- Does this further emphasize the need for a “Retail target” that is guaranteed tender, AND a “White table cloth” target for ≥ “premium Choice”?
- Retail sales of beef is by far the largest

SUMMARY

- For sustainability, beef production must be economically efficient, be 'socially responsible', and provide a high quality product
- Use of by-products and proper use of technology will be essential
- Reduction of waste fat must happen
- Sufficient marbling and 'guaranteed tenderness' will be vital
- There is great opportunity for beef production and processing in the future!!

CONCLUSIONS

- Great opportunity to increase meat production, mostly because of increased population
- Cow herd expansion will require additional grass, forages, and by-products = less used for back-grounding feeder cattle (?)
- Genetics, nutrition, and technology must 'compliment' each other
- Tremendous opportunity for cattle expansion **IF** the industry uses genetics, nutrition, and technology **'Optimally'**

THANK YOU FOR YOUR ATTENTION!