

Taking A Second Look at *Crossbreeding: Considerations and Alternatives in an Evolving Market* Nevil Speer¹

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Introduction

The primary intent behind publication of the white paper entitled, *Crossbreeding: Considerations and Alternatives in an Evolving Market* (Speer, 2011), was to examine the prevailing decision-making process regarding genetic inputs within the commercial cow/calf sector.

Part of that endeavor included outlining key advantages associated with crossbreeding: “Research has clearly and repeatedly demonstrated benefits associated with implementation of crossbred mating systems in various production systems. Simply put, crossbred animals outperform their straightbred contemporaries. Moreover, those principles are underscored by similar outcomes in other species of livestock...producers weaning crossbred calves nursing crossbred cows typically realize an improvement of 10% to 20% in weaning weight. Moreover, realization of that crossbreeding advantage doesn’t require much in terms of additional inputs—thus summoning [the] ‘free lunch’ caricature.”

Despite those well-documented benefits of crossbreeding, cow/calf producers have seemingly deemphasized execution of breeding decisions that facilitate heterosis within their respective operations. That development is somewhat counterintuitive given the prominence of educational efforts around crossbreeding from various outlets including academia and breed associations.

The inference being that commercial producers are seemingly prioritizing factors separate from heterosis when making genetic investments for the cowherd. As such, the purpose of the white paper was clearly delineated as an endeavor, “...to explore some possible explanations for those broader genetic strategies within the U.S. cowherd...”

Meanwhile, the paper also possessed a final take-away suggestion for the cow/calf sector to carefully review all management and marketing decisions per the following: “...beef producers are encouraged to comprehensively consider relationships around traits of economic importance within the context of current market signals. Doing so will facilitate both effective selection and mating strategies to enhance operational profitability.”

Unfortunately, some of those more important points have been lost in the broader discussion that’s ensued since release of the white paper. Specifically, some voices have wanted to characterize the analysis as a primer for “debate” about the most appropriate path for the beef industry’s commercial sector. Much of that has been framed as a crossbreeding versus

straightbreeding deliberation. However, that's somewhat misplaced given the increasing complexities within the beef industry's production sector.

That is, the commercial industry remains highly fragmented with widely diverse operating priorities. That's especially true when considering an increasingly differentiated, value-driven marketing system. Therefore, when matching management and marketing, a one-size-fits-all genetic solution is likely inappropriate for producers – especially when considering the industry's growing number of differentiated marketing targets. Given that reality, the intent here is to take a second look at some factors that may further illuminate the decision-making process within the commercial sector since the initial white paper was released.

Review

As alluded to previously, *Crossbreeding: Considerations and Alternatives in an Evolving Market* outlined that many producers are not fully taking advantage of the benefits of heterosis. For example, respondents to surveys performed by *BEEF* magazine (2010) reveal that nearly half of all producers classify the genetic composition of their cowherds as being high-percentage or straight British. That's further reinforced by various industry estimates that the cow/calf sector is now predominately comprised of Angus genetics, accounting for upwards of 70% of the genetics in the nation's commercial beef production system.

The white paper covered a number of different topics that are currently influencing the business and the corresponding decisions made by commercial producers. Chief among those items included the following:

- Increasing demand for, and subsequent emphasis upon, beef quality
- Increased prevalence of value-added programs
- Cowherd consolidation
- Retained ownership
- Time / labor management priorities
- Relative ease of implementing crossbreeding
- Realization of benefits of crossbreeding

The objective here is not to review nor rehash those considerations. Rather, most important is a fresh look at additional factors influencing cow/calf producers regarding management of their breeding programs and genetic strategies.

Reproduction / Longevity

The benefits of crossbreeding have been well documented – heterosis enables additional opportunities (beyond usage of additive breed effects and breed complementarity) to increase efficiency of commercial beef operations. One of the greatest advantages is derived from improved reproductive performance and subsequent longevity of the beef cow. (The

reproduction / longevity relationship inherently assumes many operations cull cows upon realization of pregnancy failure - more on that aspect below.) Parish (2012) aptly describes this phenomenon:

“The greatest improvements in using crossbred dams rather than straightbred dams involve reproductive traits. Higher reproductive rates, longer productive lives (by more than 1 year), and less frequent replacement need are documented advantages of crossbred cows over straightbred cows. In addition to having more calves because of improved reproduction, cross bred cows tend to have greater calf survival rates and greater calf weaning weights.”

Given that background, the assumption would be the nation’s beef cow reproductive performance has diminished in recent years concomitant with reduced heterosis. That’s a difficult item to monitor given the complexities associated with measuring reproductive performance (other than pregnancy status) and limited amount of meaningful data regarding reproductive proficiency (including results from pregnancy checking). For example, even among larger operations (those greater than 500 cows) only about half normally pregnancy test cows; less than 20% of the nation’s cows across all operations are regularly checked for pregnancy status (USDA:NAHMS, 2009a).

Despite the deficit of information, industry-wide data may provide some insight into broader reproductive performance over time. More precisely, if reproductive performance has worsened, resultant of reduced hybrid vigor in the cowherd, there should be a corresponding shift in herd performance and/or management strategies that emerges over time.

One source of pertinent information derives from the various Farm Management Association programs across the country. Comprehensive enterprise analysis allows for establishment of meaningful production and financial benchmarks ultimately leading to improved decision-making over time.

The Kansas Farm Management Association (KFMA) is one of the largest programs in the country. Moreover, given Kansas’ beef cow inventory ranking, KFMA data provides good insight into long-term general trends among cow/calf producers representative of many operations throughout the United States. The data outlined in Figure 1 details annual five-year moving averages for three key variables beginning with ’96-’00 time frame: 1) number of cows maintained, 2) marketing weight, and 3) number of calves marketed. Several trends are evident:

- One, consistent with national trends, cowherds incrementally increased in size (~7%) during the first half of the decade; the trend has plateaued in recent years.
- Two, the marketing weight of calves has also increased over time

- Last, and most important to this discussion, the marketing rate (relative proportion of calves marketed per number of cows maintained) has remained steady over time.

In other words, KFMA participants have remained fairly reticent about expanding their operations but have managed to market more total weight over time – the latter likely resulting from a combination of better management and genetics. And while doing so, commercial producers (based on KFMA marketing rate data) have proven successful in also maintaining reproductive performance within the cowherd.

From another perspective, KFMA cowherd inventory trends are consistent with assessment of overall cow population trends in the United States. As delineated in the white paper, the beef industry’s cow-calf sector has undergone significant transition during the past 20 years or so. Primarily, the U.S. beef cow inventory has undergone an enduring and sizeable reduction that began in 1996: 2013’s starting beef cow inventory was pegged at 29.3 million cows marking a selloff of approximately 6 million cows during the past 17 years (USDA:NASS). Second, while relatively small operations (<50 cows) still comprise the majority of beef cow operations in the United States, they also represent the category that overwhelmingly accounts for decline in the number of beef cow operations over time (LMIC, 2012). In combination, cow liquidation has largely occurred because of smaller operators exiting the business.

With that background, Figure 2 reflects relative beef cow slaughter and heifer retention rates since 1996 coupled with the annual change in beef cow inventory. The data reveals the overwhelming importance of beef cow slaughter when accounting for decline in the nation’s beef cow population. Meanwhile, heifer retention rate has remained relatively constant.

Keeping in mind disappearance of smaller operators, liquidation has been a fairly deliberate process driven by a multitude of factors (including weather, producer demographics and financial considerations). Therefore, liquidation has likely NOT stemmed from a sudden decline in reproductive performance. Were there an inordinate surge in open cows, there’d likely be a disproportionate rise in the heifer retention rate to offset loss of cow inventory and ensure the production pipeline was being replenished.

Change in operational size, management priorities and marketing opportunities has influenced selection among commercial producers. Indirectly, from several aspects, that’s potentially influenced reproductive performance in a positive manner despite declining hybrid vigor within the cow/calf sector.

One aspect revolves around calving ease. The white paper noted, “...it appears that beef producers have overwhelmingly emphasized calving ease predictability from a large and reliable data base; the risk/reward relationship of losing calves at birth versus heavier calves at weaning is heavily tilted towards the former.” Assuming that selection pressure has been effective, it’s

probable reproductive performance / pregnancy rate has improved given the negative influence dystocia has on postpartum interval and subsequent rebreeding performance.

The second aspect involves sustained selection pressure upon marbling. Research indicates selection for improved marbling may be favorably related to two-year-old heifer success and subsequent cow longevity: "...estimates suggest that sire marbling EPD had a desirable influence (if any) on both heifer success and length of productive life" (Tess et al., 2013). (Conversely, selection for increased leanness and/or retail product, independent of other considerations, proves antagonistic towards overall cow productivity. Tess et al., 2013; Speer, 1993)

Research also suggests that well-managed, straightbred cattle populations are fully capable of achieving high pregnancy rates (91%) in a defined breeding season of short duration (Brinks et al, 1990). Similarly, results from Heartland Cattle Company (McCook, NE) reveal that long-term selection pressure among Angus producers led to gains in inherent fertility thereby allowing commercial producers to relinquish some requirement for heterosis. Accordingly, Director Janet Rippe notes that: "If you get a true hybrid or an F1-cross or even just a quarter something else, those cattle are generally more fertile. But we might not see as much difference in the numbers because our long-term Angus customers have put so much selection pressure on fertility." (Reiman, 2012) Either way, pragmatic indicators imply overall reproductive performance has not sufficiently declined within the commercial sector to alter their general management strategies.

Lastly, it's important to note that reproductive performance is typically associated with cow's lifetime productivity and subsequent longevity (depending on culling strategies). The consideration of number-of-calves born is highly influential upon net present value when making cow investment decisions. Simultaneously, cows are often culled for reasons other than pregnancy status or failure to wean a calf: "...nearly two of three operations (62.3 percent) sold cows for purposes other than breeding." (USDA: NAHMS, 2009b) Any functional trait that influences culling decisions is equally important with respect to longevity and establishing net present value.

Certified Beef Programs

The rapid development of certified beef programs in recent years underscores the significance of beef demand and subsequent influence on consumer expenditures (both domestically and internationally) at the restaurant or retail level. Final demand is of primary importance to all beef producers given their fundamental connection to beef sales. Failure to consistently generate favorable eating experiences negatively influences demand. That ultimately results in lower needs for production output, weaker markets and less available revenue for all stakeholders in the beef business (Marsh, 2003). Conversely, establishing

positive changes in demand spells prosperity: more customers buying more beef at higher prices.

With that context, maintaining (let alone growing) market share is an enduring process that mandates constant innovation and positioning. Those considerations require continuous improvement regarding product quality, consistency and efficiency of production. Accordingly, the National Beef Quality Audit noted in 2000 (NBQA2000: CBB and NCBA, 2001) that “low overall uniformity and consistency” remained the number one concern within the beef industry. The issue was also identified as the greatest quality challenge in which the industry had made the least amount of progress during the previous 10 years. The industry was seemingly ignoring the consumer and beef’s demand subsequently deteriorated.

The industry provided lots of rhetoric during the ‘90s about value-based marketing as a means to induce better quality and consistency, but market structures still hadn’t sufficiently evolved to facilitate that occurrence (Purcell, 2002). Broad-based, quality-driven incentives were not generally available or sufficiently strong to have the industry respond in a meaningful way prior to 2000. Even with the advent of grid pricing, weight remained the primary market signal and overwhelming driver of revenue. For the beef industry to reestablish its core position in the marketplace going forward, a new emphasis upon quality and efficiency needed to be established.

That reality is best reflected by quality grade results cited by the National Beef Quality Audits: Prime and Choice had bottomed out around 50% within the harvest mix between 1995 and 2000 (Figure 3). (Annual averages, based on data from USDA: AMS would mark that figure closer to 60% and since improved to 69% in 2011.) The industry needed to instill more systematic, process-driven incentives to ensure a reliable, steady supply of cattle in the future to meet customer demands.

The outcome has been a decidedly sharp surge in the number of alliances and USDA certified beef programs during the past 10 years. Certified Angus Beef (CAB), initiated in 1978, holds the distinction as the first USDA-certified beef program. It took more than 20 years for 10 additional programs to be established. However, in the 13 years since then, 129 new programs have been introduced (see Figure 4) – nearly 80% of which are Angus-based.

Perhaps most significantly, the increasing presence of Angus program brand management has influenced beef industry genetics and breeding systems in recent years. Most notably, the 2011 National Beef Quality Audit outlined the growing percentage of predominately black-hided cattle (see Figure 5). That’s especially important given that higher degrees of marbling are positively associated with USDA’s A-stamp percentage (Emerson et al., 2012): A-stamp rate for Traces, Slight, Small, Modest, Moderate, Slightly Abundant and Moderately Abundant marbling scores being 49, 55, 66, 71, 81, 84 and 92 percent, respectively. Stated another way, A-stamp

cattle possess a higher probability of grading Choice or better thus explaining quality grade improvement to meet market specifications described above.

That development has also pervaded perception among various sectors. When asked about the definition and/or description of “genetics” (see Figure 6), “primarily black hided” was most cited response among retailers, food-service, packers and feeders. Meanwhile, secondary response among retailers, packers and feeders highlighted the category as “genetic potential for marbling”; the second most frequent response among the food-service sector being “primarily British”. While those terms are somewhat innocuous, the implication is a reference to the rapid rise and ensuing success of Angus-based programs.

That outcome has largely underpinned price signals throughout the supply chain. Producers now have a variety of means to garner additional revenue from their respective management and genetic decisions over time. That’s best illustrated by data available through Superior Livestock Video Market sales over time (Figure 7). Feeder calf market premiums and discounts for health management and cattle genetics are especially important. For example, a producer who invested in a VAC 45 program and possessed documentation for Angus-based loads would have received over \$11/cwt in “premiums”.

The business has begun to establish a self-reinforcing loop. Market signals have sufficiently worked to increase available supply for branded programs; in turn, that allows programs to build demand by providing volume assurances and/or price stability. Successful growth and promotion of breed-specific programs and ensuing product availability influences perception; meanwhile, perception mandates increased production of product derived from breed-specific programs. The outcome has been a sharp increase in the percentage of branded sales in recent years (Figure 8).

Meanwhile, the market is attempting to pull even more high-quality product into the harvest mix (Figure 9). The branded program spread has surpassed \$20. Even more striking, the Prime/Select spread has experienced a sharp uptick in recent years with the 26-week moving average having tested \$60/cwt (~\$500/head). Those are important signals from a final-demand perspective; consumers are increasingly calling for high-quality, program-backed beef products.

Looking Ahead / Conclusion

Deming’s core philosophy of quality and production revolved around the concept that any sub-process should be evaluated only in terms of its relative contribution to the entire system, not based upon segregated individual production merit or profit (Neave, 1990). Unfortunately, the beef industry is a good example of what occurs when the broader aim of the system is overlooked. History reveals that consumer indifference is devastating: the beef complex endured the 1980-to-1998 era with minimal consumer demand growth.

During that time the market signals were designed to reward only efficiency of production before cattle became the possession of the processor. The result was declining beef demand and challenging markets. The industry needed to refocus to reward both efficiency and encourage production of high-quality cattle, carcasses and the ensuing beef products.

Since that time, though, the beef industry has witnessed sharp improvement across all fronts. Gains in efficiency have been exceptional; production per cow has effectively reduced the need to maintain as many cows. That's dramatically reduced the industry's overall resource requirement and subsequent carbon footprint (Capper, 2011). Simultaneously, uniformity and tenderness no longer top the list among quality concerns. That's resulted in substantial enhancement in customer satisfaction proven to anchor spending – especially important given consumer fallout from the financial crisis in recent years.

That emphasis can't end there. The protein business, like all businesses, is highly competitive. The beef complex must produce and deliver consistent, high-quality products in an efficient manner to maintain competitiveness in the marketplace. Shifting consumer demand and market-channel influences by restaurants and retailers will increasingly mandate the need for responsive and efficient business models going forward. That equates to the need for even greater influence on genetic inputs and breeding systems that establish high-valued beef carcasses. Simultaneously, production management will also need to continually improve to ensure avoidance of shortfalls and maintain efficiency.

In combination, there will likely be increasing delineation around market premiums and discounts for producers to consider. As such, debate about the appropriateness of specific breeding systems separate from the context of evolving market signals and management priorities is somewhat misplaced. Well-designed, systematic crossbreeding systems can be, and are, valuable to both the producer and the industry. Simultaneously, though, opting out of such an approach isn't necessarily flawed. That's especially true when considering varying operational priorities, shifting market opportunities, new technology and selection tools all within the context of production capabilities of the current gene pool.

**Figure 1. Moving Five-Year Averages:
Cows Maintained, # Calves Marketed, Marketing Weight**
(Adapted from Kansas Farm Mgmt. Ass'n - KFMA, 2013)

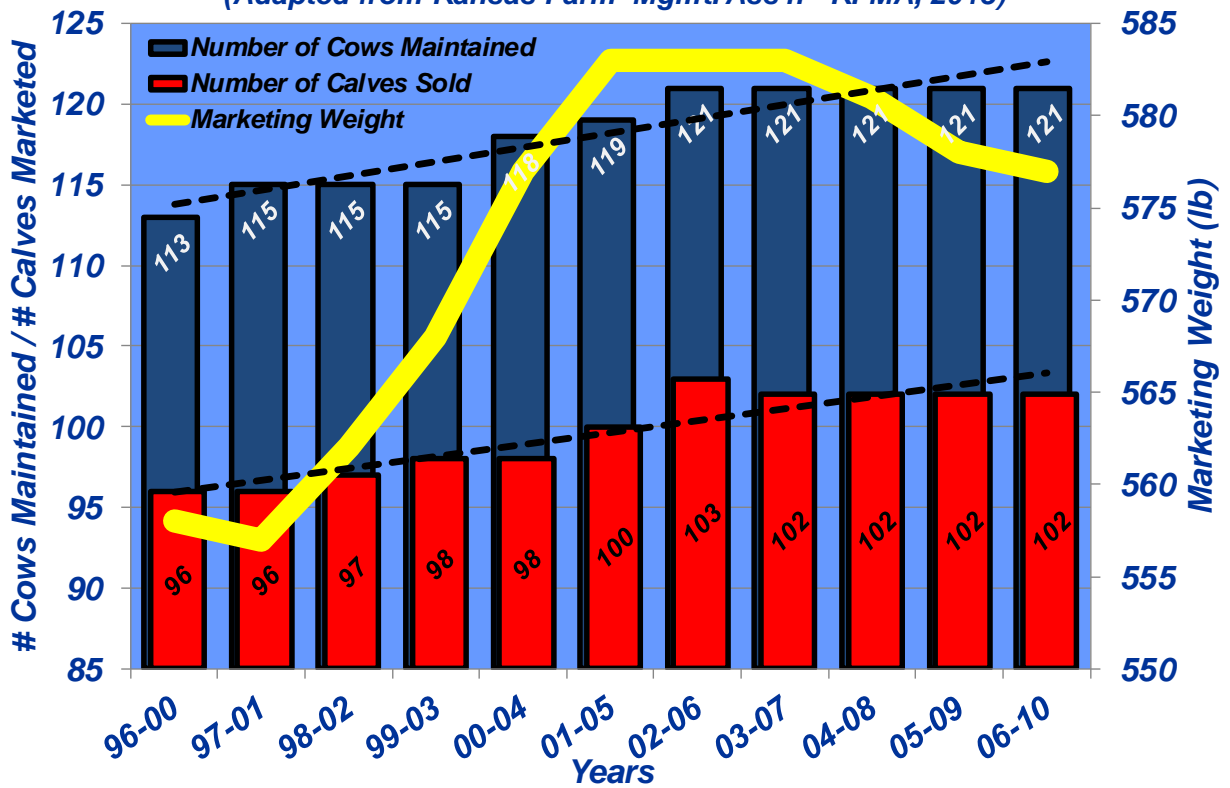
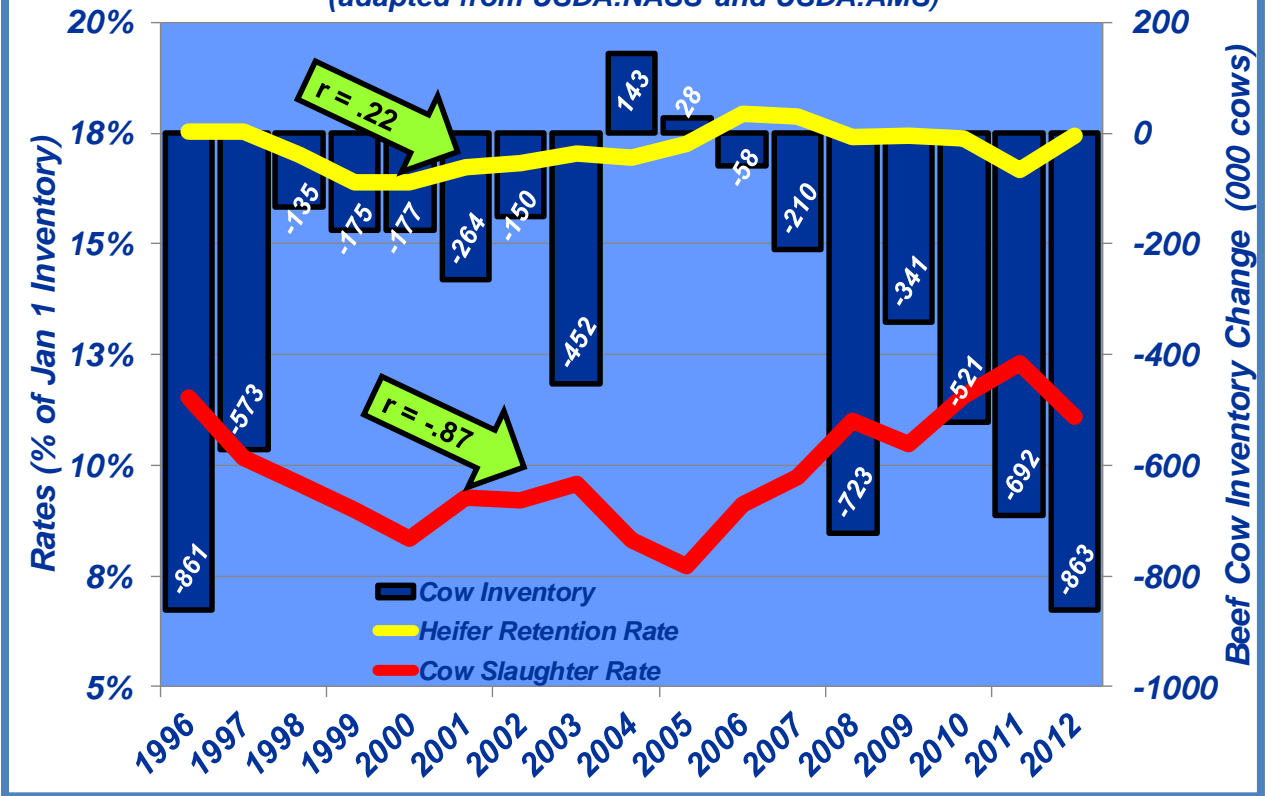


Figure 2: Annual Beef Cow Inventory Change, Heifer Retention Rate, and Cow Slaughter Rate
 (adapted from USDA:NASS and USDA:AMS)



**Figure 3. Steer/Heifer Harvest Mix:
Percentage Prime and Choice**
Adapted from NBQA, 2011 (CBB/NCBA, 2012)

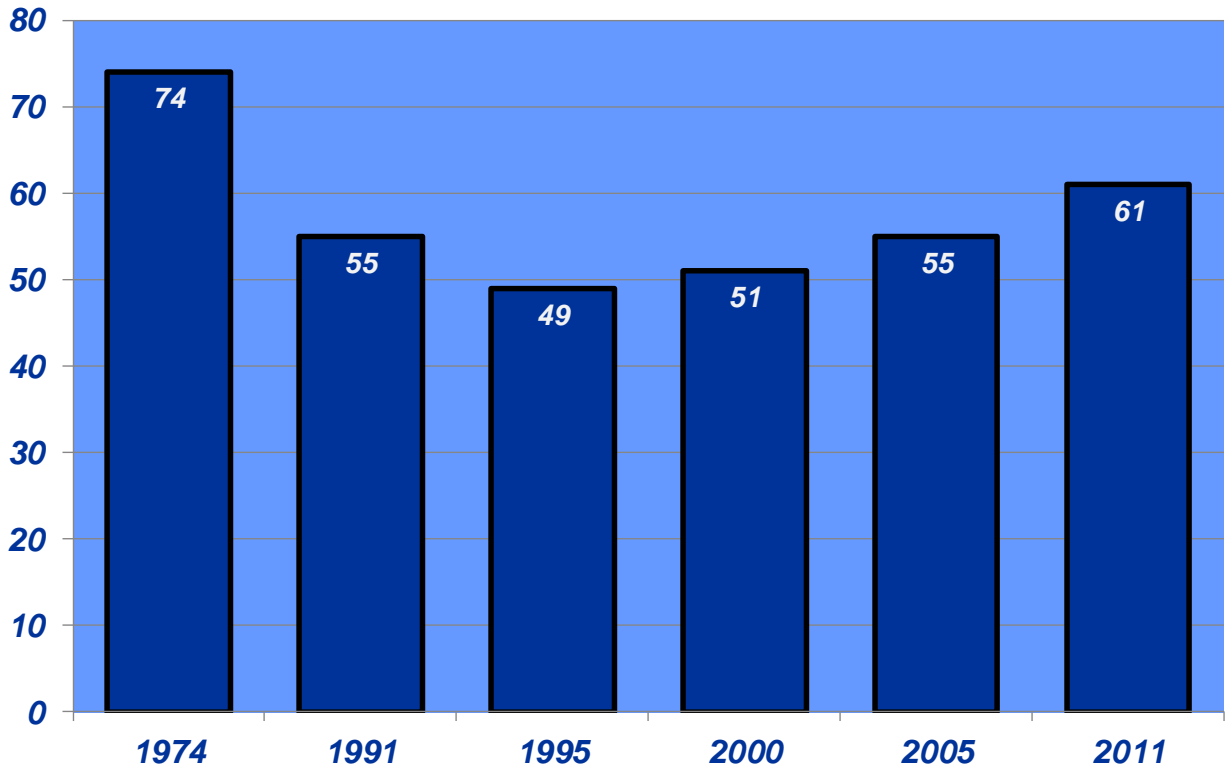
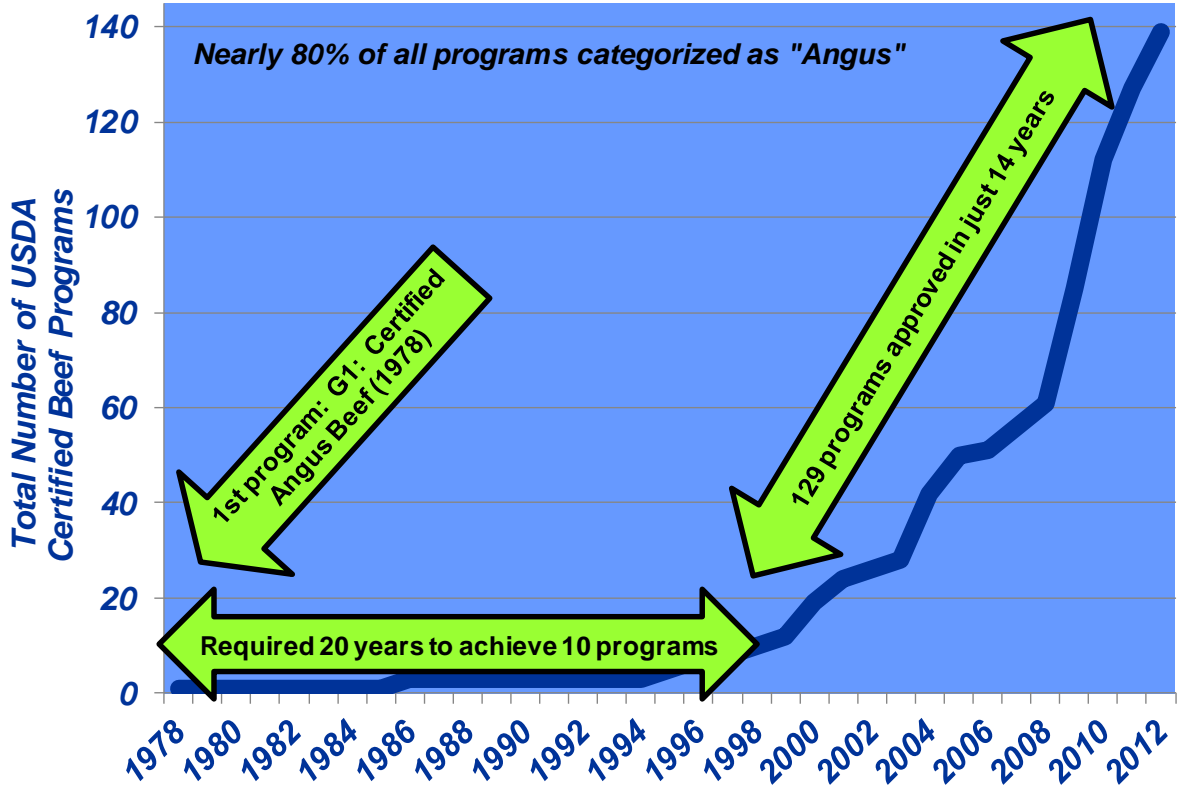


Figure 4. Cumulative Total of USDA Certified Beef Programs
(categorized by initial release date - adapted from USDA:AMS)



**Figure 5. Steer/Heifer Harvest Mix:
Percentage Predominately Black Hided
Adapted from NBQA, 2011 (CBB/NCBA, 2012)**

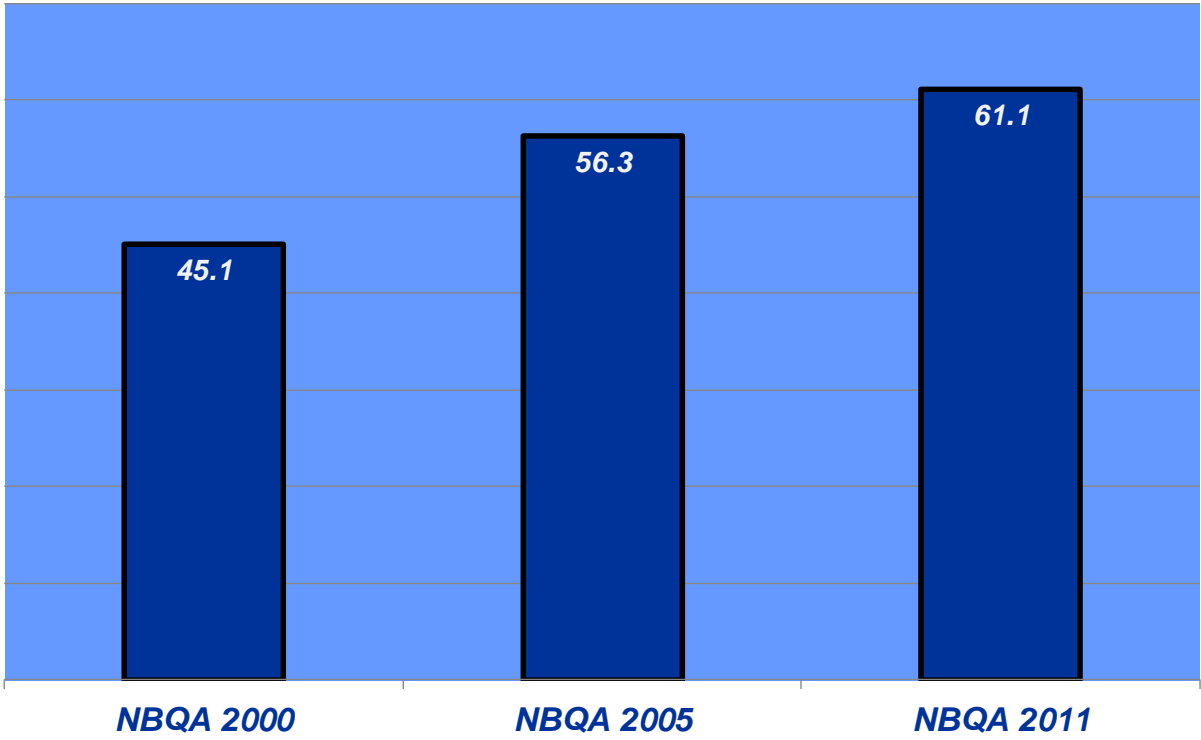


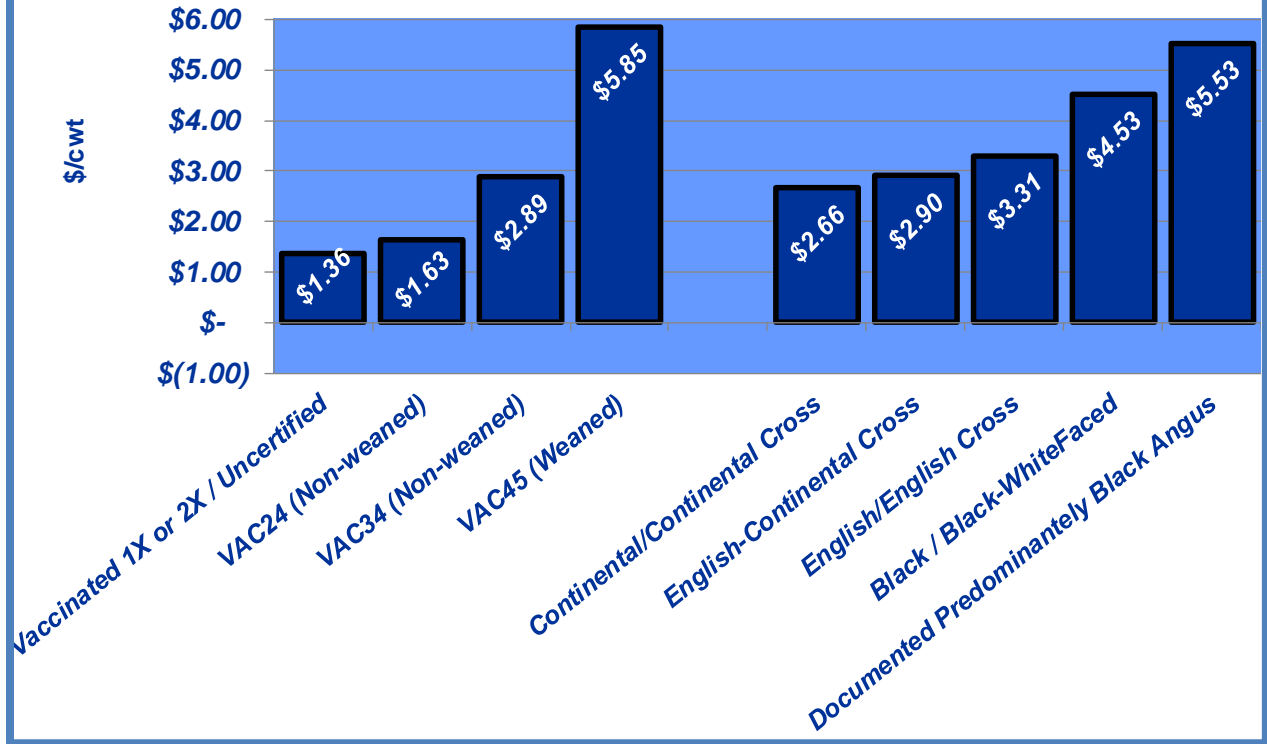
Figure 6. How Do Market Sectors Define / Describe “Genetics”?

2011 National Beef Quality Audit (CBB/NCBA, 2012)

Based on number of times each characteristic was mentioned as response to question

| Retailers | Foodservice | Packers | Feeders | Government & Allied Industry |
|--------------------------------|----------------------|--------------------------------|--------------------------------|---|
| Primarily black hide | Primarily black hide | Primarily black hide | Predominately black hide | Quality genetics |
| Genetic potential for marbling | Primarily British | Genetic potential for marbling | Genetic potential for marbling | Genetic potential for marbling |
| NOT Bos indicus | NOT dairy type | Primarily British | Genetic potential to gain | EPDs |

**Figure 7. Value-Added Management and Documentation:
4-700 lb Steer and Heifer Market Premiums/Discounts (\$/cwt)
(Simple Average , 2001-2010, Superior Livestock Video Sales)
Adapted from Zimmerman et al., 2012**



**Figure 8. Branded Boxed Beef Sales:
Branded Product as Percent of Total (through mid-April, 2013)
Weekly Spot Values and 26-week Moving Average
Adapted from USDA:AMS**

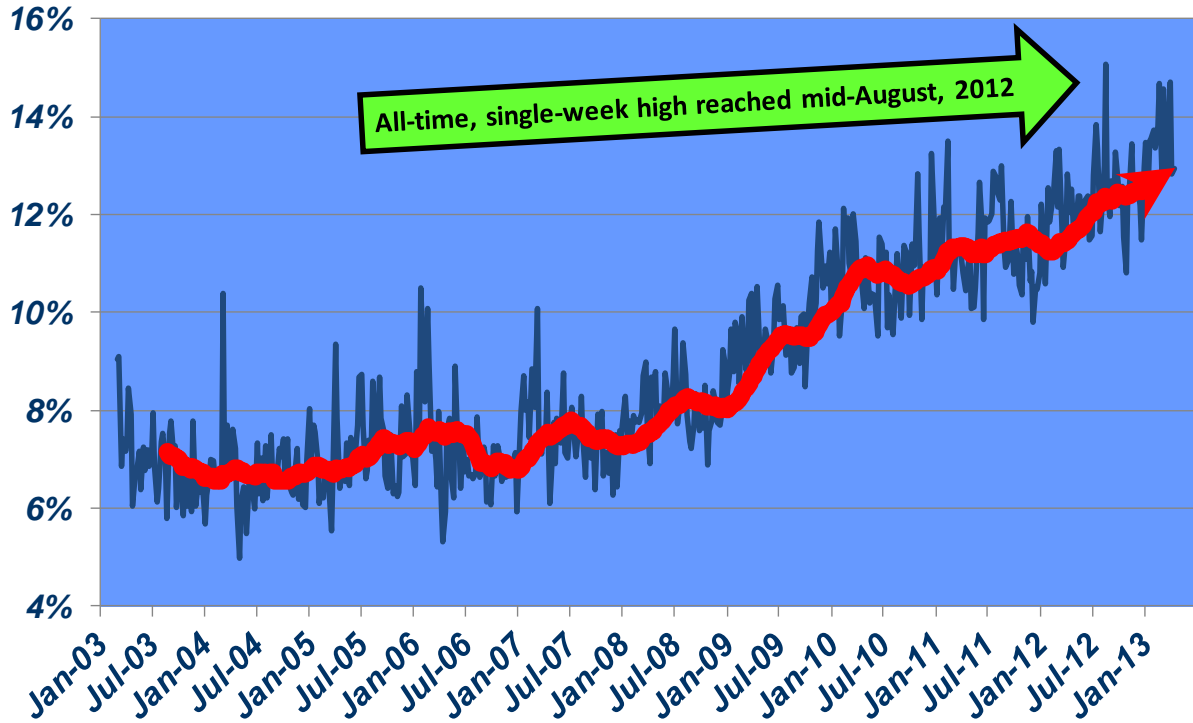
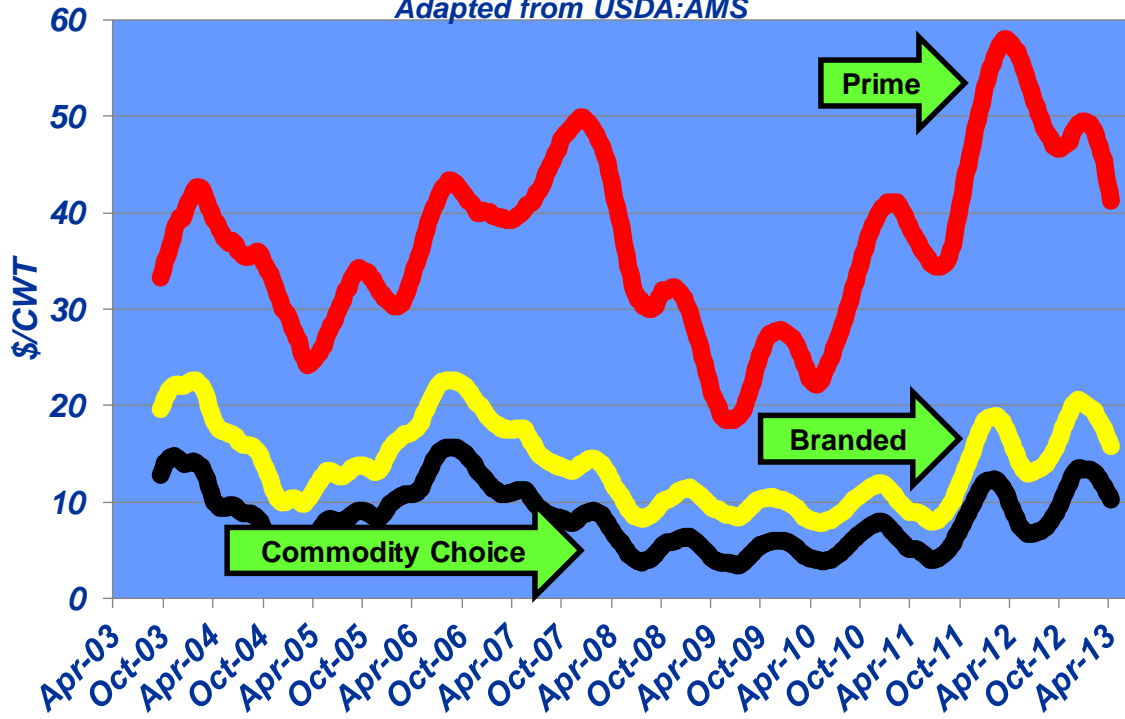


Figure 9: Comprehensive Cutout Price Spreads
Prime, Branded, Choice Product versus Select
26-week moving averages (through mid-April, 2013)
Adapted from USDA:AMS



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