

# VALUE DETERMINATION IN THE FEEDER CATTLE MARKET

---

T. A. MARSHALL  
S. A. KOCHER

RELEASED AUGUST 2023  
BY THE AMERICAN ANGUS ASSOCIATION

A multitude of decisions by cattlemen and consumers send signals through the feeder cattle market. Some are sent faster or further through the supply chain, and ultimately value, typically expressed as prices, tell a story of value determination. What does this mean for producers at different levels and how can the industry continue to shape the story to the advantage of both producers and consumers? How will cattle features like being black-hided be expressed as values, and to what end can they be justified? Exploring marketing history, industry debates, and discussion of trends reveal key movements, as buyers and sellers look toward the short and long-term future.

## BACKGROUND ON CATTLE MARKETING

Few topics have created more controversy in the livestock industry than the topic of cattle marketing. When evaluating today's cattle and beef-pricing system, several factors play a key role in its evolution to its current state and fuel further debate within the industry:

**Industry consolidation and concentration.** The beef industry is highly segmented with vast distortions in market leverage and its participants. During a 30-year span, the number of cow-calf operations declined from over 1.2 million in 1992 to around 729,000 in 2017 (USDA National Agricultural Statistics Service, 2017). Less than 1,600 feedlots market 80% of fed cattle, and four major packers process over 85% of cattle in the United States (USDA Economic Research Service, 2022). There has been similar concentration and consolidation in the wholesale trades and the hotel, restaurants and institutions trade with giant players like McDonald's and Walmart, Inc. As the industry consolidates, analysts are seeing a consolidation of pricing data and access to that data. This consolidation has amplified the differences in market leverage between segments and between entities.

**Lack of profitability and poor price discovery.** The beef industry can be characterized as a low-margin, capital-intensive business, with high barriers to entry. This coupled with a commodity pricing system tends to force prices to converge and rewards low-cost producers. This model alone does not reward value creation sufficiently. As a result of the lack of profitability, both cow numbers and the number of cattle operations have steadily declined. Compounding this, as the industry attempts to transition away from a commodity pricing system, the number of cattle trading in open, competitive markets has steadily declined as formula, contract and grid-pricing increases. This has raised concerns about whether there is sufficient cash trade to accurately discover prices at the fed-cattle level.

**Commodity pricing in a value-based world.** The very definition of a commodity

market states that over time prices hover in and around break-even levels. Over time, the commodity pricing system does reflect overall differences in supply and demand, but it has been fairly ineffective in sending signals of consumer preferences through the system. One success has been growth of grid marketing. While not perfect, they have transformed marketing of fed cattle and sent far more clear signals tied to consumer demand. The longevity of the beef industry, including its competitiveness with other proteins and international production, relies on it being more responsive to consumer desires, reducing inefficiencies of production, and increasing the overall value proposition or eating experience of consumers.

Despite these debates, very little substantive change has reached the marketplace at the cow-calf level. This lack of progress can be characterized by the basic conundrum of today's pricing system – while evolving and becoming more rational in the way prices are allocated based on value, it continues to allocate value inefficiently and inconsistently forcing prices toward the average. Marketing can be viewed as inefficient when prices are forced towards the average, and the better, higher-quality beef cattle continue to subsidize the poorer cattle. While problematic on its own due to its said inefficiencies, the system has also been tied to the industry's inability to, firstly, objectively and reliably utilize metrics describing genetic merit or potential and, secondly, influence management protocols affecting the expression of selected genetics and industry standards that improve over time. The industry has also struggled to accurately reflect genetic differences within the pricing equation for feeder cattle, adding to further debate over whether or not hide color should dictate so much premium in the marketplace.

## HISTORICAL PERSPECTIVE OF OUR CATTLE MARKETING SYSTEM

The cattle industry's marketing scheme was built for and around a commodity pricing system, where prices were determined primarily based on macro supply and demand dynamics and easily-quantifiable market differences. As a result, factors such as distance from feedyards and packing plants, health status, condition, and size of lot have been incorporated into the overall pricing equation and better reflect overall value differences as they relate to measurable factors.

Around 1990, the industry began a quest to transform the marketing of cattle and beef in general. Declining market share and demand, when compared with competing proteins like poultry and pork, made it crucial for the industry to become more consumer centric, and have a pricing system that sent appropriate demand signals throughout the various segments of our business.

In 1990, the National Cattlemen's Beef Association, created a value-based marketing task force, relying on foundational work from Dr. W. Edwards Deming, whom discussed the importance of improving beef quality. This brought about the first National Beef Quality Audit which characterized beef in the marketplace and its shortcomings. Following the National Beef Quality Audit of 1991, a "Value-Based Marketing Revolution" was created (Beef Quality Assurance, 2023). In response to the audit and industry dynamics, specific market targets and market segmentation were more commonly discussed, improving understanding about the importance of consistently meeting the needs of consumers. The industry responded by altering breeding, feeding and management practices to assure compliance with consumer desires in a way that was both repeatable and consistent.

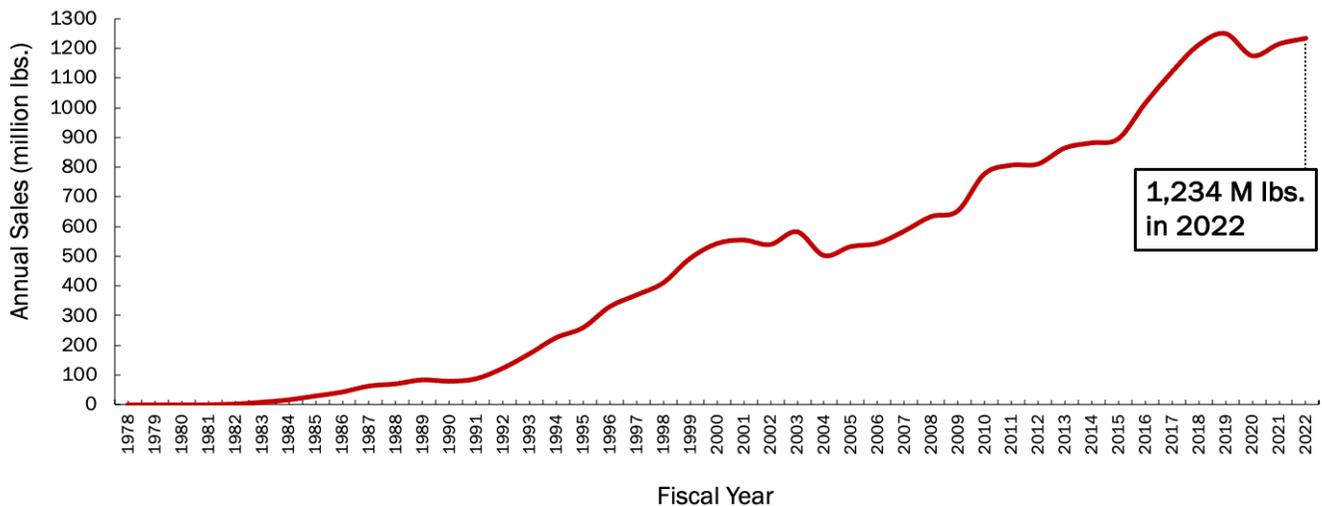
At the same time these changes were occurring at the feeding and packing levels, the seedstock industry went through a major transformation in their genetic evaluations. With the widespread acceptance and use of EPDs in the 1980s and early 1990s, the industry increased its ability to create genetic progress. This trend has only accelerated with the advent of genomics and applied

reproductive technologies. Today, the vast majority of seedstock cattle are marketed based on objective genetic metrics, like EPDs (Garrick and Golden, 2009). Consequently, the seedstock industry sees the most differentiation of their product, with values varying greatly based upon the use of EPDs (for the economically relevant traits of beef production) as the currency for trade.

Of course, the packing industry has long sold a differentiated product based on USDA’s quality and yield grading systems. The USDA grading system coupled with the growth in branded programs allows packers to sell their products on a value-based system. As we move closer to the end consumer, the ability to differentiate product value tends to increase.

Consumer concerns about beef quality and their taste preferences have led to several significant changes in the way product is marketed. In the 2020s, the industry’s paradigm is focused on exceeding customer expectations. Significant growth in the number of branded beef programs has been one form of response. It has also demonstrated how long-term success and sustainability of the industry will be centered around a value-based pricing system that is far less reliant on commodity pricing, using commodity pricing components to establish base prices. The boxed beef revolution is another, led by new technologies at the packing level and increasing the need for quality, consistency and uniformity of beef. Consequently, the packing industry has been able to capture significant value differences for their products. The birth of grid marketing, where cattle were no longer priced solely on industry averages, also occurred; and cattle sold on a grid became rewarded for quality and yield.

**Figure 1. Certified Angus Beef® brand Sales from 1978-2022**



Data source: Certified Angus Beef LLC, 2023.

Ironically, the cow-calf sector is the one segment of the industry largely left out of the value-based marketing revolution. The seedstock industry sees the most differentiation of their product based upon the use of EPDs garnering significant value differences in their cattle. Conversely, the feeding industry on any given day markets 60-80% of their cattle on a formula or grid basis and as a result are paid based on value (USDA AMS, 2023; Schroeder, et al., 2022). They also directly realize the value of the differences in the cattle they are feeding from a health, performance, feed efficiency and growth standpoint. The cow-calf segment of our business is the least concentrated, the most geographically, and management diverse of all the segments. Even though they are arguably the most important segment of the value-creation chain, cow-calf producers have been relegated to describing genetic differences based on “reputation” which is a highly inefficient and ineffective way of assigning value.

## THE VALUE OF GENETICS

In today's market, the economic impact of genetics from a total systems approach is well-known. The industry finds itself within a perfect storm, where consumers are making increasing demands on the product they are buying and are increasingly willing to vote with their dollars based on those preferences. The industry has the capability of sharing and exchanging information, and the marketing system is increasingly capturing the value differences that exist. Record high input costs and historical levels of price differentiation are simply widening value differences in the marketplace, making production efficiency paramount. Based on quality and composition, beef products are also enjoying historical levels of price differentiation.

Sustainability also serves as a driving force in the U.S. beef industry and the broader marketplace regarding profitability, and genetics are a primary resource for advancement when tackling increased sustainability pressures (Snelling, 2022). When it comes to beef production's overall environmental footprint, the two biggest considerations are reproductive efficiency and production efficiency – again driven by genetics.

Economists, geneticists and cattlemen agree that proper management of genetics is nearly as important as the genetics themselves. The ability to properly manage genetics is highly dependent upon two things: the accurate characterization of those genetics, and the ability to modify management to maximize genetic potential. All these outcomes are largely determined by genetic potential.

## GENETICS HAVE NEVER BEEN WORTH MORE THAN THEY ARE TODAY.

**Maternal Genetics.** The cow-calf segment of the business requires the most capital (land, labor, and cash) of all the segments in the beef cattle industry. The cowherd has often been described as the factory, which not only influences the quality of the product, but also has an impact on the efficiency of production. While the marketplace tends to focus on terminal traits, as 80% of cattle move through terminal channels. It is crucial to keep in mind the important influence of maternal genetics, including the impact of reproduction, fertility, convenience traits and maintenance requirements.

**Terminal Genetics.** It is easier to quantify the economic values of terminal genetics because they tend to be easier to measure, are highly heritable, and can be placed in more uniform management and production environments. This also means terminal genetics are easier to assign economic value to and use to measure change. Plus compared to maternal ones, terminal genetics encompass fewer traits and exhibit fewer genetic antagonisms. Therefore, they are easier to quantify. While supply chains will inevitably refine these factors, the terminal traits with the most economic impact tend to be post-weaning gain, feed efficiency, yield as defined by carcass weight or red-meat yield, and carcass quality or marbling.

## CALCULATING THE VALUE OF GENETICS

For these demonstration figures, the calculations assume 100 head of cattle in a pen, gaining 850 lbs. in the feedyard, and assume a ration cost of \$475/ton. The advantages of average daily gain and post-weaning gain and their impact on feeding profitability are well-documented and understood. There are many economic drivers for the cattle feeding industry, but for simplicity Figures 2-4 will focus on three of the most important traits: carcass weight, feed conversion and marbling. (A truly comprehensive view of the value of genetics would include health, post-weaning gain, red-meat yield, etc.) These three traits are recognized as the three biggest drivers of profitability and are significantly impacted by genetics.

### **Figure 2. Value of Carcass Weight**

<u>Pen 1</u>		<u>Pen 2</u>	
Average Carcass Weight	950	Average Carcass Weight	900
Price/lb.	\$2.85	Price/lb.	\$2.85
Value for Pen	\$270,750	Value for Pen	\$256,500
		<b>Difference/pen</b>	<b>\$14,250</b>
		<b>Difference/head</b>	<b>\$142.50</b>

### **Figure 3. Value of Feed Conversion**

<u>Pen 1</u>		<u>Pen 2</u>	
Average Feed Conversion	5.5:1	Average Feed Conversion	6.5:1
Amount Fed/Animal	4,675	Amount Fed/Animal	5,525
Value for Pen	\$111,031	Value for Pen	\$131,219
		<b>Difference/pen</b>	<b>\$20,188</b>
		<b>Difference/head</b>	<b>\$201.88</b>

### **Figure 4. Value of Marbling/Quality Grade**

<u>Pen 1</u>		<u>Pen 2</u>	
% Select	2%	% Select	14%
% Choice	10%	% Choice	44%
% CAB	50%	% CAB	36%
% Prime	38%	% Prime	6%

The following prices of \$348 for Prime, \$309 for CAB, \$293 for Choice, and \$279 for Select were used along with an average carcass weight of 910 lbs.

<u>Pen 1</u>		<u>Pen 2</u>	
Pen Value - Select	\$5,078	Pen Value - Select	\$35,545
Pen Value - Choice	\$26,663	Pen Value - Choice	\$117,317
Pen Value - CAB	\$140,595	Pen Value - CAB	\$101,228
Pen Value - Prime	\$120,338	Pen Value - Prime	\$19,000
Total Pen Value	\$292,674	Total Pen Value	\$273,090
		<b>Difference/pen</b>	<b>\$19,584</b>
		<b>Difference/head</b>	<b>\$195.84</b>

The difference for the two pens considering all three of these factors for profitability – value of carcass weight, feed conversion and quality grade – is \$54,022. These differences combined equal

\$540 per head. This number does not reflect the full range of differences in the population, but rather the type of variation seen daily. Assuming cattle were placed at 600 lbs., the break-even difference for these two pens of cattle would be \$90/cwt. This gap demonstrates that today’s marketing system is insufficiently differentiating prices based upon genetic merit. It also illustrates the overall inefficiency of the current pricing system and its inability to appropriately allocate value in relation to the actual value created. The differences in the provided example calculations are reflective of typical genetic differences seen in the marketplace. It is common to see pens of cattle with over \$1,000 per head differences in value.

In summary, the value of genetics relative to profitability has been increasing for a variety of reasons:

- Input costs, price premiums, and overall prices have been increasing, intensifying the impact of genetics.
- Genetic progress or genetic trends are accelerating, making the genetic differences between breeds of cattle and individual animals increase exponentially.
- Genetics are not only the best way to increase efficiency and create value, but they are also increasingly recognized as one of the best tools to mitigate risk in the feeding and packing industries. The concept of using genetics as a risk mitigation strategy has been well understood in the cow-calf industry for quite some time.

## BREED GENETICS AND THEIR IMPACT ON VALUE

There is a saying, “there is as much difference within a breed as there is between breeds.” Truthfully, the spread from the top 20% to the bottom 20% within an individual breed for the economically relevant traits is widening. At the same time, the genetic differences between breeds, on average, for the various traits tends to be widening as well. Significant differences in progressiveness are seen among breeders and breeds based upon their adoption of genomic tests, and their use of reproductive technologies like artificial insemination (AI) and embryo transplant (ET), and data-driven selection practices. Economic incentives, population genetics, and size of genetic databases have all converged to increase the differences between breeds. The following graphs illustrate the vast genetic differences that exist between breeds and how they are widening.

**Figure 5. MARC Germplasm Breed Differences**

Breed	Yearling Weight, lbs.	Carcass Weight, lbs.	Marbling Score
Angus	981.3	921.7	Mt25
Simmental	961.2	866.2	Sm52
Charolais	949.7	899.5	Sm32
Red Angus	940.6	884.9	Sm87
Limousin	938.2	891.7	Sm41
Hereford	917.5	871.7	Sm34

*Data source: Kuehn and Thallman, 2023.*

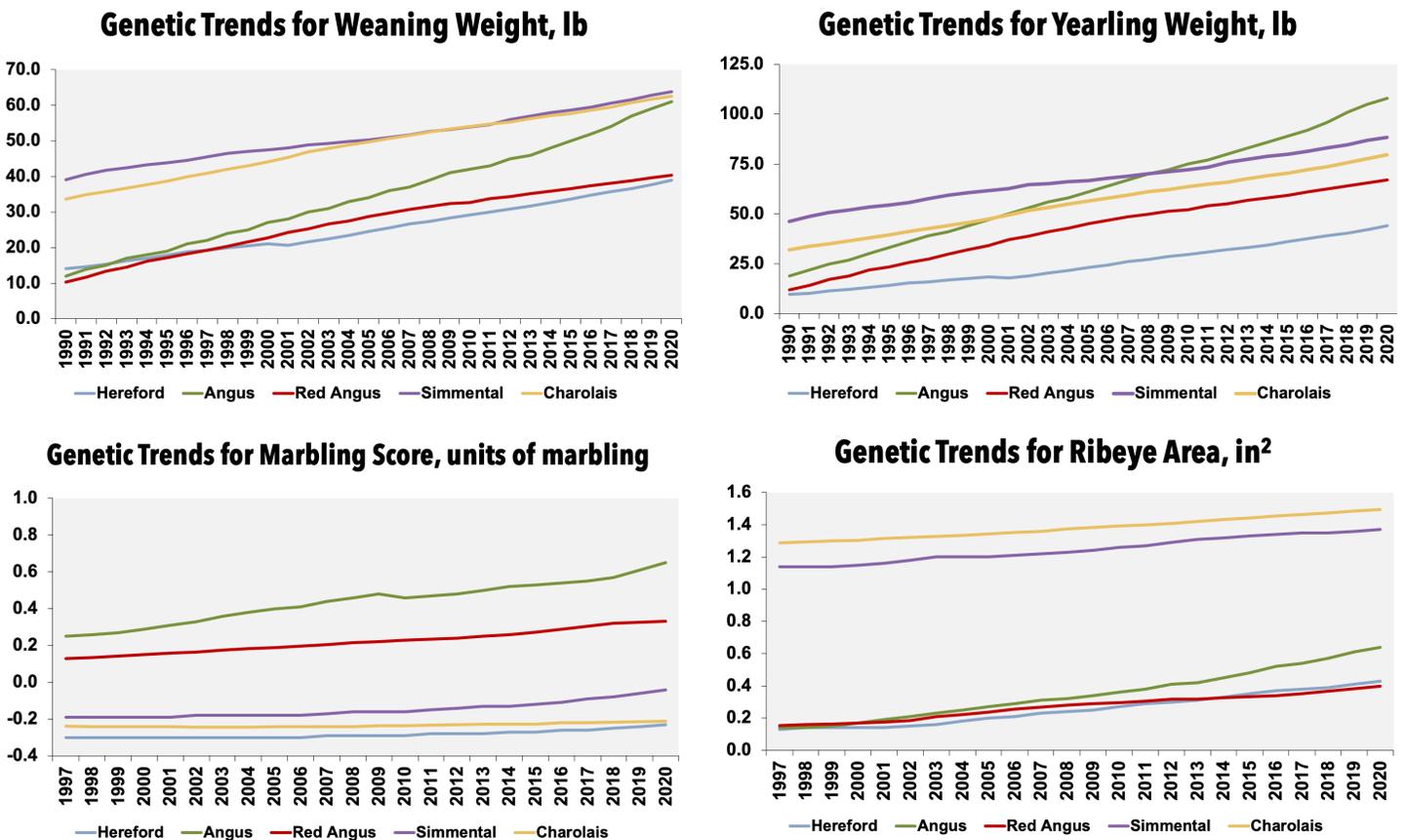
**Figure 6. Average EPDs by Breed**

Breed	Birth Weight EPD	Yearling Weight EPD	Carcass Weight EPD	Marbling Score EPD
Angus	1.2	108	48	0.65
Simmental	3.6	88.5	24.7	-0.04
Charolais	6.1	79.6	25.3	-0.21
Red Angus	0.5	66.9	12.7	0.33
Hereford	3.8	44	-4.1	-0.23
Gelbvieh	3	85	17.2	-0.25

Data source: American Angus Association, based on USDA MARC data, 2022; adjusted to an Angus base

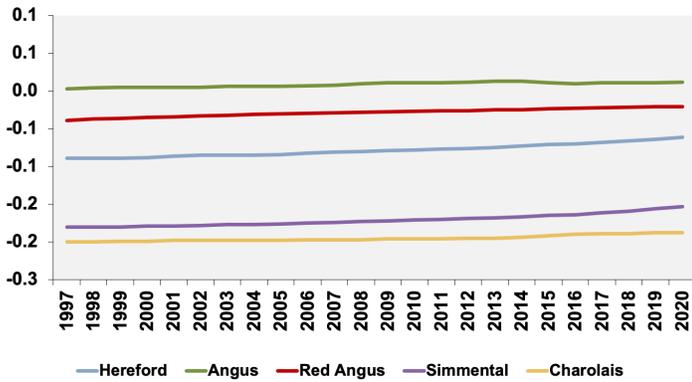
Many producers might be surprised to learn, for example, that Angus as a breed has significantly more growth than Charolais or Simmental; or breeds that were once considered to be quite similar, like Angus and Red Angus, now vary significantly for growth and marbling.

**Figure 7. Genetic Trends by Breed**

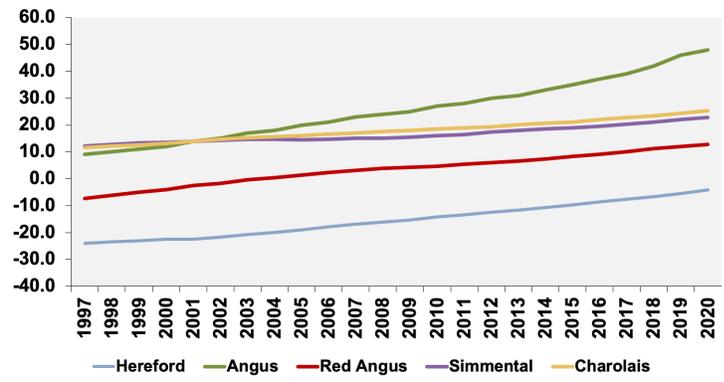


Data source: Spring 2021 Genetic Trends from Breed Associations and 2021 AB-EPD factors; adjusted to an Angus base using USMARC cross-breed adjustments

## Genetic Trends for Backfat Depth, In



## Genetic Trends for Carcass Weight, lb



Data source: Spring 2021 Genetic Trends from Breed Associations and 2021 AB-EPD factors; adjusted to an Angus base using USMARC cross-breed adjustments

Sources obtained from Dr. Larry Kuehn at the U.S. Meat Animal Research Center and adapted from the AB-EPD 2023 updated released. According to the center, “Breed of sire means predict differences when bulls from two different breeds are mated to cows of a third, unrelated breed, for animals born in 2019 under conditions similar to USMARC.”

## HIDE COLOR

Because hide color has long been a topic of conversation relating to its role in the pricing system, it is important to include a discussion of hide color when talking about more accurately assigning value to feeder cattle. Some would argue that hide color is not an economically relevant trait, and as such it has no role in a pricing system that accurately reflects value. This argument from a precursory viewpoint makes sense, especially if the aim is to accurately assign value based on genetics and economic differences. However, when one makes a more in-depth analysis of the value of hide color in the marketplace, it becomes more of a testament to value-based marketing, rather than a condemnation of it.

When it comes to hide color, there are several questions that must be answered. The first being, “Is the economic premium for black-hided cattle in the marketplace justified?” Secondly, “Are those premiums sending appropriate signals to direct the beef cattle industry to better meet the desires of consumers?”

It is true there has been a consistent premium for black-hided cattle, amounting to approximate \$4-5/cwt across all weights and classes of cattle. However, the price variation within black-hided cattle, based on weight, has been larger than the price variation of cattle without black hides. The standard deviation around black-hided calves within weight classes is larger as a result. Again, validating what casual observers of the market can see on a daily basis, the market does differentiate value based on a myriad of factors including: lot size, distance from buyer location, health status and condition of calves, breed and genetic makeup. The amount of differentiation is determined by the accuracy of the information provided, the confidence level of the buyers in the information provided, and the risk associated with that information.

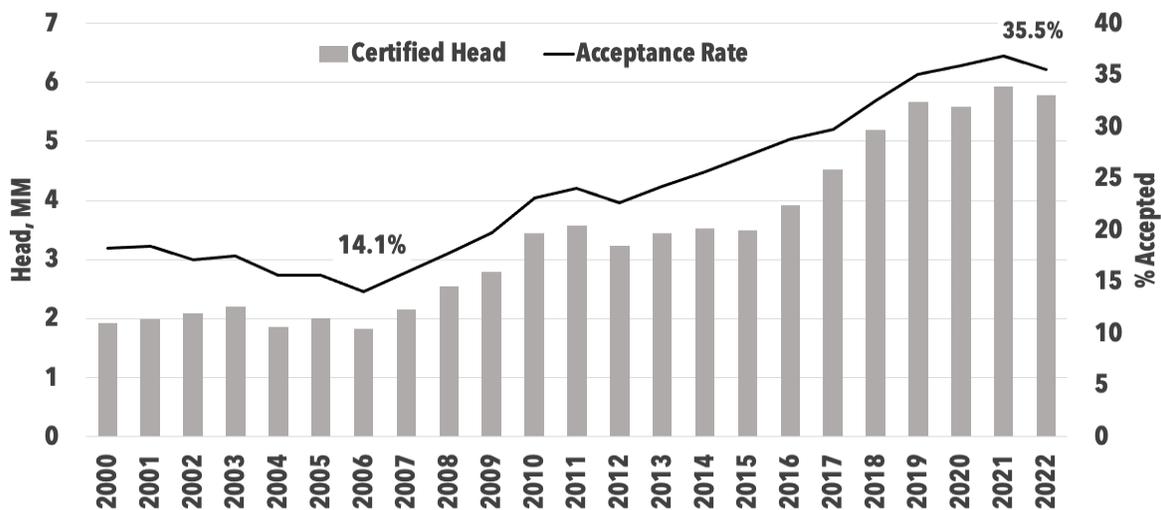
It is important to remember consumer preferences determine end product value. Brand performance in the marketplace plays a significant role in signaling consumer preferences. Admittedly, some of the value derived is based on perception or on intangible factors not easily measured. A Timex watch may keep as accurate of time as a Rolex; a Chevy may provide as much comfort as a

Mercedes; but consumer’s see more value in the Rolex and the Mercedes based on tangible and intangible differences.

A marketplace where consumers have the freedom to vote with their dollars is a very effective system for assigning economic value. Value is determined by objective measures and consumer’s perception of risk, prestige, common values, service, resell value, etc. While most beef consumers don’t know the breeds of cattle, they have learned over time to associate Angus with quality. This has been in large part to the quality and consistency of CAB and the prominence of the brand in the market since the late 1970’s. CAB became the first national beef brand, and its adherence to stringent carcass characteristics along with phenotypic requirements, including hide color, allows it to consistently deliver a high-quality product. As a result, the brand was able to create a system that has established brand equity in the minds of consumers and consequently generated 100’s millions of dollars in premiums over time for producers (Dykstra, 2023).

Figure 1 on page 3 illustrates how consumers have increasingly recognized value in the brand, with tremendous growth over time. In fact, the growth of CAB has always been more limited by supply than demand. In order to have continued success, the brand must create enough value in the marketplace for it to create premiums for cattlemen and those in the food service industry marketing it -- making it a preferred product compared to others available. The brand also had to create a system that sent appropriate signals through the production system, to increase the two key metrics of the brand’s supply chain – the percentage of cattle meeting the visual specifications for the brand and the percentage of cattle meeting its carcass specifications.

**Figure 8. Acceptance Rate\* and CAB Supply Trends**



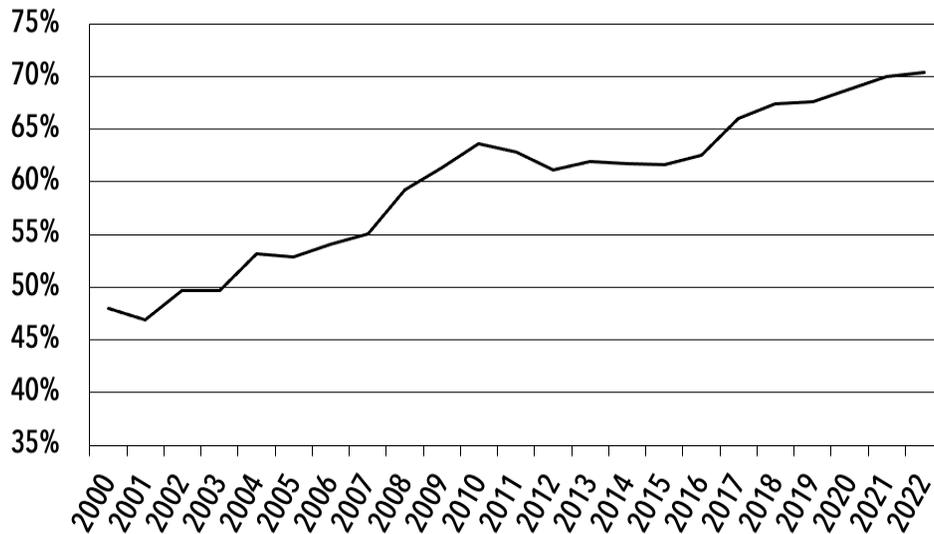
Data source: Paul Dykstra, 2023.

\*“Acceptance Rate” refers to the percent of Angus-type cattle meeting the CAB’s brand specifications.

The demand for high-quality beef has created pricing signals, and producers have responded in two ways. First, selection pressure for a black hide color has increased to get cattle to clear the first barrier of entry to Angus-branded programs. Just as importantly, there has been increased selection on carcass merit, specifically marbling, which has allowed those black-hided cattle to qualify for additional premiums. Demand signals remain strong despite significant increases in beef quality (marbling). The beef cattle industry has seen a nearly three-fold increase in the number of cattle

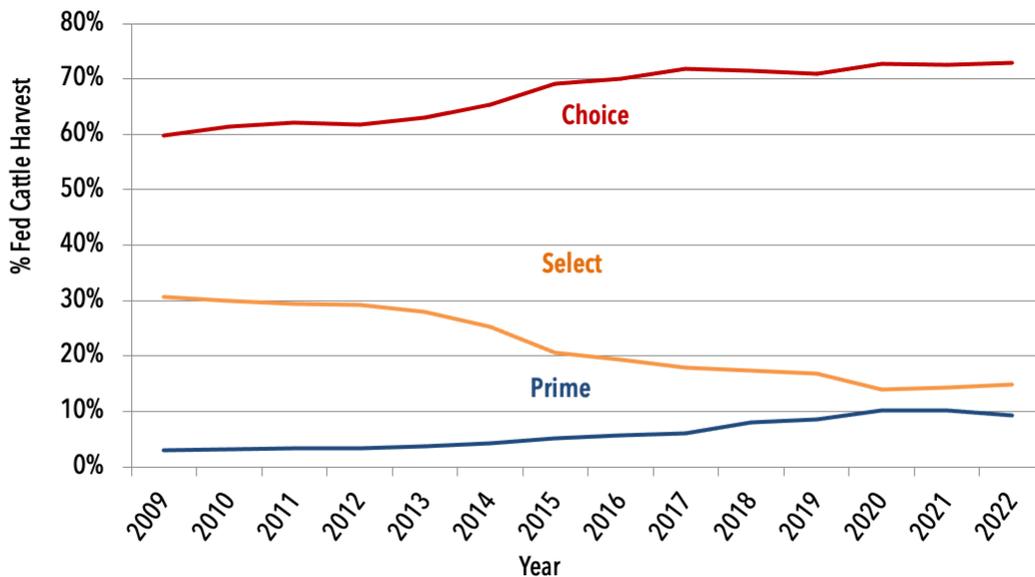
meeting the CAB specifications, and yet the premium for CAB has remained the same (USDA, 2023). Similarly, the amount of Prime product has more than doubled, and the premium has still grown. Conversely, the amount of Select beef has been cut by one third but the discount has increased significantly. Figure 9 below shows the number of cattle that qualify for the visual specifications of CAB has increased over time as cattlemen responded to demand signals.

**Figure 9. Percent of US Fed Cattle Qualifying as Angus-Type**



Data source: Paul Dykstra, 2023.

**Figure 10. Grading Percentages for Fed Cattle**



Data source: Paul Dykstra, 2023.

Back to the original question, is the premium seen in the marketplace for black-hided cattle justified? Figure 11 walks through some simple math to help answer the question.

## **Figure 11. The Value of a Black Hide**

### **Assumptions:**

- 925 lb. Carcass Weight
- 40% CAB Acceptance Rate
- CAB Premium \$5/cwt

$$925 \text{ lb.} \times 0.40 = 370 \text{ lb.}$$

$$370 \text{ lb.} \times (\$5/100 \text{ lb.}) = \$18.50/\text{head}$$

In recent years, the premium for black-hided calves has been approximately \$4-5/cwt. These premiums are reflective of both genetic and breed differences. It is important to note that no grids pay a premium for just being black-hided, and feeders are seeking black Angus genetics because they are known to have a higher propensity to marble, making them more valuable as an end product. USDA branded-beef premiums, while significant, make up a small portion of the overall value of a fed animal. Just looking at terminal traits, the difference between the average Angus-sired animal, and non-Angus sired animal is roughly \$180/head with July 2023 prices and price spreads.

When genetic differences are combined with market advantages or CAB premiums (\$19) the valuation on average extends to \$200/head. In turn, the average 500 lb. Angus-sired calf is worth \$40/cwt more than an average calf sired by another breed; so the premium for black-hided cattle has not only been fully justified, but also remains dramatically understated. Nor is it surprising that beef breeds like Simmental, Gelbvieh and Limousin have become predominantly black-hided.

Clearly, the question is not whether the premiums for black-hided cattle are justified but rather can the premiums be more efficiently allocated to reflect differences in consumer preferences, perceived value and realized performance differences.

## **CONCLUSIONS ON THE VALUE OF HIDE COLOR AND GENETICS**

In recent times, there has been around a \$4-5/cwt premium for black-hided calves in the marketplace. While hide color alone is not a completely objective nor comprehensive measure of “value,” it is fully justified as earning a premium in today’s marketplace. This premium is reflective of the brand value that was created through CAB and the over 70 other Angus programs that compete with it.

The value of black Angus genetics when compared to other breed genetics for the economically relevant traits of beef production, also indicates the marketplace has been more than fully justified in paying a premium for them. Admittedly, the ubiquitous nature of black hides in the marketplace has reduced its effectiveness as being a perfect proxy for Angus genetics. No longer can a black hide be seen as evidence of being Angus sired, nor does it necessarily guarantee that such cattle will be significantly more likely to meet the specifications of Angus-branded meat programs beyond meeting the initial live animal specifications.

It is in the interest of the entire industry to expand its ability to describe genetic merit beyond the proxy of hide color and move toward more objective and reliable metrics for genetic potential. As discussed, the premium for black hides is both justified and a great example of the advantages of sending appropriate economic signals through the industry based on the value they are recognized for in the marketplace. However, the premium for black-hided calves is not always properly applied in the marketplace at the current time, because of a lack of objective genetic metrics, which leads to the continuation of the commodity pricing system based on averages and reputation.

Genetic differences account for as much as a \$1,000 dollar differences in profitability between pens of cattle. The evidence demonstrates it is advantageous for the industry to evolve towards more verifiable, objective and reliable measures of genetic merit. This includes measuring genetic merit more accurately as a means to improve the pricing equation of feeder cattle – an advantageous move for all segments of the beef industry. It would not only create a system that would more accurately reward cattlemen for the value they create, but also improve beef demand, overall system efficiency and profitability in the process.

Similar to the adoption of EPDs for seedstock, these metrics will take some time to be widely adopted within the industry. The advent of EIDs, coordinated supply chains, branded programs, tracking systems and genetic metrics provided by breed-based programs like AngusLink<sup>SM</sup> have created an environment where widespread adoption, access and implementation is possible. The value of genetics are at a historically high level, and the genetic differences within sets of cattle and among breeds is widening. The industry is uniquely positioned to take advantage of the current dynamics to improve profitability for individual producers and the industry as a whole.

In conclusion, key metrics signal the industry is evolving toward a more value-based marketing system. Key economic metrics validate this positive trend. While not perfect, hide color premiums are an effective and justified means of value-differentiation. They tell a story of higher value cattle – cattle that grade well and earn premiums on the other end. However, there remains opportunity to improve the market's ability to reward cow-calf producers for their selection decisions when creating more of these high quality cattle in the herd, and the market is evolving to do that. Tools for cattlemen to differentiate cattle more accurately based on value and genetic merit will allow them to buy with more confidence, reduce risk, improve management and increase profits. Ultimately, this will also reward cow-calf producers more accurately for the value they have helped to create.

## REFERENCES

- American Angus Association. (2022.) *Average EDPs for breeds (2020 birth year) converted to an Angus base.*
- Beef Quality Assurance. (2023.) *National Beef Quality Audits.* Retrieved July 1, 2023 from <https://www.bqa.org/resources/national-beef-quality-audits#:~:text=The%20National%20Beef%20Quality%20Audit,affect%20consumer%20demand%20for%20beef>.
- Certified Angus Beef LLC. (2023.) “Certified Angus Beef® brand Sales.”
- Garrick, D. J., B. L. Golden. (2009.) *Producing and genetic evaluations in the United States beef industry of today.* *J. Anim. Sci.* 2009, 87: E11-E18. DOI: 10.2527/jas.2008-1431.
- Dykstra, P. (2023.) “Brand Supply Trends from 2000-2022.” *Certified Angus Beef.*
- Dykstra, P. (2023.) *Personal Interview.*
- Kuehn, L., M. Thallman. (2023.) “2023 Across-Breed EPD Table and Improvements.” *USDA Meat Animal Research Center.*
- Kuehn, L., M. Thallman. (2023.) “USMARC Germplasm Evaluation Program Report - 2021 Born Animals.” *USDA Meat Animal Research Center.*
- Schroeder, T.C., B.K. Coffey, G. T. Tonsor. (2022.) “Hedonic Modeling to Facilitate Price Reporting and Fed Cattle Market Transparency.” *Applied Economic Perspectives and Policy: 1–18.* <https://doi.org/10.1002/aep.13324>.
- Snelling, W.M., R.M. Thallman, M.L. Spangler, L.A. Kuehn. (2022.) *Breeding Sustainable Beef Cows: Reducing Weight and Increasing Productivity.* *Animals (Basel).* 2022 Jul 7;12(14):1745. doi: 10.3390/ani12141745. PMID: 35883292; PMCID: PMC9311566.
- USDA Ag Marketing Service. (2023.) “Livestock Mandatory Reporting from Jan-Mar 2023.”
- USDA Economic Research Service. (2022.) *Cattle & Beef: Sector at a Glance.* Retrieved August 15, 2023 from <https://www.ers.usda.gov/topics/animal-products/cattle-beef/sector-at-a-glance/#:~:text=Feedlots%20with%20less%20than%201%2C000,85%20percent%20of%20fed%20cattle>.
- USDA National Agricultural Statistics Service. (2017.) *Cattle Inventory Report.*