

WHY ALL THE FAT BULLS?

BULL DEVELOPMENT WHITE PAPER
RED ANGUS ASSOCIATION OF AMERICA
COMMERCIAL MARKETING TEAM

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Introduction

The sale of beef bulls is often the primary source of income for seedstock producers. That makes bull growth and development a BIG DEAL for everyone involved. Bulls must be adequately grown out to sell well, but there are limits. Proper bull development programs include an extensive list of steps and actions that must be completed by every operation. It may not always be fun, but it has to be done. From cost analysis to ration formulation to customer preferences, there are many considerations in building an effective program.

There can also be friction between a seedstock producer's goals and bull buyer demands. The Red Angus Association of America desires to bridge this gap by addressing key aspects of beef bull development. The goal is not to praise or denounce any particular approach, but rather to provide an understanding of the positives and negatives associated with different development targets and methods.

Producers often ask, "What is the best path to follow in growing my bulls to help them do their intended job and build my sale's reputation?" Dr. Justin Waggoner, beef systems specialist at Kansas State University, sums up the uncertainty felt industry-wide by saying, "We would be doing the industry a service by providing more education on the bull development process."

That is, in part, what this paper intends to do.



Development Systems

Most modern agricultural practices utilize intensive management. High input/high output scenarios are commonplace. This approach may or may not fit producer targets when it comes to developing bulls. While specific practices in bull development vary, the objective is generally the same - selling phenotypically appealing bulls with high genetic merit and the physical and sexual soundness to go out and settle adequate numbers of heifers and cows.

Developing bulls effectively is a balancing act between time, weight gain, cost and marketability. Preparing bulls for their first breeding season is an important task, because bulls can be damaged for life if improperly grown. Bulls pushed too hard or fed inadequately may experience lasting adverse effects in their physicality, structure and ability to breed.

During the 1980s and 1990s, increased emphasis was placed on having more yearling bulls available at sales. This trend has remained in place up to the present time. Just over 72% of Red Angus producers offer yearling bulls in their annual sales, with an average target weight of 1,100 pounds (2019 RAAA Seedstock Survey). Industry professionals attribute this, at least partially, to genetic advancements and earlier age of maturity in beef bulls today. The other motivator behind this change is the desire to avoid added feed costs and injury risk associated with developing bulls to 18 months of age or older.

Private sector nutritionist Dr. Mike Mehren does the greatest percentage of his work in the northwestern United States. Mehren believes that extra feed costs, combined with today's more efficient cattle, led many seedstock producers into designating their young males to be bulls from birth, not considering castration until later in life. Innovations such as DNA testing and feed intake data collection, along with faster-growing genetics becoming more widely available, alleviated some of the risk involved with purchasing younger herd sires. These changes, along with increased acceptance of EPDs, has given commercial producers more confidence in turning out yearling bulls.

Selling younger animals does come with potential weaknesses. Drawbacks include a decrease in sale price (yearlings often sell below the price of older bulls), customer complaints due to changes in phenotype, the reduced number of cows/heifers that can be covered, and from the seedstock supplier side, earlier weaning in order to get bull calves on a more rapid growth plane.

Some seedstock producers elect to offer mostly or exclusively 18-month old bulls in their sales. Though only 18% of Red Angus bull sales attended by the RAAA commercial marketing team in 2020 offered solely 18-month old bulls, it may be seen as a point of added customer value to sell age-advantaged bulls with the ability to cover more females in the first season of service. Age-advantaged bulls do have higher input costs when compared to their yearling counterparts, which leads some producers to question whether they can garner enough premium at sale time to justify developing their bulls to older ages. However, some bulls that are offered at older ages were not ready to be sold as yearlings due to injury, date of birth or a slower growth rate. Sale averages reflect these concerns as production sales that offered mixed ages of bulls exhibited the lowest price received when compared to sales that offered a single age group. Furthermore, the least common practice is the development and marketing of bulls at 2-years of age. Only about 15% of Red Angus producers say they offer 2-year-old bulls in their sale or private treaty offering and only 8% of producers offered strictly 2-year-old bulls in the 2020 spring sale season.

Continued selection for more progressive and complete genetic profiles, along with the implementation of genomics, has shifted the most traveled path of bull development and marketing toward yearlings. Faster genetic improvement has also changed the nutritional requirements and feeding practices for seedstock producers, who know they have to accelerate the rate of gain on their young bulls to get them ready to be sold at 12 to 15 months of age.

Table 1: Comparison of Advantage and Disadvantages in Developing and Marketing Yearling versus Older Bulls for Sale

	Yearling Bulls	Older Bulls
Pros	<ul style="list-style-type: none"> • Lower development cost • Less risk of injury or mortality • Opportunity to market the most current genetics and decrease the customer's generation interval 	<ul style="list-style-type: none"> • Higher gross sale price • Opportunity for slower development process • Moderated gain, fewer feet and structural issues related to a faster development process • Buyers' preference (RAAA Bull Buyer Survey)
Cons	<ul style="list-style-type: none"> • More susceptible to feet and structural issues associated with overfeeding energy • Lower gross sale price 	<ul style="list-style-type: none"> • More days on feed - higher risk and increased cost • Less potential to offer fresh, cutting edge genetics to customers

Performance Comparisons of Development Systems

The RAAA has compiled the following analysis comparing bulls developed and intended to be sold as yearlings versus those intended to be sold at older ages. All Category 1A and 1B Red Angus bulls born on or after January 1, 2013, with recorded weaning and yearling weights were included. To narrow the scope, bulls were categorized as yearlings (those transferred to new owners from the age of 12 to 15 months of age) and age-advantaged (bulls transferred between 18 and 25 months of age). The data set was further subcategorized into spring-born and fall-born cattle in which spring-born animals had birth dates ranging from January 1 to March 31. The table below illustrates the differences found in adjusted weaning and yearling weights, post weaning growth and average daily gain for the spring-born contemporary group.



Table 2: Comparison of Performance Benchmarks in Spring-Born Red Angus Herd Sires (RAAA, 2020)

Classification	No. of Head	Adjusted Weaning Weight	Adjusted Yearling Weight	Post-Weaning Gain	Weaning to Yearling ADG
Yearling Bulls	25,591	652	1,139	487	3.04
Age-Advantaged Bulls	5,951	624	1,033	409	2.56

Confirming what bull buyers and industry professionals have believed for some time, yearling bulls are pushed harder, boasting three pounds of average daily gain from weaning to yearling. Bulls are generally fed at a higher plane of nutrition in months nearing the sale which might mean that ADG remains high up to the time of sale for those cattle being sold at 14 or 15 months of age. Nonetheless, the data does show that buyers and sellers have found an acceptable middle ground for adjusted yearling weight between 1,100 and 1,200 pounds, which may not be as high as some may have speculated.

On average, producers who opt to sell spring-born bulls at 18 months of age or older will provide nutrition adequate enough to facilitate around 2.5 pounds of ADG. Fall born bull calves show a more moderate weaning to yearling growth rate, as expected. Cattle born from August to October and sold at older ages are likely weaned and turned out for grazing through the summer growing season before being placed on a higher nutritional plane later in the development process.

Yearling-sold bulls also boasted a higher adjusted weaning weight when compared to their age-advantaged counterparts. In some models, bulls are sold as yearlings due to them having greater growth genetics and more potential for post-weaning gain. In others, producers who choose to sell bulls at an earlier age may feel it is necessary to place greater emphasis on early growth. Regardless, bull calves that wean off heavier can be grown at a more moderate rate of gain and achieve acceptable

performance benchmarks without additional, and in some cases excessive, energy in the diet.

Environmental differences should not be ignored; areas that offer a lush green-up, longer growing season, or a more productive forage base are sure to contribute to heavier weaning weights, giving producers the opportunity to develop their bulls for sale as yearlings without overfeeding and over fattening. On the opposite end of the spectrum, the environment will play a role in customer preference as well. When considering less productive and arid regions that may not be as advantageous for the sale of yearling bulls, customers may place an even greater emphasis on purchasing a more mature herd sire that was developed slower and will have a better chance of maintaining body condition through his initial breeding season.

Nutritional Factors in Bull Development

There is much discussion regarding plane of nutrition as it relates to bull fertility and longevity. There is an equal amount of conversation on body condition as it relates to sale averages. How much energy is too much? Will bulls always sell better with more flesh? Though the latter question can be difficult to answer, breeders might want to consider whether it is worth damaging a potential long-term business relationship for the sake of a small increase in sale average? There is certainly a point where we compromise a bull's productive lifetime based on decisions made during the development process.

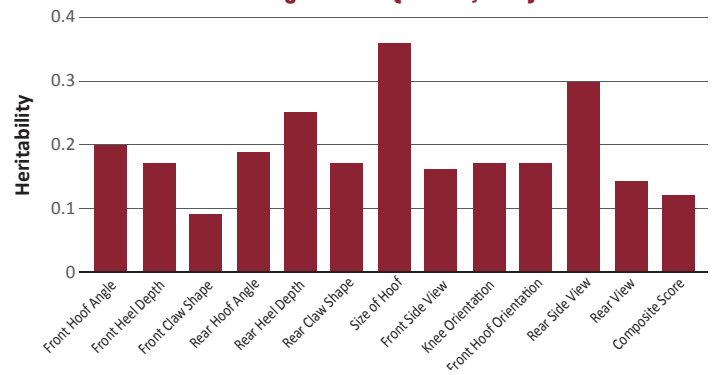
Though debates are frequently made about the benefits and complications of concentrate versus forage-based development diets, the core of all programs should revolve around industry accepted requirements given the physiological age of the bulls. For various reasons, producers sometimes feed beyond these benchmark nutritional requirements, most commonly to endure challenging weather patterns, demonstrate genetic potential or to even mask deficiencies. However, it is most tempting to heighten the plane of nutrition when there may be a premium for performance and flesh condition involved.

When a herd sire prospect is early in the post-weaning development phase, it is likely that they can achieve three pounds of ADG, or greater, on a diet with 48 Mcals per hundredweight for net energy gain. Most commonly paired with higher protein and roughage content, these grower rations are effective in starting young cattle. Anipro technical nutritionist, Mike Simon, notes that the level of crude protein in the diet continues to play a vital role, even as bulls mature and consume additional feed. “Protein is expensive, but keeping the calorie to protein ratio in check will allow bulls to build muscle mass, not deposit fat,” says Simon, “ultimately facilitating a much ‘harder,’ more manageable gain and resulting in optimal testicular development.”

Yearling bulls are frequent participants in bull tests where high-concentrate diets are popular. Concentrate-driven rations can result in more “exciting” gains, but can be tricky to regulate, both during development and prior to the breeding season. As these yearling bulls are pushed to perform at higher levels, exceeding 4.5 pounds ADG in some cases, a steep increase in energy is necessary. Based on Nutrient Requirements of Beef Cattle, an additional 25% percent increase for net energy gain is required when comparing an 800-pound bull being fed for 3.5 pounds of ADG versus a same-weight bull being fed for 4.2 pounds ADG. Simon, along with numerous other nutritionists, believe diets with such high energy content should never be utilized in bull development.

As bulls continue to grow and mature, dry matter intake will increase leading to additional energy consumed. By this stage, nutritionists have likely increased the development ration’s net energy gain to 50 Mcals per hundredweight or higher. A herd sire prospect weighing 1,100 pounds will reasonably be able to maintain between 3 and 4 pounds ADG on this diet, provided bulls are on full feed and the ration meets the remainder of their nutritional requirements. Feeding bulls a “hotter” ration and continuing to push for performance can result in gains well over 4.5 pounds per day (NRC, 399) – a feat accomplished by the substitution of concentrate for roughage in the diet. These very high gain rates usually result in bulls accumulating more flesh and condition, as well as significantly higher feed costs.

Figure 1: Heritability Estimates for Feet and Leg Traits in Red Angus Cattle (Jensen, 2017)



Dr. Waggoner reminds producers that not all rations are formulated with the same intent and that total caloric intake is a key driver. “If a producer is feeding a ration with higher starch content, it should be well planned and intentional. We can feed fewer pounds and potentially achieve the same gains.” Managing a program-fed diet requires both diligence and discipline. Increasing energy density within the diet can be beneficial, but producers must know how much the cattle are actually consuming. “If we increase energy density in the diet to increase gains, we have to be cautious of the total feed delivered. If we are not monitoring both total feed delivered and energy content in the diet, it can be easy to over feed and potentially over-fatten bulls,” says Waggoner.

While it is not uncommon to hear of diets far surpassing total energy requirements, Mehren believes this can also be where foot issues may be introduced. Given the current emphasis the beef industry is placing on feet and leg soundness, producers across the country are speculating on what percentage of foot shape problems are genetic and what percentage are introduced from environmental factors such as the development process. Kansas State University has shown that claw shape, foot angle and eleven other foot scoring measurements range from low to moderate heritability (Fig. 1). While these findings give producers reason to be optimistic that we can improve feet traits through selection, it also suggests that a much higher percentage of industry foot problems are environmentally driven. Dr. Jordan Thomas, University of Missouri, states that, “In addition to reproductive soundness, a herd sire has to maintain the physical ability to mate. There is evidence that subclinical acidosis has direct impacts on hoof structure. Therefore, the development process undoubtedly influences the hardness and structural integrity of a bull’s feet.”

As the fourth generation from a ranch with more than 60 years experience in marketing beef bulls, Blake Ochsner of Torrington, Wyoming, urges producers to remember that cattle have improved drastically over time. He agrees with Mehren that they are more efficient today. “In the 1990s, when there was a push for more performance, bulls could be fed harder without much concern of getting them overly fat.

Now that cattle have greater appetites and are more efficient, feeding a higher energy ration leads to a much greater risk of overly fat animals for a percentage of the group being developed. More bulls are ruined due to improper feeding than need be,” says Ochsner.

It is fairly common to see age-advantaged bulls developed in range-type programs. These forage-oriented programs are widely praised for moderated rate of gain due to lower energy inclusion in the diet. They may also be beneficial due to the travel requirements bulls must endure. Many nutritionists are proponents of these roughage-based development systems, noting that higher levels of crude protein and ample roughage within the diet allow for the bull’s natural maturity pattern to show through, ultimately leading to fewer problems with failed fertility tests and lack-of-longevity complaints. Ochsner and Simon both believe these rations lead to rates of gain (usually closer to 2.0 to 2.5 pounds in ADG) that will leave bull buyers satisfied with their purchase long after sale day.

On the other hand, it should be recognized that these slower gain rates – while generally suitable for bulls sold at 18 months of age, may not be fast enough to support the – marketing of yearling bulls. Breeders should discuss performance goals and expected outcomes with their consulting nutritionist. Realistic gains, that will promote longevity and functionality are sure to vary depending on genetics, environmental differences, and age of the bulls at the time of marketing.

According to the University of Nebraska’s Bull Nutrition and Management, herd sires should enter the breeding season

ranging from 5.5 – 6.5 for body condition score, given the increased workload they will endure. A widely accepted benchmark by producers, nutritionists and industry professionals, this generally allows for a bull still covering any late-cycling cows to be in an adequate BCS 5, and to conclude the breeding season in acceptable shape. Yet, many bull buyers claim to prefer their purchases in a slightly leaner package at sale time. In the RAAA Bull Buyer’s Survey, a majority of producers preferred to buy bulls in a BCS 5, giving them the opportunity to keep the bull on an increased plane of nutrition leading into the breeding season. They also acknowledge that many young bulls offered for sale over the past five years have been fleshier than ideal. This can be partially related to the claim that producers will pay a premium for the higher performing bulls in any contemporary group. However, it may also hinge on the fact that an 56.5% of Red Angus seedstock producers opt to go without nutritionist insight when formulating bull development rations (RAAA Seedstock Survey). In many cases, this results in visual appraisal and performance weights being the sole benchmarks for nutritional adequacy and appropriateness during the development stage.

Given the emphasis on efficiency and the current push for feed-to-gain data, it would bode well for all parties involved from the development to the purchase of a herd sire to remember that performance is only one-half of the equation. A truly efficient animal shows the ability to consume adequate amounts of feed and outperform his contemporaries in an objective setting. This pairs directly with the statement made by bull customers in the survey, where “continued moderation of frame” was voted as the number one selection key they would like to see their seedstock suppliers focus on moving forward. Ultimately suggesting that it is not exceptional performance they are after, but adequate performance coupled with exceptional efficiency.

All bulls intended to breed cows in a pasture setting should be adapted to high forage diets for a 30-to 60-day period prior to turnout. However, if a bull is too fat, suppressing energy in the diet to “step down” into an acceptable body condition score can negatively impact fertility. This can be particularly problematic with bulls transitioning from a diet with high concentrate levels. Mehren believes that bulls gaining approximately 3.0 pounds per day should still give the purchaser a reasonable chance to prepare their herd sire for a breeding season where his nutritional requirements will most likely be met through grazing.



Seedstock Producer Survey and Production Overview

Red Angus seedstock producers also had the opportunity to voice their opinions on the bull development process through a similar survey that was given to their commercial customers. The majority of producers still opt to sell yearling bulls, most likely due to lower production cost and less inherent risk. Variables such as genetic potential, individual performance goals, ration content, weather, and several other factors undoubtedly impact cost of gain. Developing bulls will have a higher dry matter intake as well as require additional energy content to facilitate deposition of muscle mass, however, metrics from the fed-cattle sector have been included as a reference point for cost of gain in bull development. It is important to remember that most bull management protocols and feed rations will not include common fed cattle technologies such as implants or beta-agonists, which both play a significant role in today's cattle feeding industry.

Kansas State University's Focus on Feedlots shows that average cost of gain from July 2019 to June 2020 averaged \$83.18 per hundredweight for steers gaining between 3.0 and 4.0 pounds per day with a dry matter conversion of 6.16-to-1 – similar marks to what bull development facilities might aim for or even try to beat. Seedstock suppliers most commonly note that 18-month-old bulls tend to boast a 400-pound weight difference when compared to yearlings. In feed costs alone, there is potential to save \$300 to \$500 per head by selling bulls close to a year of age. Commercial customers do indicate a modest preference towards buying age-advantaged bulls (Fig. 2). However, with little to no change in use expectation for these bulls (five years, one breeding season per year, according to the RAAA Bull Buyers Survey), it may be seen as advantageous to produce a yearling bull for less cost with customers replenishing their bull battery on a similar timeline.

Within the survey, RAAA members were asked to rank, in order of importance, the following traits: calving ease, maternal traits, growth, carcass traits and visual appraisal. Nearly 40%

of seedstock producers said that visual appraisal was their first and foremost consideration. This confirms the adage that “he has to look like a herd sire first,” but also hints that many producers may be placing stricter stipulations on the type and kind of bulls for sale, especially in traits that affect their ability to mate and reproduce, as Dr. Thomas pointed out. This coincides with the fact that bull producers also believe feet and legs were the number one trait that the breed needs to focus and improve upon in years to come.

As the various categories were ranked by seedstock breeders, points were assigned to formulate an average score for each trait/traits group. Average scores were computed with 5 being most important and 1 being the least important/least emphasized.

Cumulatively, calving ease scored of equal importance to visual appraisal, despite not having as many first-place designations. On the 1 to 5 scale, these categories averaged 3.46 and 3.38, respectively. Next in line were maternal traits at 3.22, ranking only slightly below the leaders. Growth traits scored slightly lower, averaging just below 3.0. Finally, carcass merit ranked lowest as the fifth consideration for our seedstock producers with an average score of 2.09. A comparison of these rankings can be seen in Figure 3.

With respect to the future, seedstock producers clearly believe structural soundness is of the utmost importance. Though this differs from the top-ranking answer on the commercial bull buyer's ballots, both groups selected areas of importance that relate to functionality and longevity – a pair of characteristics for which Red Angus cattle have long been known. Producers selected “other” traits that should be at the front of breeder considerations in the years ahead less often (17%). Many of those commented about improving udder structure and teat quality. Even so, we can safely conclude that functionality is key to gaining more traction and improving profitability in both the purebred and commercial marketplace.

Figure 2: Preferred Age of Herd Sires at Time of Purchase (RAAA Bull Buyer Survey)

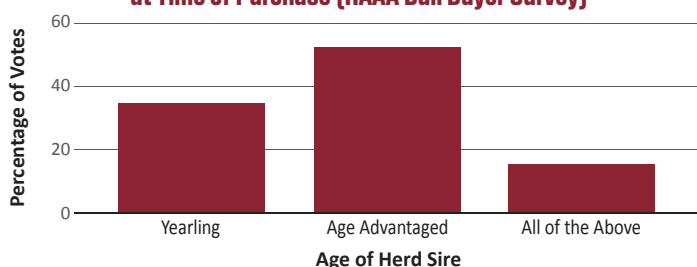
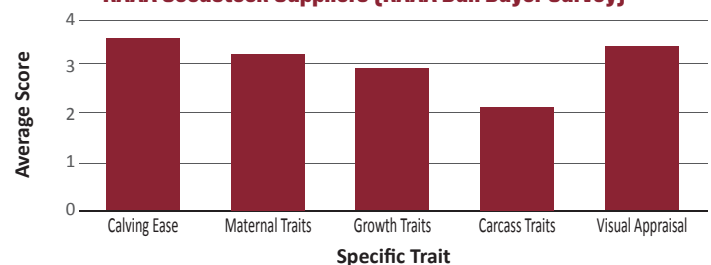


Figure 3: Traits of Importance as Ranked by RAAA Seedstock Suppliers (RAAA Bull Buyer Survey)



What Do the Commercial Buyers Want?

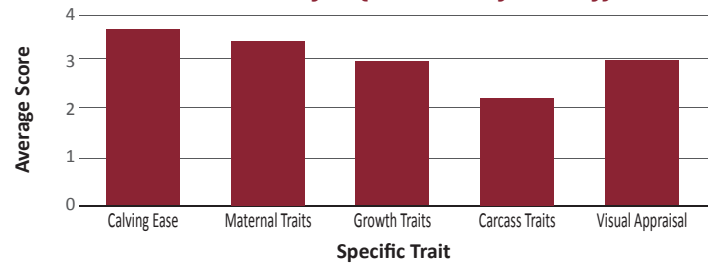
RAAA offers its own bioeconomic selection indexes that are based upon IGS-BOLT generated EPDs. However, most producers have their own “index” already in mind when they are making bull purchasing decisions. One ever-present challenge involved with sire selection is the lack of education on what various EPDs and indexes actually mean. In a survey conducted by RAAA, seedstock producers and commercial cattlemen alike indicated a lack of understanding pertaining to the breed’s genetic evaluation.

The balanced distribution of preferred traits as ranked by commercial cattlemen indicates that they aim to purchase the most genetically and phenotypically complete animal available. Yes, they understand that no individual animal, or breed, does it all. With that being said, there are specific traits that producers tend to focus on. Calving ease ranks at the forefront of commercial cattlemen’s demands. Many commented that they cannot justify hiring extra help during the calving season. More importantly, they do not want to cause injury or affect the longevity of their females.

Maternal merit ranked a close second in importance among bull buyers. The maternal traits listed were HerdBuilder, stayability, calving ease maternal and heifer pregnancy. The Red Angus breed has enjoyed substantial growth in the past decade, much of which can be contributed to the consistency and functionality associated with its females. Both longtime and new Red Angus producers echo the phrase, “Don’t mess up the cowherd and you will be miles ahead of the rest.” Many commercial producers have stuck to this approach and want to ensure that their bull selection is going to improve their in-herd genetics year after year, including the genetic and phenotypic quality of their replacement females.

Although genomically enhanced EPDs have added accuracy to sire selection, the physical structure and condition of bulls plays a vital role in purchasing decisions. Fifty-two percent of commercial producers indicate that visual appraisal is one of the top three factors they use to select an animal. Visual appraisal includes looking at feet and legs to make sure animals are sound and functional. Several commercial producers noted that if an animal has bad feet, they will no longer consider

Figure 4: Traits of Importance as Ranked by Commercial Bull Buyers (RAAA Bull Buyer Survey)



purchasing him, even if the EPDs indicate longevity is not an issue. Functional, phenotypically attractive cattle will always be a favorite at sales and are emphasized as important to commercial producers and borne out in the RAAA Bull Buyer Survey. Structure is not the only key factor in visual appraisal, producers each have their own type and kind in addition to personal preferences on factors such as body condition score.

Commercial beef producers indicate that they want yearling bulls to have a body condition score of 5 -- not too fat, but not thin. Nearly 45% of producers indicate that bulls available for purchase in the last five years have been fleshier than they prefer. Body condition score not only affects semen quality, but also longevity. To make matters worse, over-conditioned bulls that are brought home and fed a ration of lesser nutritional value can show negative impacts on sperm motility and overall viability. Due to the physiological cycle of sperm production (60 days), this change can greatly impact pregnancy rates (Walker et al.).

Over-conditioned bulls that are still developing tend to have added stress on legs and joints, which plays a big role in their ultimate longevity. Sixty percent of commercial producers expect to use the bulls that they purchase for five or more years, some using them for multiple breeding seasons per year. Bulls accumulating excess weight during the development stage rarely last in a large pasture setting for the desired amount of time. Producers who stick to their 5.5 BCS requirement are more often content with their purchase and likely to return to the same seedstock supplier in the future.

Seedstock producers desire that their customers would make it a priority to attend their bull sale every year. The reality is that many bull buyers source genetics from multiple operations over a period of years and even within an individual year. Ninety percent of commercial producers noted that they go to more than one operation annually to acquire bulls. The saying “the customer is always right” applies more to this scenario than many seedstock producers think. Understanding the expectation and demand of potential bull buyers will lead to a greater percentage of retained customers. Functional cattle that continue to perform tend to keep all parties in good spirits, resulting in a longer lasting business relationship.



Have Tendencies Changed in Bull Development?

The RAAA commercial marketing team has been collecting data from the large number of Red Angus bull sales they have attended annually since 2017. One goal of this endeavor is to provide insight into what traits are most valued by Red Angus bull buyers and how preferences have changed over time. Correlations between sale price and selection criteria such as EPDs, bio-economic indexes and ultrasound measures are evaluated to gauge which traits and measures have the greatest influence on price.

In 2020, weaning weight, yearling weight and average daily gain EPDs had the highest correlations with sale price, indicating that bull buyers were placing more emphasis on growth traits compared to previous years. This coincided with less emphasis on calving ease direct and birth weight EPDs. It seems more bull buyers were searching for power bulls in 2020 and were willing to accept higher birth weights in order to achieve their goal.

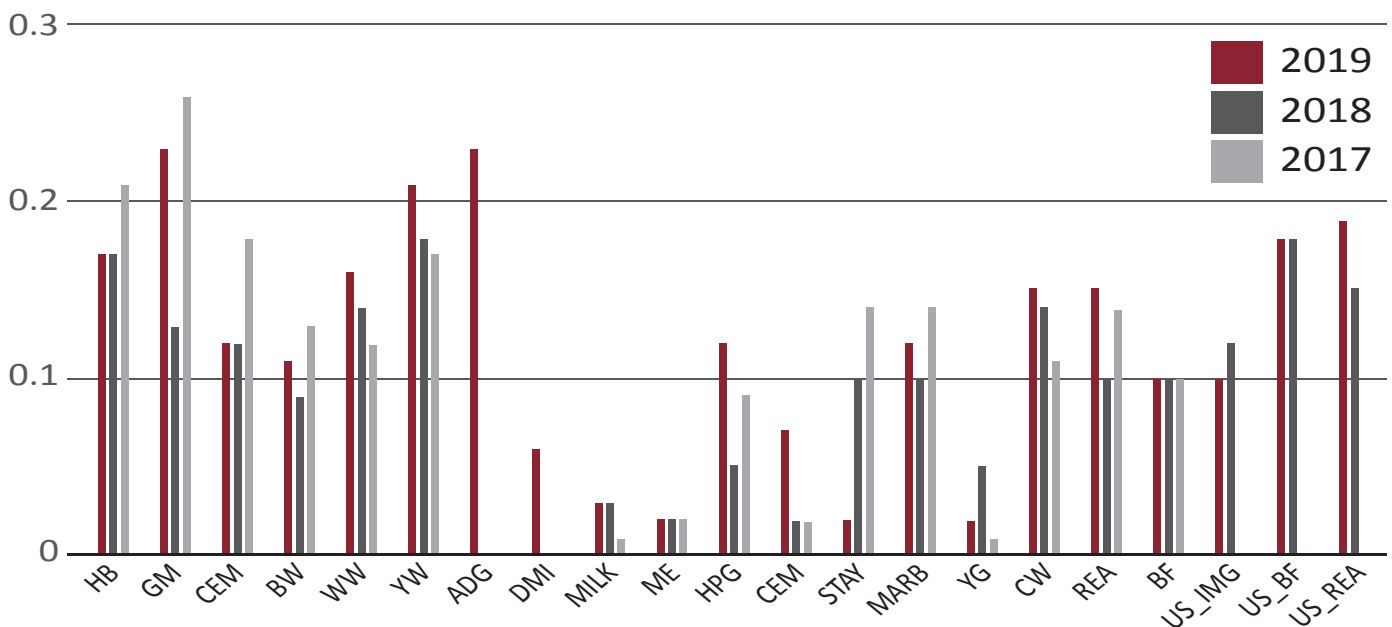
Over the four-year period for which data was collected, buyers consistently placed high value on GridMaster index, Herd-Builder index and the weight traits. It is logical that there were high correlations between sale price and the bio-economic selection indexes provided by RAAA, as these indexes are powerful selection tools that utilize economically relevant traits to predict profitability in various production scenarios. Between the two economic selection indexes, stronger emphasis was placed on the GridMaster index. Among the EPD correlations, growth traits had higher correlations with sale price than other reported EPDs. It can also be noted that ultrasound back fat and ultrasound rib eye area had strong



correlations with sale price for both years that this data was recorded. Based on these results, it might be inferred that bull buyers generally paid a higher price for bulls that were visibly fleshier and heavier muscled.

Worth noting is the difference between what commercial bull buyers say they want in bulls compared to how they actually execute their bull purchases. Growth and carcass traits tend to be more emphasized when producers vote with their pocket-books, whereas their spoken emphasis on these traits ranks lower.

Figure 5: Year-Over-Year Comparison: Correlation Between Sale Price and Selection Criteria



Conclusion

Bull development continues to be an evolving process. As genetics change, become more efficient and are better estimated through genomically enhanced EPDs, purebred producers are able to make better bull development decisions. Their commercial buyers, in turn, are able to select bulls from programs that most closely match their desired production scenarios and available resources. Region of the country will affect the cost and availability of ration ingredients and potentially the type and length of the development period for bulls. Yet bull development is, and should be, influenced by what customers prefer as well.

Research in this paper indicates both purebred and commercial cattlemen weigh bull selection heavily towards structural soundness, feet quality and overall phenotypic balance. All of these things have been shown to be influenced by growth and development regimes. While maternal and calving ease traits rank high in the minds commercial cattlemen's selection intent, growth and carcass traits generally achieve greater value at bull sales, indicating balanced-trait bulls are the most desired by the industry.

This publication has outlined a number of different systems and the nutritional factors that influence bull development. It has also outlined areas of selection pressure from both the purebred and commercial perspective as well as supporting price information related to various traits. There is no one perfect way to develop bulls, but this document provides a guide for blending methods and desired outcomes into a reasonable process.

Purebred producers that are aware of and attentive to the traits and development techniques desired by their customers will continue to be the most successful. By efficiently matching the body condition, structural correctness and fertility to customer preferences, top value and appropriate levels of genetic expression can be obtained as it relates to bull development. As genetics, technology and resources evolve, so will development systems, nutrition programs and demand criteria of bull development.



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