Connecting the Cowherd to the Carcass: Balancing Production, Environment, and the Market Place

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The commercial cow-calf operation is now facing greater challenges and economic uncertainty as the beef industry continues to consolidate into production segments with profit centers that focus on an increasing number of traits and issues that impact herd management and breeding decisions. The economic importance of marketing and producer accountability has changed so dramatically that integrated beef production has become a near requirement in some cases for market access. At a minimum, cow-calf producers must consider the acceptability of their cow herd production and too often have little or no knowledge of the true value of their calves to others in the industry. It is realistic to assume that marketing power (value) will drive production concepts. However, market value is too often confused and misrepresented in our segmented industry. This has led to the concept of value-based marketing and the need for integrated production systems that consider all traits and issues affecting value perception in a fair and honest manner for all industry participants. With most beef industry participants this means a loss of independence in management in some cases and to dictated control by others in other cases. This makes it hard to accept for those with a truly independent attitude about their enterprise. Most often, it is viewed as profitability competition among the segments with a material distrust resulting within the industry. It will be no easy task to develop efficient industry operation with many cow-calf herds owned and operated by part-time cattlemen and with the cattle enterprise a largely secondary aspect to many landowners and agricultural businesses.

Basic Concepts

Beef production and the industry cannot succeed without the basic cow-calf operation as the viable foundation. The cow herd is the renewable resource and the most important segment in capital investment. Low returns (profitability) are accepted by many based on land appreciation and alternative land use. However, future industry emphasis must address the need for survivability of cow-calf enterprises. Essentially every educational effort dictates the need for brood cows to be genetically matched to the production environment. Ritchie (2002) prepared the following table based on BIF guidelines as an illustration.

Table 1. Examples of matching genotype to production Environment.[a]

Restricted feed resources, arid climate
British X British
Medium feed resources, semi-arid climate
British X Smaller, Moderate-Milking Continental
Abundant feed resources, adequate precipitation
British X Larger, Heavier-Milking Continental
Sub-tropical environment
Bos taurus* X *Bos indicus

[a]Based on guidelines of BIF Systems Committee (BIF, 1996).

The problem is many industry leaders in other segments beyond the cow herd ignore the production environment of the cow as an industry concern. I would like to point out that the really important factor is that in every environment crossbred cows are universally needed. Research has consistently identified reproductive, maternal, and growth trait heterosis that cannot be ignored in brood cows. I submit that British X *Bos indicus* cows are advantageous in arid climates with restricted or medium feed resources. Any type of crossbred cow is functional in an environment with abundant feed resources and adequate rainfall. Extreme cold climate disadvantages in winter may limit British X *Bos indicus* cow acceptance. Sub-tropical climates truly require *Bos indicus* inheritance in the crossbred cow.

Beef Traits

Balancing the relative importance or emphasis to place on beef production traits has been widely discussed and evaluated. On a broad classification, reproductive traits are most economically important but only limited opportunity exists for direct selection in breeding cattle. Fertility is best managed in any herd by pregnancy testing cows annually and the best genetic predictor is to select crossbred replacement females. Culling open and non-functional cows and maintaining a sound heifer development program insures herd reproductive performance. Bulls should be fertility tested yearly and scrotal circumference used as a threshold trait to ensure early sexual maturity in yearling bulls. Use 34 cm at 12 months of age as a reference.

Production traits, maternal and growth, are the most widely available for use in direct selection. However, they are environmentally influenced and we need to rely upon EPD values when available. For cow-calf operations weaning weight is the major trait correlated with economic return. It is not maximum weaning weight but that performance level that is economically viable. Most cow herd efficiency evaluations reflect realistically that the calf weaning weight to mature cow weight at weaning ratio should be about 0.47. Stated differently, a 1,150-pound mature cow at weaning should produce a calf weighing 540 pounds (1,150 X 0.47) at 7 months of age. Heavier cows should produce more calf weight while smaller cows produce proportionally less calf weaning weight. Producers must decide if their herd weaning weight average is adequate and economically viable in the environment. Weaning weight is an important cow trait and should be evaluated with percentage calf crop weaned of cows exposed. Cundiff (1987) defined the product value (average weaning weight X percentage calf crop weaned) as a maternal index. I used it in early research reporting it as a herd productivity value which measured the actual average calf weight weaned per cow exposed to breeding. It is a true herd efficiency measure but has no application to an individual animal. The actual weaning weight of a calf has some merit in selection for growth but is a dual trait (milk and growth) and other growth traits expressed later in life are most capably used for individual growth selection.

Individual growth evaluation in cattle beyond weaning should rely upon yearling weight or a defined postweaning average daily gain. Cundiff (1987) recommended a lean growth index (yearling weight - 3.2 X birth weight) in young beef bulls which stresses heavy yearling weight and credits value to low birth weight. This really stresses early growth and technically aids cowherd management to avoid calving difficulties. Interestingly, the lean growth index also added a negative emphasis on fat thickness at yearling weight or stressed selecting low fatness bulls. This was not widely applied or used. Today we see many cattlemen using an implied lean growth index when high yearling weight and low birth weight bulls are selected via EPD values. Such “spread” bulls are valued as industry acceptable. Most commercial cow-calf producers are not aware of postweaning growth performance of their calves since most calves are sold after weaning. It is safe to recommend that crossbred calves be recognized as superior due to growth heterosis. Most industry participants use expected breed differences to predict growth potential. Frame score and muscling score are reported in marketing description as aids to predicted growth. However, there are other factors relative to weight, age, sex, and fat condition that greatly influence growth. Cattle buyers use all aspects in value determination but most feel breed composition is the best predictor. It is the easy descriptive terminology accepted. I disagree with judged breed composition as a safe growth predictor because many cannot see or correctly identify the inheritance. What really creates problems are the discrimination aspects of a breed that become major price deductions in value assessment. It is simply not color, shape, muscling, or a quality measure that guarantees success. Buyers will use any aspect to discount price paid whether factual or an implied problem. Unknown genetics and beef breed limitations are still largely used by most to establish price. This appears acceptable to many in the industry since breed

differences are recognized for product traits like tenderness and marbling and associated with feedlot growth and feed efficiency. Extremely large and small frame cattle are discounted relative to expected slaughter weight. Reduced marbling and tenderness expectations by breed inheritance are too often used. Yield grade is not so much a genetic trait to consider, but is a feeding management problem. With mixed breeding load-lots being fed, it is easy to blame breed inheritance as the problem. Maybe the buyers and feeders should sort and feed more by breeding potential to acceptable fatness (0.35 inches of fatness) and let slaughter weight vary according to cattle breeding merit. Feeders have too often extended feeding time to increase fatness in order to increase marbling and thus destroy yield grade. Also, cattle have been fed to heavier weights by increasing fatness which is improper feeding management. Again in mixed load-lots, the lot feeding concept creates more "out" carcasses when cattle have not been sorted or packaged properly before feeding. Variation within a breed is large enough that even purebred cattle will not fit with improper feeding management in load-lot feeding without proper sorting and grouping prior to feeding. Because marbling ability and tenderness are highly heritable traits, many consider genetic control as the major emphasis. I strongly recommend the industry needs to review the USDA beef quality grading system. It is too subjective and does not address maturity in truly youthful cattle. I support research and development of objective and mechanical systems like the CVS BeefCam® that attempts to sort beef carcasses at chain speed for tenderness and yield grade component traits. Those carcasses sorted into less desirable groups for tenderness can then be further processed and treated to enhance eating quality. Major emphasis in feeding management must be to minimal fatness for eating quality and optimum lean tissue yield. Feedlot energy efficiency for the beef industry has predicted a 100-day feedlot period as optimum.

With breed differences clearly identified for tenderness and marbling, it is acceptable to many in the industry to justify breeding discrimination as economically accurate. It is not always justified nor accurate but widely used. Without carcass data and progeny records, selection of young breeding animals in any breed for product traits is difficult. Most commercial cattlemen rely upon breed of bull to predict quality grade, yield, and eating quality (tenderness). Ritchie (2002) identified three market targets for the beef industry and defined acceptable breed composition to meet each as:

1. Upscale restaurants and export trade, Mid-Choice and higher grade.

British X British
¼ Continental X ¾ British

2. Retail supermarkets and midscale restaurants, High Select to Low Choice.

½ Continental X ½ British
¼ *Bos indicus* X ¾ British

3. Young, extremely lean market.

Continental X Continental
¾ Continental X ¼ British
¾ Continental X ¼ *Bos indicus*

I would recommend that Market 1 should specify ≥ ½ British crossbred. Market 2 cattle should include all crosses except avoid ≥ 75% any specialty breeds inheritance. Market 3 cattle will require cattle of higher growth potential and larger mature size breeds.

I support the notion that the consuming public mainly fits into the Market 2 classification. With about 50% of all beef consumed as ground beef with reduced fat content preferred, it seems logical to rank Market 3 as next in priority. With young cattle being more widely used in feeding operations, beef carcass maturity is largely A or A- in the industry, so young cattle are expected in all markets. Certified Angus Beef (CAB)® is represented by Market 1. This very successful program is an excellent example of quality control. However, of all breed qualified (black hide) cattle presented for CAB®, only about 15 to 20% qualifies. This means the majority of all cattle fed

and prepared for this market fails and must be assimilated into the other markets, which means more inefficient fat content to address.

The industry carcass target of 70% Choice or above, 70% Yield Grade 1 or 2, and 0 % "outs" is an unrealistic goal. Some individual sets of crossbred cattle may meet the target but the normal association between marbling ability (grade) and yield grade make it unrealistic. A well-known genetic antagonism is at play here and selection within a breed cannot guarantee high grade and high lean yield. Fatness management is deemed a more important need and to seek an optimum marbling level. This is certainly more economically important to the industry.

Ritchie (2002) prepared the following, Table 2, which illustrates the breeding problem for any one-breed type composition:

Table 2. Quality grade and yield grade of various biotypes of fed cattle.[a]

Biotype	% Choice	%YG1 & 2
100% Continental	30	89
¾ Continental X ¼ British	43	83
½ Continental X ½ British	56	56
¼ Continental X ¾ British	66	52
100% British	70	38

[a]Adapted from U.S. Meat Animal Research Center (MARC) data.

The U.S. Meat Animal Research Center (MARC) and Gelbvieh Alliance general recommendations imply that ideal feedlot cattle should be 50% Continental and 50% British. My early research of feedlot mating type comparisons show that three-breed and backcross cattle are heavier than F-1 and purebred cattle at slaughter due to maternal and growth heterosis advantages carried over from hybrid cows. F-1 cattle were faster gaining in the feedlot but did not compensate for the early weight advantage of calves from crossbred cows.

Historical Industry Management Concepts

The commercial beef industry has been breed oriented since improvement was deemed necessary over native cattle of natural indigenous origin. Selection emphasis has been stressed for heritable traits that are easily measured in life through performance testing. With limited breeds and differences to make rapid industry change, the industry adopted breed importations and creation. Crossbreeding became well documented as advantageous for the cow herd and identified advantages for breed diversity. Management of the cow herd with predictable heterosis over generations then surfaced as an important need. The movement to product marketing and beef product quality and consistency has lead to the renewed emphasis on selection for product traits that are difficult and expensive to measure. It is safe to assume that the commercial cattlemen will demand the purebred breeders to perform this task and commercial cattlemen will use breed selection to address beef product merit through bull purchases. It appears we will not abandon crossbreeding at the commercial herd level. Some propose a single dominant beef breed will become the breed of all commercial cattlemen. This is very doubtful as no evidence to date identifies a straight bred system as comparable in economic efficiency to controlled crossbreeding for the commercial cattleman. The extensive climate and environmental differences across our nation clearly identify the need to address crossbreeding as required for most commercial beef herds. Certainly evidence exists to stress the need to address beef product quality and consistency but this must be done in holistic management concepts. There is a need to address low-cost production on a brood cow basis in our commercial herds.

Conclusions

It seems important that commercial producers must stress meeting market demands but must select the market that best fits their cow herd genetic potential. Selecting a breed of bull for the market specifications is most important to compliment the cow breeding to produce a suitable calf of breeding that can compete. Optimum calf genotype will vary over the different cow herd environments. Neither one breed nor one breed of bull will be an industry standard that meets all needs. It can work in egg

laying chickens and dairy cattle where the production environment is essentially controlled. Swine breeds are essentially similar for most production traits except for maternal breed aspects, which demand crossbred genotypes. Because cattle are creatures of forage and climatic environments, the beef industry must balance traits and enhance management to control production limitations without destroying breed diversity and/or limiting the known use of crossbreeding and controlled heterosis in the industry. The need for uniformity and consistency does not imply only purebred cattle. Crossbred cattle can be equally uniform or actually have less variation in traits influenced by heterosis. Crossbred cattle are intermediates.

Selection and management emphasis must be prioritized in rank order as reproduction, production, and product traits for the beef industry. Functional breeding cattle and management ease in the herd will drive acceptance along with low-cost production.

The crossbred cow that produces a breed composition calf with heterosis in growth traits and sufficient additive inheritance in product traits must be used. Who will make these decisions? Who is responsible for industry accountability to the consumer? How will the industry progress to a more profitable position for all participants? The producer, who selects the crossbred cows, chooses the breed of bull and individual breeding cattle based on optimum trait performance for the industry and controls the mating system and management to ensure effective heterosis usage is the responsible person. The consumer, packer, feedlot manager, nor order buyer individually can correctly dictate the needed balance of traits for the industry to survive. Each can specify acceptable production and product trait values or what is clearly unacceptable performance that impacts them. We need to think in threshold values and reduce the simplistic breed or breeding answers for the complex industry problems. Source verified, reputation hybrid cattle that combine beef production attributes are the answer. They must be manageable on a herd basis in a defined production environment as a renewable resource. The brood cow is the required base for a profitable beef industry.

Acknowledgement

This presentation was formatted to comply with an original paper prepared by Harlan Ritchie cited as Animal Science Staff Paper 433, File No. 19.162, July, 2002. Prepared for 2001 KOMA Beef Cattle Conference, Fayetteville, AR and Ft. Scott, KS. I was originally asked to address this topic in reference to this paper and I did, but I take responsibility for any errors and omissions in my preparation and presentation of his concepts. My presentation and recommendations are believed to be consistent with his conclusions. However, I am totally responsible for the presentation and conclusions and use his citations to verify a consensus.

Notes: