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Beef Cattle Management Update

CARCASS QUALITY AND TARGET MARKETS

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Introduction

Cow/calf and feedlot producers and those who provide professional assistance to them are very aware of the need to produce feeder/fed cattle profitability, but often fail to put sufficient emphasis on ensuring consumers a quality and consistent beef product. A heightened awareness of the importance of beef quality and consistency has occurred throughout the beef industry during the 1990s. The first indication on a national scale was the establishment of the Value-Based Marketing Task Force in 1990. This act essentially started the "war on fat" which has really turned into an attempt to assess the overall quality and consistency of beef at the packing plant, in the retail store, and in the eyes of consumers through various studies (Table 1).

The real impetus for this interest in the actual product rather than just the production process can be attributed to the significant loss of market share beef has experienced since the 1970s. Quarterly per capita disappearance expressed as shares of the U.S. domestic market in 1979 for beef, poultry, and pork was 51.0, 20.3, and 28.7%, respectively, and in 1993, 38.6, 32.9, and 28.6%, respectively. Note that beef's market share dramatically decreased at the expense of poultry's increased share. The reason was stated very clearly in the opening sentences of the Beef Industry Long Range Task Force Report (1993), "The U.S. beef industry has, for too long, been focused inwardly-production driven, not consumer driven. We have demonstrated neither the ability nor inclination to respond to consumer signals in the market place."

The purpose of this paper is to present information to producers and agricultural professionals who advise producers on the importance of improving carcass quality at every stage of the production cycle, realizing that genetic decisions are the initial step in determining the final product. Four main areas are presented: 1) issues of primary importance, 2) assessing carcass/beef quality in a herd, 3) targets for carcass/beef quality and yield, and 4) methods for improvement.

Table 1. Studies, reports, and demonstrations targeted at evaluating meat quality.

National Beef Market Basket Survey (1990-91) Savell et al. (1991)

Objective: To determine the amount of external fat remaining on beef cuts at retail along with dissectable and chemical fat levels found in cuts offered in the retail meat case.

Results: Overall average fat thickness was .12 inch, and .15 inch for steaks and roasts from the chuck, rib, loin, and round. Steaks and roasts had 27.4% less separable fat and hamburger 10% less fat than USDA Agriculture Handbook 8-13.

National Beef Tenderness Survey (1990-91) Morgan et al. (1991)

Objective: To determine and compare average sensory panel tenderness scores and Warner-Bratzler shear force values from a representative cross-section of U.S. retail cuts varying in USDA quality grades and subprimal source.

Results: Percentage of beef cuts rated as "slightly tough" or tougher -- 20% of middle meats, 40% of chucks, and 50% of round steaks/roasts.

National Beef Quality Audit (1991-92) NCA (1992); Lorenzen et al. (1993)

Objective: Assess what the beef industry is producing through slaughter floor and cooler surveys.

Results: Cattle are fed to heavier weights with about the same subcutaneous fat, but less marbling and fewer high quality grades than in the 1970s. Significant losses in value for every fed animal primarily due to excess fat and lack of quality and consistency. One out of every four steaks is too tough.

Beef Industry Long Range Plan Task Force Report (1993) NCA (1993)

Objective: To develop a long range strategic plan for the beef industry that focused on domestic marketing, international marketing, issues management, public relations, efficient and effective use of resources, and industry governance.

Results: Eight "leverage points" to regain market share were cited. Quality and consistency were identified as the most critical and the plan calls for reducing consumer dissatisfaction (related primarily to toughness) by 50% by 1997.

Strategic Alliances Field Study (1992-94) NCA (1994); Woodward (1994b)

Objective: Conduct a value-based marketing pilot project to answer at least six "big picture" questions on beef uniformity and consistency by doing everything "right" from "gate to plate."

Results: Greater communication across segments and a value-based marketing system are necessary to make positive change in beef uniformity and consistency.

National Customer Satisfaction Project (1993-94)

Objective: To determine the relationship of beef quality classification -- marbling score -- to satisfactory eating experiences -- customer satisfaction -- in three different retail cuts, prepared and evaluated in the home of moderate to heavy users of beef.

Results: Beef found to be more tender and flavorful was rated higher. Data show a strong interaction between quality grade and cut, where the greatest effects of grade are more for lower-quality cuts and less for the best-quality cuts. Price is the most important factor in purchase intent.

National Beef Tenderness Conference Report (1994) NCA (1994)

Objective: To determine the current state of knowledge about beef tenderness/palatability, review research in process, determine minimum thresholds and develop a plan to address the genetic contribution to beef's inconsistency and lack of tenderness.

Results: The final report gives a broad overview of the genetic, nutrition, management, and processing factors that the industry must confront to improve beef tenderness/palatability.

Issues of Primary Importance

All of us involved in the beef industry need to be aware of the hurdles we are faced with overcoming so as to prevent blindly going in multiple directions, which are likely to lead many further from what is desired rather than toward beef quality and consistency targets. The four primary issues of importance and other contributing factors from a genetic standpoint along with potential industry improvements were recently presented at the Beef Improvement Federation meetings (Woodward, 1994a). A brief review of the primary issues follows.

Excess Fat. Consumers have supposedly wanted leaner red meat for 20 years, but the beef industry has seen little change in fat content of fed steers and heifers. The amount of excess fat produced on U.S. fed cattle is estimated to be over 5 billion pounds annually. Actual cost of this waste fat to the industry was estimated in 1991 to be $4.4 billion -- $2.0 billion to produce and another $2.4 billion to ship and trim (Lambert, 1991).

Variation in Tenderness/Palatability. Perhaps the largest single factor contributing to beef quality and consistency problems is the variation in product tenderness and palatability. The Beef Industry Long Range Plan Task Force Report (1993) cited eight "leverage points" to regain market share. Quality and consistency were identified as the most critical and the plan calls for reducing consumer dissatisfaction (related primarily to toughness) by 50% by 1997. Both the National Beef Quality Audit (1992) and the Strategic Alliances Field Study (1994) indicated that as many as 1 out of every 4 steaks is unacceptably tough. While genetics of fed cattle play a role, there also are numerous management, nutrition, and processing factors that contribute to tenderness and palatability variation.

The industry should not expect a premium for improving tenderness and palatability. It should be considered a minimum requirement for retail beef; the return will come in the form of increased market share.

Variation in Carcass/Retail Cut Size. There has been a long-term trend toward larger frame size cattle, starting with the introduction of Continental European breeds of cattle in the 1960s. Larger frame size cattle naturally led to larger carcasses and larger retail cuts. While beef consumption initially increased, during the 1980s the average (and especially urban) consumer began to reduce their preferred portion size due to a more sedentary life style, health issues (unfounded or not) and America's growing obsession with not being fat and reducing consumption of saturated fats. The introduction of boxed beef for 600 to 800 lb carcasses revolutionized the sale and distribution of beef. The commonly accepted carcass weight range for boxed beef is now 550 to 900 lb.

Outdated Marketing and Quality Grading Systems. Although there have been some changes to the way cattle have been marketed and graded over time, it has become fairly obvious that major changes are yet necessary. The fact that packers still buy the majority of their cattle on averages based on visual assessment of when a pen of cattle is 70% Choice suggests that the beef industry really only talks about change and meeting consumers' preferences. The message sent to feeders and cow/calf producers is that "cattle are cattle" and almost all types will eventually reach the 70% Choice target.

Not only is there a problem with predicting when cattle have enough finish to grade Choice, the subjective nature of evaluating the ribeye for marbling compounds the problem. In addition, we have known for years that marbling accounts for only about 10% of the variation in tenderness. The Strategic Alliances Field Study results clearly showed considerable variation in fat thickness, carcass weight, and yield grade of carcasses grading Select and also for those grading Choice (NCA, 1994; Woodward, 1994b).

If improvements are to occur in the quality and consistency of beef provided to the consumer, a quality assessment and pricing system based on discounts and/or premiums related to consumer preferences must be implemented. Value-based marketing is being touted as the system that will send the appropriate signals from the consumer all the way through the chain to the cow/calf producer, hence, creating a link from conception of the animal to consumption of the product.

Other Contributing Factors. Although a complete list of factors contributing to beef quality and consistency problems is not possible here, there are several others worth mentioning that have a genetic component.

- Industry structure
- Lack of information flow between segments
- Lack of business approach to cattle production
- Poor/nonexistent crossbreeding programs
- Low selection emphasis on carcass quality and carcass traits in general
- Breed association spending on shows and promotion much more than research

Assessing Current Carcass Quality in a Herd

A small percentage of seedstock producers seriously track the type of carcasses their breeding programs generate because very few carcass data are reported to breed associations. Many of these same producers are interested in carcass quality, but choose not to go to the extra effort and expense required to track contemporary groups through the feedlot and arrange to have qualified people collect the necessary carcass data. Even fewer commercial producers track large numbers of the cattle they produce annually. Prior to developing a genetic selection program that includes carcass characteristics or changing one's crossbreeding system to produce feeder cattle for a specific market, cow/calf producers need to evaluate what their current genetic program is producing in terms of carcass quality and yield. There are several options that range from getting a limited amount of data to a very detailed report of how a group of cattle from an individual operation hang on the rail: 1) sell grade and yield, 2) participate in a carcass merit/steer "feedout" program, and 3) use a carcass data collection service.

Selling Grade and Yield. Although this should be a last resort on which to base genetic decisions, producers can get an indication of what quality and yield grades their cattle have. On the contrary, if a large producer had this type of information on numerous pens of cattle over time, there might be sufficient information to assess the general changes necessary in genetics, nutrition or management, but probably not any one in particular. There is just not enough information in knowing the breakdown by yield and quality grade to develop a genetic improvement program for carcass quality, assuming value-based marketing becomes reality. If you choose this option, sire groups should be slaughtered in a manner that will result in separate data summaries as a minimum.

Carcass Merit Programs. Many states now have some type of program designed to assist producers in obtaining feedlot performance and carcass data on a sample of calves from any operation. The programs have been known as steer "feedouts" or carcass merit programs. Typically, a producer pays a fee for a single or multiple lots of 5 calves. Note that it is important to collect data on 10 to 20 progeny per sire to get a meaningful indication of his genetics for carcass quality and yield. Generally, all of the cattle are fed and slaughtered at one place. Arrangements are made to collect the feedlot and carcass data for all cattle. Owners do not have to be present when the cattle are weighed or slaughtered. Although there is a fair amount of labor in running these programs from the standpoint of the organizers, producers stand to learn something about their end-product at a very reasonable price and with little extra effort.

Minnesota's Carcass Merit Program started last year and was well received by most participating producers even though the market had a drastic drop this spring, causing most groups of 5 head to lose money. The 1994 program offers three feeding options: 1) an accelerated finishing program, 2) a growing phase followed by a high-energy finishing diet, and 3) backgrounding at the home operation for 45 days, followed by a high-energy finishing diet. Cattle are weighed initially, and at 45 day intervals. Because of small groups from many producers being co-mingled, death loss is shared by all owners, who incidentally, are required to follow pre-conditioning guidelines. In addition to the valuable carcass data, owners are able to evaluate the pros and cons of retained ownership on a small scale. The most profitable group of 5 head in 1993-94 earned a $921.45 profit while the greatest loss suffered on 5 head was $613.70. Hopefully, both producers will utilize the information received as a result of their participation to fine-tune their program or make the major changes necessary to produce more efficient cattle that have higher quality carcasses. Keeping everything as is and just selling feeder cattle to a different buyer each year should not be considered an option. Otherwise, we will never be able to make industry-wide improvements in beef quality and consistency.

Carcass Data Collection Services. In order for producers to obtain a complete set of data on cattle from their operation not involved in a state or breed carcass merit program, it is necessary to use a carcass data collection service. The four primary sources offering this type of service are 1) USDA, 2) National Cattlemen's Association (NCA), 3) breed association programs, and 4) individual packing plants.

The USDA (or orange tag) program has been available for many years; however, it is not widely used because of problems with excessive missing data for groups of fed cattle. It seems a surprising number of the orange tags were lost between arrival at the packing plant holding pens and the slaughter floor! Typical charges for this program are 50 cents for the tags and $2.50/hd for collecting the data. Similar characteristics are recorded by USDA and NCA (see below).

NCA began the Cattlemen's Carcass Data Service in March, 1992 in an effort to offer U.S. cattle producers a totally reliable method for obtaining carcass data. They achieve that reliability by contracting with university and college personnel near major packing plants to personally match ear tags on the live animals with the appropriate carcasses and then return to collect carcass data. The minimum charge (< 50 hd) for this service is $250 for members and $300 for non-members. A per head fee of $5 is charged to members with 50 to 120 hd and $4.50/hd for groups over 120 hd. Data collected through the USDA and NCA is similar and includes at least the following:

Tag number	Fat thickness	Ribeye area	Marbling score
Hide color	Yield grade	Internal fat	Quality grade
Carcass weight	Remarks and abnormalities (dark cutter, bruises, etc.)		

Some breed associations involved in recording carcass data also offer some type of carcass data gathering system. Perhaps the most successful is the Certified Angus Beef program. Other breed associations with the intent of conducting a national cattle evaluation for carcass traits may assist their producers in arranging to have carcass data collected and added to the breed database.

Finally, some packing plants are beginning to offer this service to their customers. As the demand for carcass data continues to increase, as is expected with value-based marketing coming closer to reality, this may become more widespread.

Targets for Beef Quality and Yield

Prior to developing and implementing a plan for improving carcass quality, or more specifically, beef quality and optimum yield, producers and their advisors need to have some specific targets to strive for. Assuming value-based marketing is going to become reality in the next 5 to 10 years, changes in breeding programs to take maximum advantage of that type of marketing need to begin soon. Those producers running "cutting edge" businesses today have probably already found a marketing system that will reward them for the type of end-product their cattle produce. However, under a value-based marketing system and changing consumer preferences, producers will probably want to develop genetic improvement programs that will result in carcasses fitting into one of four categories: 1) "lean" or "lite" beef, 2) "retail" beef, 3) "white tablecloth" beef, or 4) niche market beef. There already are programs which pay premiums for beef fitting into one or more of these categories. Such programs currently in place are either tied to a breed or a packing plant. In addition, there are certainly other niche markets currently in existence or waiting to be developed.

The following paragraphs provide a definition of each of these categories in terms of end-product targets and breed combinations likely to be most successful producing cattle that when fed out appropriately should meet the desired end-product specification targets. These targets are adapted from articles by Strohbehn and Gibb (1993), Dikeman (1994), and other carcass extension and research literature. Research results that support these target market specifications and the suggested breed types are given in Tables 1 to 3 in the Appendix of this paper. Pure- and crossbred progeny performance results in these tables provide an indication of what to expect with different breed types of cattle in this region. Appendix Table 1 summarizes the first four cycles (1970 to 1990) of the Meat Animal Research Center's (MARC) Germplasm Evaluation (GPE) Program where 26 different sire breeds have been mated to Hereford and Angus cows.

Appendix Tables 2 and 3 provide breed group averages for growth and carcass traits and measures of efficiency (using days on feed as the end point) on purebred and composite steers evaluated as part of MARC's Germplasm Utilization (GPU) Program (1988 to 1991). Appendix Table 3 shows measures of efficiency based on 0 to 207 days on feed as the end point. Gregory et al. (1994c) emphasize that "rank of breeds for gain efficiency is dependent on the end point of interest and the output measured." They provide tables in their paper which shows the affect of gain efficiency on breed ranking using the

following end points: 1) time constant (Appendix Table 3), 2) gain constant, 3) marbling score constant, 4) longissimus muscle fat constant, 5) carcass weight constant, and 6) retail product weight constant.

MARC I cattle are _ Angus, _ Hereford, ¼ Braunvieh, ¼ Charolais, and ¼ Limousin. MARC II cattle are ¼ Angus, ¼ Hereford, ¼ Gelbvieh, and ¼ Simmental. MARC III cattle are ¼ Angus, ¼ Hereford, ¼ Red Poll, and ¼ Pinzgauer. Categorizing these three composites according to their percentage inheritance from British breed types and Continental European breed types: MARC I cattle are 25% British and 75% Continental; MARC II are 50% British and 50% Continental; and MARC III are 75% British and 25% Continental. A review of the MARC GPE and GPU results are a good starting point for helping interested producers in choosing breeds and a breeding system. A detailed summary on genetic factors influencing feedlot performance was given by Woodward (1992).

"Lite" or Lean Beef. The number of diet/health conscious consumers has dramatically increased over the past 20 years. However, the common perception of this demand for leaner beef has not translated into volume buying in most markets. Granted, lean or Select graded beef is not commonly found in most retail meat counters. Nevertheless, it is safe to assume this trend for a growing segment of the population to prefer less fat in their diet will continue. As that happens, there will be greater demand for leaner beef and more retail stores will carry USDA Select in their meat counters. Table 2 contains the specification targets producers should use in developing a genetic improvement program aimed at producing beef for the lean beef market.

While it is not difficult to produce leaner beef through management and nutrition, i.e., fewer days on feed or lower concentrate diets, there may be ramifications in terms of reduced red meat yield, carcass quality, and profitability. Because of the genetic antagonism between fat and lean growth, it is possible to genetically select and breed cattle that will have adequate red meat yield with limited amounts of waste fat. Continental breeds are typically known for their ability to have higher lean to fat ratios than British breed cattle because they grow more rapidly and mature later. Therefore, commercial cow/calf producers would find it relatively easy to produce feeder calves for this type of end-product by using a crossbreeding system that results in 75% Continental and 25% British breed calves. Dams that are a 50:50 mix bred to a Continental breed sire should work well. These half-blood cows mated to a terminal sire avoid dealing with selecting for leanness within the cow herd. Cows need a certain amount of condition (fat cover) to get through winter in many parts of the U.S. and as they prepare for lactation. Having these body reserves then allows them to begin cycling sooner after calving. The tradeoffs between lean beef production and its ramifications in the cow herd are still being researched.

Some purebred Continental feeder calves are ideally suited to this market because of their ability to reach market weight with little fat and high meat yield at a young age when weaned at 7 to 8 months and put into the feedlot by about 9 months of age. Although many of these calves will grade at least Select, a small percentage will grade Standard. Pushing these cattle on a high energy finishing diet in the feedlot should allow most of them to be ready for this market within the 1200 to 1300 lb live weight range specified. Further supporting evidence is shown by the performance of purebred Continental breed steers from MARC's GPU program in Appendix Tables 2 and 3.

Another option for lean beef production includes utilizing cattle with muscle hypertrophy (double-muscled). Although more research is needed on raising these cattle in the U.S. and crossing them with

our existing breeds, dystocia may not be a major production obstacle in producing F_1 calves (Cundiff et al., 1993). Recent preliminary results from Cycle V of the MARC GPE study indicate that Belgian Blue and Piedmontese sires work well as terminal sires because their progeny have high retail product yield and relatively tender steaks (Cundiff et al., 1994).

Table 2. Lean or lite beef specification targets.

Typical breed types	Continental; 75% Continental, 25% British
Average live weight range	1,200 to 1,300 lb
Average carcass weight range	750 to 850 lb
Average frame score range	6 to 7
Average ribeye area range	12.5 to 14.5 square inches
Average fat thickness range	.15 to .25 inches
Yield grade mix	1s and 2s
Average age range	13 to 15 months
Quality grade minimum	Low Select

Retail Beef. This is the category in which the bulk of the beef from fed cattle produced in the U.S. will fit and the type of beef most consumers buy in retail stores. These consumers are looking for a balance between leanness/fat, price, nutritional value, and overall palatability. Producers who choose not to aim for one of the other target markets (those listed in this paper or others) need to develop their genetic selection program to at least fit this "retail" or "institutional" beef target market (Table 3). Part of the implementation of a value-based marketing system could include new measures of beef quality that are no longer dependent on fat. Therefore, it should be possible for many breed types to fit this market. However, keep in mind the beef industry goal of overall increased beef quality and consistency. That means the existence of this broad end-product target market should not be thought of as the catch-all for beef that does not fit anywhere else. That type of beef will and should be discounted.

Appendix Table 1 presents the performance of 50% Continental x 50% British steers as the last two biological types. The data demonstrate that breed complementarity between these two types appears to be optimized for the retail beef market in terms of carcass traits. Because cattle type has changed so much since the start of this GPE project in 1970, many of these numbers are slightly lower (or higher) than might be expected for the same breed types produced today. This difference can be seen by comparing the original and current data for Hereford-Angus cross steers and also for Charolais cross steers. Original sires were born 1963 to 1970 while current sires were born 1982 to 1984. Appendix Tables 2 and 3 also show how well the MARC II composite, which is 50:50 British:Continental, performed in relation to the MARC I and III composites and purebred steers.

Even those tropical and sub-tropical environments can match these targets and generally be sufficiently tender as long as *Bos indicus* influence in the feeder calves is less than 1/4 to 3/8. Preliminary results from progeny of Tuli sires used in Cycle V of MARC's GPE study indicate that the calves (50% Tuli, 50% British) have carcass characteristics more similar to British-sired (*Bos taurus*) progeny than other *Bos indicus*-sired progeny (Cundiff et al., 1994). Therefore, because the Tuli breed of cattle evolved in the tropics, they may be an ideal choice for using in Southern regions of the U.S. without the usual risk of reduced carcass quality associated with *Bos indicus*-sired progeny.

Table 3. Retail beef specification targets.

Typical breed type	50% Continental, 50% British
Average live weight range	1,100 to 1,300 lb
Average carcass weight range	650 to 850 lb
Average frame score range	5 to 7
Average ribeye area range	11 to 13 square inches
Average fat thickness range	.25 to .35 inches
Yield grade mix	Mostly 2s
Average age range	14 to 16 months
Quality grade minimum	High Select

White Tablecloth Beef. Beef destined for consumption in higher quality hotels and restaurants has come to be known in the beef industry as white tablecloth beef. These types of establishments typically prefer beef that is at least average Choice and a small percentage of restaurants buy only Prime beef. They have found that consumers who frequent this type of establishment with the intent of eating a steak are not overly concerned with fat and cholesterol intake, and in many cases price, because they are looking for the "ultimate" eating experience. That is not to say they are not diet-health conscious because fat intake in moderation, i.e., most people don't eat the same foods every day, is necessary for normal body functions. Therefore, restaurants buy beef with higher amounts of marbling to ensure sufficient flavor and juiciness (Table 4). A smaller percentage of these steaks will be found to be tough as well. However, marbling is not the best indicator of tenderness, but it currently defines our measure of quality along with the maturity of the carcass. Without another indicator of quality, i.e., a quantitative measure of tenderness, it is difficult to provide direction to producers aiming for this target market. However, research and development work in this area is currently being conducted. A reasonable goal for fat thickness is given (but may still result in excessive waste fat) and it is conceivable that the importance of marbling will decrease when a measure of tenderness is developed. The Beef Industry Long Range Plan Task Force Report (1993) and the National Tenderness Conference Report (1994) suggest it is only a matter of time.

The tradeoffs between meat yield and meat quality (under the current market quality definition) play more of a role in trying to produce a product for this target market than probably any other. In order to have sufficient marbling to attain average Choice or better, cattle breed type is fairly limited to British and high-percentage British-cross cattle (see Appendix Tables 1 and 2). The Strategic Alliances Field Study results indicated that cattle of only British inheritance may be more profitable when put on a cheap growing diet (in confinement or on pasture) before going into the feedlot for 120 to 150 days (Woodward, 1994b). Some success also is possible with cattle that are 25% Continental breeding, provided they are managed appropriately in the feedlot on a high concentrate diet and marketed after reaching about .40 inches of fat cover (for example, MARC III steers in Appendix Table 2). Continental breeds best to consider are those moderate-framed, previously dual-purpose type cattle. Research has shown that it is possible to select, breed, and feed cattle to grade average Choice and still be yield grade 2s and 3s as indicated in Table 4. Yield grade 4 cattle are discounted now and may receive greater discounts under a value-based marketing system. If yield grades 2 and 3 are split as proposed by NCA, carcasses in the upper half of yield grade 3 may also be discounted. Finally, white tablecloth establishments do not want <u>any</u> unsatisfied customers; therefore, it is not wise to include any or certainly no more than 1/8 *Bos indicus* breeding in cattle being produced for this market.

Table 4. White tablecloth beef specification targets.

Typical breed types	British; 75% British, 25% Continental
Average live weight range	1,100 to 1,200 lb
Average carcass weight range	650 to 750 lb
Average frame score range	5 to 6
Average ribeye area range	11 to 13 square inches
Average fat thickness range	.35 to .45 inches
Yield grade mix	2s and 3s
Average age range	15 to 17 months
Quality grade minimum	Average Choice

Niche Market Beef. This fourth category of target markets can be divided into many sub-divisions because of the numerous possibilities entrepreneurs have and will develop. Two that have proven to be fairly effective are branded beef and "organic" or "natural" beef. Both are already marketed either direct or through retailers in the U.S.

Branded beef usually refers to meat that carries a company or person's name in the retail case or available for purchase via mail-order. Because any type of product could theoretically be sold under a brand name, it would be meaningless to present a set of specification targets for this type of beef market.

One type of product that has a growing market and is often sold under some brand name is "organic" or "natural" beef. These terms are very misleading as they implicate any beef not fitting under this label

is either inorganic or unnatural, which obviously is not true. Unfortunately, these terms are used in restaurants and advertising which is sometimes on the borderline of being misleading. Some federal and state government guidelines have been developed (i.e., Organic Foods Production Act of 1990), but it is yet unclear how they can be enforced. It is not possible to detect "chemical" differences between meat taken from an organic carcass and meat from a typical carcass at levels deemed safe for human consumption. The only reason to produce beef for an "organic" market is to receive the typically large price differential that oftentimes comes with any product perceived by small segments of a population to be better, i.e., healthier, better quality, etc.

It is not really necessary to provide any specification targets for cattle produced for an organic market because one could use those specifications given for any of the other three end-product target markets. The difference is in the management of the animals and the feed fed. Reduced performance also is likely in comparison to cattle fed under current typical production practices. However, there is a high likelihood that a person willing to pay a higher price for a product labeled "organic" probably also prefers lean or "lite" beef. A person who can establish a market for "organic" beef and has "organic" feedstuffs available may also want to consider feeding out intact males if feedlot facilities permit and no discount is given at the packing plant. Another production option is to raise primarily British purebreds or crossbreds on grass to finish. Once again, it is important to have a market outlet prior to having the final product. Americans are used to the taste of grain-fed beef, making this option less likely an easy sell.

Improving Meat Quality

Producers continue to struggle with the question of whether it is economically justified to select for improved meat quality and how to go about doing so. The many popular press articles in magazines recently covering the beef industry and articles like this should make it fairly clear that a lot of people think meat quality is important enough to evaluate in every cow herd. Some of the information for this section has already been discussed for each end-product target market and will not be repeated here.

The manner in which actual improvement is undertaken will vary; however, there is no doubt it will not be as easy as with growth traits. The first step in improving meat quality after assessing what a particular herd is producing will be to evaluate the genetic, feeding, marketing, and management programs that determine the end-product as well as the handling of the product postmortem. The second step will be to determine the primary marketing goal by selecting one of the markets presented in this paper or some niche market. The next step will be the most difficult -- developing a plan to make genetic progress in carcass quality and ensuring the cattle are managed, fed, and marketed accordingly so that a profit is received.

The task is somewhat easier for individuals raising Angus, Limousin, Simmental, and Salers cattle (or when using progeny-tested bulls from these breeds) because they have carcass EPDs for some of the traits discussed in the specification targets given in Tables 2 to 4. These EPDs will allow for directional change the same way growth and milk EPDs do. As other carcass traits become important, additional EPDs will be developed. For example, considerable research efforts are currently underway at several universities to develop EPDs for Warner-Bratzler shear force, "tenderness" and various ultrasound measurements. In addition, other breed associations are working at encouraging their breeders to collect and report carcass records in sufficient numbers to enable them to develop carcass EPDs. In

the meantime, those purebred producers will have to evaluate enough progeny from the sires used in their herd to know what sire lines are best.

The best opportunity for commercial producers to improve meat quality of the feeder calves they produce is through the use of a crossbreeding system that takes advantage of breed complementarity. The discussion of each end-product target market included details of the typical breed crosses most suited to meet the goals listed. For example, a producer with a moderate-frame cow herd of primarily British breeding may want to balance the earlier-maturing, higher-marbling British contribution with faster-growing, increased muscling/decreased fatness provided by Continental European breed sires. If a breed without carcass EPDs is chosen, then visual characteristics for muscling, possibly ultrasound data, and carcass information potentially collected on progeny of the same sire line by other producers will have to be used to choose herd sires.

Use of composite breeds of cattle were not previously discussed because there are enough different ones already in existence to effectively meet the specification targets of the different markets discussed in this paper. A composite breed of cattle may consist of as few as two breeds, such as all those developed for tropical and sub-tropical U.S. regions using Brahman (i.e., Simbrah, Brangus, Braford, etc.). Development of a composite breed may involve several breeds in an effort to take advantage of breed complementarity to the extent of attempting to use the best of several breeds for growth, maternal, and carcass traits. Composite breeds have received a considerable amount of press, but should not be considered the cure-all nor something that everyone should consider developing. They can help small producers take advantage of the retained heterosis by using a composite bull in their straightbred or two-breed cross cow herd.

Finally, considerable research data is available to assist producers in designing an appropriate breeding system for a specific market, environment, resources available.

Conclusions

The beef industry is entering a period that will most likely involve numerous changes destined to affect all segments of production. Part of this change is guaranteed to be a much greater focus on the end-product and how it is perceived by U.S. consumers (and foreign consumers as exports of higher quality cuts increases). Remember that consumers make the final judgement of the product and the Customer Satisfaction Project results showed that participants (moderate to heavy beef users) think beef tenderness, flavor, and appearance are the "main drivers of consumer satisfaction."

Keep in mind that as the industry changes, one of the most often predicted changes will be the adoption of a value-based marketing system and under that system, fat (marbling and otherwise) will most likely play a less significant role, other than result in discounts for excess. Along with quality of product, cow/calf producers need to strive toward a more uniform cow herd that will produce more uniform, moderate-frame calves. Feedlot operators need to fine-tune their management and feeding of these calves in an effort to produce a more consistent, higher-quality carcass. Finally, beef processors (and retailers to some extent) must make a much greater effort at adopting proven technology and handling procedures known to influence the quality and consistency of the end-product. In essence, the beef industry must do a much better job of working together to regain market share or the current downward trend will continue.

References

Beef Industry Long Range Plan Task Force Report. 1993. Published by National Cattlemen's Association, Englewood, CO.

Cundiff, L.V., K.E. Gregory, and R.M. Koch. 1993. Cycle V of the germplasm evaluation program in beef cattle. In: *Beef Research Progress Report No. 4*, ARS-71:3.

Cundiff, L.V., K.E. Gregory, T.L. Wheeler, S.D. Shackelford, and M. Koohmaraie. 1994. Carcass and meat characteristics of Tuli, Boran, Brahman, Belgian Blue, Piedmontese, Hereford, and Angus breed crosses in the cattle germplasm evaluation program. In: *Proc. 5th World Congr. Genet. Appl. to Livest. Prod.* 17:272.

Cundiff, L.V., F. Szabo, K.E. Gregory, and R.M. Koch, M.E. Dikeman, and J.D. Crouse. 1994. Breed comparisons in the germplasm evaluation program at MARC. In: *Proc. Beef Improvement Federation 25th Research Symposium and Annual Meeting,* May 26 to 29, Asheville, NC, pp. 124-136.

Dikeman, M. 1994. Beef carcass quality vs meat yield. In: *Proc. Northwest Kansas Cow/Calf Seminars.* Kansas State University Extension Service, pp. 19-33.

Gregory, K.E., L.V. Cundiff, and R.M. Koch. 1994a. Breed effects, dietary energy density effects, and retained heterosis on different measures of gain efficiency in beef cattle. *J. Anim. Sci.* 72:1138.

Gregory, K.E., L.V. Cundiff, R.M. Koch, M.E. Dikeman, and M. Koohmaraie. 1994b. Breed effects and retained heterosis for growth, carcass, and meat traits in advanced generations of composite populations of beef cattle. *J. Anim. Sci.* 72:833.

Gregory, K.E., L.V. Cundiff, R.M. Koch, M.E. Dikeman, and M. Koohmaraie. 1994c. Breed effects, retained heterosis, and estimates of genetic and phenotypic parameters for carcass and meat traits of beef cattle. *J. Anim. Sci.* 72:1174.

Lambert, C. 1991. Lost opportunities in beef production. International Stockmen's School, February, Houston, TX.

Lorenzen, C.L., D.S. Hale, D.B. Griffin, J.W. Savell, K.E. Belk, T.L. Frederick, M.F. Miller, T.H. Montgomery, and G.C. Smith. 1993. National beef quality audit: Survey of producer-related defects and carcass quality and quantity attributes. *J. Anim. Sci.* 71:1495.

Morgan, J.B., J.W. Savell, D.S. Hale, R.K. Miller, D.B. Griffin, H.R. Cross, and S.D. Shackelford. 1991. National beef tenderness survey. *J. Anim. Sci.* 69:3274.

National Beef Quality Audit Report. 1992. Published by National Cattlemen's Association, Englewood, CO.

National Beef Tenderness Conference Full Report. 1994. Published by National Cattlemen's Association, Englewood, CO.

Organic Foods Production Act of 1990. *Federal Register* S.2830:577-593.

Savell, J.W., J.J. Harris, H.R. Cross, D.S. Hale, and L.C. Beasley. 1991. National beef market basket survey. *J. Anim. Sci.* 69:2883.

Strategic Alliances Field Study, Executive Summary. 1994. Published by National Cattlemen's Association, Englewood, CO.

Strohbehn, D.R. and J. Gibb. 1993. End-product target survey. In: *Proc. Beef Improvement Federation 25th Research Symposium and Annual Meeting*, May 26 to 29, Asheville, NC, pp. 159-170.

Woodward, B.W. 1993. Review: The influence of genetics on feedlot performance of cattle. Beef Cattle Research Report B-409. Minnesota Extension Service, University of Minnesota, pp. 111-134.

Woodward, B.W. 1994a. Beef quality and consistency issues: How do we affect change? In: *Proc. Beef Improvement Federation 26th Research Symposium and Annual Meeting*, June 1 to 4, Des Moines, IA, pp. 134-143.

Woodward, B.W. 1994b. Is value-based marketing really possible? In: *Proc. of Minnesota Cow/Calf Days.* Minnesota Extension Service, Univ. of Minnesota, C-107, pp. 59-73.