Colorado State University
DEPARTMENT OF ANIMAL SCIENCES

Final Report

National Beef Quality Audit-2016:
Phase 1, Face-to-Face Interviews

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RESEARCH PROJECT SUMMARY OUTLINE – FINAL REPORT
January 22, 2017

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II. **Project Title:** National Beef Quality Audit – 2016 (Phase I: Face to Face Interviews)

III. **Project Objectives:**

(1) To identify how customers of steers heifers, market cows and bulls, beef carcasses, beef whole muscle cuts, and beef variety meats and offal products describe seven specified quality attributes of: (1) How and where the cattle were raised, (2) Lean, fat, and bone, (3) Weight and size, (4) Cattle genetics, (5) Visual characteristics, (6) Food safety, and (7) Eating satisfaction and quantify quality-related details/practices that are important to each customer-sector within each attribute.

(2) To estimate the Contingent Valuation willingness-to-pay (WTP) of the identified sectors for the seven specified quality attributes.

(3) To establish the relative importance RI ranking of the specified quality attributes for each sector, as well as overall rankings of importance for each industry.

(4) To document any additional quality-related or financial items of concern to each customer-sector of the industry and quantify their importance.

   * In the context in which it will be used in this document, "quality" includes all factors affecting value/desirability of fed slaughter cattle, of their carcasses, products from those carcasses, and of their dress-off/offal items.

ABSTRACT

Similar to the studies conducted every five years since 1991, this 2016 version of the National Beef Quality Audit (NBQA): Phase I, Face-to-Face Interviews, gauged the status and progress of the cattle industry towards improving overall quality and consistency of beef. This 2016 version of NBQA extended use of the research framework and methods also used in 2011 (Igo et al., 2013), but was the first time that the audit of fed cattle was combined with an audit of market cow and bull beef. Face-to-face interviews were designed to illicit definitions for beef quality, estimate willingness to pay (WTP) for quality attributes, establish relative importance (RI) rankings for important quality factors, and assess the image, strengths, weaknesses, potential threats, (SWOT) and shifting trends in the beef industry since the last audit. Individuals making purchasing decisions for five sectors of the steer/heifer and cow/bull beef supply chain were interviewed, including Packers (n = 36), Retailers (including large and small supermarket companies and warehouse food sales companies; n = 35), Food Service operators (including quick-serve, full-service, and institutional establishments; n = 29), Further Processors (n = 64), and peripherally related government and trade organizations (GTO; n = 30). Face to Face interviews were conducted across the U.S. from January to November 2016 using a dynamic routing survey designed on the Qualtrics software platform (Qualtrics 2016; Provo, UT, USA). Interviewers from three separate land-grant universities first correlated on the administration of interviews in November of 2015 to standardize data collection. Definitions (as described by interviewees) were recorded as unprompted, open-ended answers that were categorized into one of seven pre-determined quality factors, including: (1) How and where the cattle were raised, (2) Lean, fat, and bone, (3) Weight and size, (4) Visual characteristics, (5) Food safety, (6) Eating satisfaction, and (7) Cattle genetics. It was critical to understand how interviewees perceived the meaning of each of the seven quality factor groupings to interpret WTP and RI responses. As in NBQA-2011, "food safety" surfaced as the most important quality factor during RI scaling. Additionally, each sector that did not list "food safety" as a non-negotiable *must have* characteristic, but was willing to pay a premium for the trait, said that they would pay an average of 11.1% premium for a guarantee of their definition of "food safety" (likely overinflated). The "Eating satisfaction" quality factor, primarily defined as "customer satisfaction" by all sectors, was ranked second by all marketing sectors except Packers, who ranked "lean, fat, and bone" second. Compared to NBQA-2011, a higher percentage of companies were willing to pay a premium for guaranteed quality attributes, but overall were willing to pay lower average premiums than the companies interviewed in 2011.

Background Information

National Beef Quality Audits (NBQA) initially were conducted based on rationale derived from Total Quality Management principles of W. Edwards Deming. Those same principles leading to the original audit in 1991 hold true for today's beef industry. In NBQA-1991, authors stated that, "The U.S. cattle industry cannot expect improvements in prices for its products/byproducts when "quality" doesn't warrant such a price increase." Deming described quality from two different perspectives. The first perspective was from a production stand point; identifying quality as "conformance to standards" through the prevention of problems. Deming understood that the correction of problems after the fact has nothing to do with quality. He described a second perspective of the consumer as "meeting consumer wants and needs." Phase 1 of the NBQA historically focused on the wants and needs of consumers by interviewing employees that make purchasing decisions for large and small beef companies.

Since 1991, and throughout the history of the audits, multiple areas of concerns have arisen, shifted, and sometimes plagued the industry throughout each audit. In 1991, the top three concerns for Retailers were (1) Excess External Fat, (2) Excessive Weights/Box, and (3) Too High Incidence of Injection-Site Blemishes (Smith et al., 1992).

Materials and Methods

Face-to-face interviews were administered across the U.S. from January through November 2016 using a dynamic routing survey. Interviews targeted individuals making purchasing decisions, individuals very knowledgeable about purchasing requirements within U.S. beef companies, or decision makers within peripherally related government and trade organizations (GTO). Individuals in companies and organizations across five sectors of the US beef supply chain for steers and heifers and market cows and bulls were interviewed: Packers (n = 36), Retailers (n = 35), Food Service (n = 29), Further Processors (n = 64), and peripherally related GTOs (n = 30).

Computer-Assisted Interview Software

A dynamic-routing, computer-assisted interview program was developed using the Qualtrics software platform (Qualtrics 2016; Provo, UT, USA). The computer program standardized administration of the interview such that the order of questions was "designed" to prevent "leading" interviewees to answers by those

administering the interview. Additionally, the program allowed for routing of questions based on responses and provided sliding scales to interpret a respondent's WTP. Subtle changes were adapted to improve the interview process from the previous audit (Igo et al., 2013).

Interview Overview

Interviews began with demographic questions used to determine total market coverage within each market sector of the beef industry. Demographic questions were used to dynamically route subsequent questions; Qualtrics software allowed such routing (Qualtrics 2016; Provo, UT, USA). Sectors of the industry not associated with purchasing, such as GTO, did not answer financial questions. Likewise, companies purchasing only steers and heifers or only cows and bulls were routed such that they answered questions only associated with that portion of the audit, while companies purchasing both types of beef answered questions from both perspectives.

Economic questions followed demographic questions closely. Respondents not involved in the GTO sector were asked to list any and all financial considerations determining if and how much beef would be purchased in an open-ended format. The goal of asking financial questions before asking quality questions was to separate the influence of such factors on purchasing from those associated with quality in the mind of respondents.

Willingness to pay (WTP) questions immediately followed, and were broken into two separate categories. In order to accurately determine a respondents WTP for a quality attribute, it was key to first identify non-negotiable quality traits that a company "*must have*" before continuing with a business transaction. Respondents were asked to list all attributes of cattle or beef products that they absolutely *must have* before purchasing the product. Responses were categorized into one of the seven predetermined quality factors by trained interviewers and were then asked: if that trait could not be guaranteed, would they still purchase the product at a discounted price? If the respondent agreed to purchase the product for a discount, then that quality trait was determined not absolutely necessary to purchase, and was therefore removed from the *must have* responses during analysis. For every quality factor that was not determined to be *must have,* a WTP a question was asked: "If your definition of the trait could be guaranteed, would you be willing to a premium?" If the respondent answered no, the interviewer moved to the next

question. If yes, a follow up question was asked to determine the percent premium the respondent was willing to pay for a specific quality bucket.

Questions to determine relative importance of quality factors followed questions associated with WTP. Eight questions were asked for each type of beef (fed steers/heifers vs cows/bulls) such that seven of the questions included a triad of quality factors, while the eighth question included all of the seven quality factors as described by Louivere, (Louviere, 2008). Respondents were asked to select the most important and least important quality factor during each round of ranking.

Questions to elicit the perceived definitions for quality factors followed. Questions were phrased as, "What does the [quality factor] mean to your company?" Interviewers recorded entire responses into blank textboxes or into checkboxes populated with common potential answers such as "Tenderness" or "Flavor". How an interviewee defined each quality factor was critical to extracting meaning from the WTP estimates and the relative importance responses administered in preceding questions.

Images, strengths, weaknesses, potential threats, and changes since the last NBQA audit were the last questions asked; all allowed open-ended responses. Entire responses were recorded verbatim into text boxes within survey software and were categorized into groups of similar responses for analysis.

During open-ended questions, it was common to record multiple unique responses to one question. In cases of multiple responses from a single individual, each response was counted individually. For instance, if a respondent stated that weight and size meant, "How large the individual muscles were," and "how consistent they were in size" the analysis was conducted so that the statements were counted as two separate responses.

Data Collection

Research institutions involved in conducting face-to-face interviews included Colorado State University, Oklahoma State University, and Texas A&M University. Following the precedent set by (Igo et al., 2013), teams of two trained interviewers conducted each face-to-face interview. One individual would conduct the interview and record responses into the Qualtrics software, while the other individual would manually record responses on a

written copy of the interview template for quality control. Interviews were conducted at the 2016 National Cattlemen's Beef Association's Annual Convention in San Diego, CA, the 2016 International Production and Processing Expo in Atlanta, GA, the North American Meat Institute's Annual Meat Conference in Nashville, TN, the American Meat Science Association's Reciprocal Meat Conference in San Angelo, TX, and at multiple company headquarters across the country. The number of interviews conducted by market sector included: Packers (n = 36), Retailers (n = 35), Food Service (n = 29), Further Processors (n = 64), and peripherally related GTO (n = 30). Packers represented greater than 92% of all cattle slaughtered in the U.S. in 2016, greater than 55% of the U.S. retail market, and greater than 25% of the Food Service industry. We are unsure of the total market coverage of the Further Processing sector because, at the time of publishing, there was no known metric to gauge coverage in this sector.

Statistical Analysis

The GLIMMIX procedure (SAS Institute Inc., Cary, NC) was used to estimate probabilities that a respondent would select a quality bucket as a *must have*, and if the quality bucket was indeed a *must have*, the probability that the respondent would be WTP a premium for a guarantee that they would receive his or her definition of the quality bucket. Least squares means were calculated and mean separations were computed with α = 0.05.

The MIXED procedure of SAS was used to estimate the average percent premium that respondents were reportedly willing to pay for each quality bucket given that the bucket was not a *must have*. Least squares means were calculated and mean separations were computed with α = 0.05.

Relative Importance analytics were based on the methods utilized by (Wolf, 2013) to determine policy preferences within the U.S. Dairy industry. Relative rankings were determined using a method called best-worst scaling. To calculate the shares of preference for each bucket, the respondent's best-worst scaling survey results were estimated using a multinomial logit model (Greene, 2003) within SAS (SAS Institute Inc., Cary, NC). After utilizing the multinomial logit model, the estimated coefficients were used to calculate the share of preference for each bucket following (Lusk and Briggeman, 2009). In order to test whether the shares of preference differed from

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one another, a distribution of each estimated parameter was generated using a Monte Carlo procedure within Simetar (Richardson and Outlaw, 2008). In this application, probabilities generated a cardinal ranking system of relative importance. Mean separations of the calculated shares of preference were compared using the Mixed model of SAS ($\alpha = 0.05$; SAS Institute Inc., Cary, NC). This system can be used to identify magnitudinal differences between quality factors. For example, if a share has a value twice as large as another, it can be stated that one share is twice as important as the other.

Due to the combination of the steer and heifer audit with the market cow and bull audit for the first time, it was essential to separate steer and heifer answers from cow and bull answers when possible. However, multiple companies participate in both markets. When a company participated in both markets, answers to perspective questions were analyzed separately as if the responses came from two individual institutions.

Results and Discussion

Demographics

Industry-wide, there appeared to be a substantial increase in numbers of dairy cattle harvested as a replacement for shortened supplies of native beef animals. Additionally, the average number of branded beef items increased in the marketplace, coinciding with concerns expressed about size inconsistencies in beef boxes. Researchers also found that the penetration of Beef Quality Assurance (BQA) in the market place was severely lacking. When companies were asked whether or not they required their suppliers to source cattle that were raised using live animal quality assurance programs, less than 5% of companies cited BQA in their responses.

Steer and Heifer Packers

Relative importance of the seven quality factors (established by the research team) was estimated using methods provided by Louviere (Louviere, 2008). "Food safety" (36.7% shares of preference; Table 1) was most important and was preferred more than twice as often as "Lean, fat, and bone" (13.7%; Table 1), which was the second most important. Twenty-nine percent of Packers identified "food safety" as a *must have* and, when they didn't identify it as a *must have,* 69% were willing to pay an average premium of 11.1% (Table 3). When asked to define what the term "Food safety" meant to their company, 40% (Table 2) defined it as a "critical" part of business

and when pressed further for a definition, 29% (Table 2) responded with "pathogen free." "Lean, fat, and bone" was defined by Packers as "yield" (36%; Table 2) and "lean to fat ratio" (26%; Table 2). Furthermore, 19% (Table 3) of Packers required a guaranteed "lean, fat, and bone" before purchasing cattle.

The third most important factor for Packers was "how and where the cattle were raised" (11.37%; Table 1), which they defined as "source location" (38%; Table 2) (the geographic region the cattle were raised in) or "welfare/handling" (28%; Table 2). "How and where the cattle were raised" was tied (*P > 0.05)* with "food safety" as the most frequently (*P < 0.05*) identified as *must have* (32.5%; Table 3), but generated the lowest premium (4.9%; Table 3). "Eating satisfaction" (11.17%; Table 1) was the fourth most important bucket. Curiously, "eating satisfaction" dropped two places since the previous audit (Igo et al., 2013), which could potentially be linked directly to economic fluctuations in 2015 and 2016. Not a single Packer listed "eating satisfaction" as a *must have*, but 55% of Packers were willing to pay an average premium of 10% (Table 3) to guarantee it, which they primarily described as "customer satisfaction" (29%; Table 2) driven by "tenderness" (17%; Table 2) and "flavor" (14%; Table 2). "Cattle genetics" (10.97%; Table 1), defined as "Breeds", (39%; Table 2) were fifth most important followed by "weight and size" (9.3%; Table 1), defined as "cattle size", (40%; Table 2).

The quality category of least importance to steer and heifer Packers was "visual characteristics" (6.8%; Table 1), which they defined primarily as "live cattle composition" (45% Table 2). One packer told of his experiences buying cattle primarily by visual characteristics, stating that "Anybody buying cattle knows that you want them to look good but that you can never really tell what their carcass will look like when they're alive."

As a whole, Packers indicated a larger number of quality factors as *must haves* and were more willing to pay a premium for quality guarantees, but were willing to pay less for those guarantees than in the NBQA-2011. Relative importance rankings for market cow and bull Packers can be found in (Table 4). "Food safety" again dominated relative importance rankings at 56.3%, with the second most important factor of "lean, fat, and bone" at 13.4%. Following the two most important quality factors of "food safety" and "lean, fat and bone", the remaining quality factors had comparatively low shares of preferences when compared to the steer and heifer Packers.

Retailers

Relative importance of the seven quality factors for Retailers began with "food safety" (44.0%; Table 1) as the most important factor, which, similarly to 2011-NBQA, Retailers primarily defined as being "produced within a safe environment" (25%; Table 2). "Food safety was also described as "critical to business" and as "an obligation to consumers" (23% and 18%, respectively; Table 2). Twenty-six percent of Retailers determined that "Food safety" was *must have,* but of the companies not describing "Food safety" as *must have,* 47% said they were willing to pay an average premium of 12.3% (Table 3).

"Eating satisfaction", primarily defined as "customer satisfaction" (Table 2), was the second most important factor (P <0.05) (23.6%; Table 1) and was more than twice as important as "visual characteristics" (Table 1). When describing "Eating satisfaction", one retailer stated that "It is very important, if it (the product) doesn't taste good and isn't tender, people won't come back and buy it." "Customer satisfaction" was the primary definition of "eating satisfaction" followed by "tenderness" and "flavor" (20% and 13%, respectively; Table 2). During the interviews, it was made apparent that Retailers fundamentally understand their consumers' purchasing patterns and complaints. Similar to studies performed by (Platter et al., 2005) and (Huffman et al., 1996), Retailers were very aware of the impact that "eating satisfaction" has on maintaining repeat customers, as 29% of Retailers required guaranteed "eating satisfaction" as a *must have* (Table 3). Of the Retailers not requiring "eating satisfaction" as a *must have*, 85% were willing to pay an average premium of 13.2% (Table 3) for guaranteed "eating satisfaction".

"Visual characteristics," primarily described as "color" by 34% of respondents (Table 2), is another factor related to customer purchasing. Despite the knowledge that color does not necessarily affect eating satisfaction (Carpenter et al., 2001), color is a primary driver for beef purchases (Smith et al., 2000; Font-i-Furnols and Guerrero, 2014; Holman et al., 2016). Retailers know how important color is to their bottom line and although only 6% require "visual characteristics" as a *must have,* 63% were willing to pay an average premium of 6.6% to guarantee it (Table 3). Following the three most important factors, the differences between quality factors narrowed considerably with "lean, fat, and bone" identified as "Yield" and "lean to fat ratio" (27% and 22%, respectively; Table 2) rating as the least important factor to Retailers. Tighter windows on company specific cutting

specifications could be the reason that "lean, fat, and bone" guarantees ranked so lowly in importance, as there are already mechanisms in place to control this quality bucket.

Very few Retailers claimed to participate in the market cow and bull industry with only 7 of the 35 companies interviewed stating that they purchase beef from market cows and bulls. Nevertheless, the cardinal ranking of quality factor importance can be found in Table 4. It should be noted, that of the Retailers stating they purchase beef from market cows and bulls, they answered the majority of questions from the perspective of ground beef. "Food safety" (52.3%), followed by "Visual Characteristics" (21.2%) and "Eating satisfaction" (15.9%), were the quality factors that dominated the relative importance rankings with "Cattle genetics" (1.1%; Table 4) as the least important quality factor ($P < 0.05$). Retailers were the only market sector that did not rank "visual characteristics" towards the bottom of the cardinal ranking system. Considering the business models for the marketing sectors, this discrepancy fits perfectly in line with what the researchers would expect. Retail meat purchasing decisions are influenced by color more than any other quality factor because consumers most often associate color with freshness (Mancini and Hunt, 2005), with the deterioration of cherry red color costing the industry an estimated $1 billion annually (Smith et al., 2000).

Food Service

"Food safety", "eating satisfaction", and "lean, fat, and bone" (46.3%, 18.5%, and 9.3%, respectively; Table 1) were the three most important quality factors to Food Service providers with "cattle genetics" (5.1%) ranked the least important ($P < 0.05$). According to Food Service companies, the term "food safety" was described equally as the "top priority", "wholesome", or "pathogen free" 19% of the time (Table 2). "Food safety" was more than twice as important ($P < 0.05$) as "eating satisfaction" and, prior to 2011, had never even been listed as a top 10 quality concern (Smith et al., 1992; Smith et al., 1995; Smith et al., 2006). Fifty percent of Food Service respondents cited "food safety" as a *must have* with 51% of the companies not listing it as a *must have* being willing to pay an average of 15.6% (Table 3) premium for "food safety" guarantees.

Food Service providers defined "eating Satisfaction" as "customer satisfaction" 29% of the time, 18% described the term as "flavor", and 11% as "tenderness" (Table 2). Food Service providers required "eating

satisfaction" 39% of the time while 61% of remaining companies were willing to pay an average premium of 8.9% (Table 3) for guaranteed "eating Satisfaction". "Eating satisfaction" was tied with "food safety" ($P > 0.05$) for the most likely quality factor to be required before purchasing and ($P > 0.05$) as the trait companies were most willing to pay a premium for (Table 3). Following previous consumer research (Huffman et al., 1996; Boleman, 1997; Miller et al., 2001; Platter et al., 2003), it is widely known that consumers are willing to pay a premium for positive eating experiences and can differentiate multiple levels of known sensory differences within steaks. The ability to provide a consistent, positive eating experience generates more exposure for the restaurant to new customers and increases the rates of returning customers. It was apparent during the interviews how passionate restauranteurs were about "eating satisfaction" and the impact it could have on their business, "Customer satisfaction; It's all about eating satisfaction and the consumer telling their friend about their experience."

"Lean to fat ratio" was used to define the "lean, fat, and bone" quality factor by 33% of the respondents (Table 2) with 18% of respondents defining it as "yield" and 13% referring to the presence of "bones" within the product. With the dramatic increase in ground beef purchases by US consumers, CattleFax estimates that U.S. ground beef consumption today has grown to between 55 and 60% of total beef consumption, up 5 points from 10 years ago. Therefore, it is logical that Food Service companies would place emphasis on a specific "lean to fat ratio" within their ground beef blends. Although companies have tight specifications already in place for "lean, fat, and bone" percentages, 34% of companies are willing to pay an additional 7.6% (Table 3) premium for increased guarantees. One restauranteur described the potentials for quality service in regards to "lean to fat ratios", as "Ensuring proper ratios will entice more business between a supplier and customer, and will also play key roles in the guests' experience and if they would be willing to repeat the purchase of that menu item." Food Service companies stated that 43.5% of their beef purchases were subprimals to be cut in the back of the stores. "yield" and the amount of trimming required to reach serving specifications is critical within the back of the restaurant because there is rarely an outlet for trimmings in large Food Service companies and it is widely considered waste. "Cattle genetics", predominantly defined as "breed" by 43% (Table 2) of respondents, ranked last ($P < 0.05$) in relative importance and only 4% (Table 3) of companies required specific "Cattle genetics" for purchase.

Of the 29 companies, 10 claimed to participate in the market cow and bull market with the cardinal rankings found in (Table 6). "Food safety" dominated the rankings with six times the shares of preferences (66.4%) than the second most important quality bucket "lean, fat, and bone" (11.1%). Again, like Retailers, the majority of companies only focused on beef from the cow and bull market as trimmings or ground beef and, for the vast majority, were not answering questions from the perspective of whole muscle cuts.

Further Processors

Companies interviewed consisted of grinding operations, purveyors, cookers, and distributors and represented a much broader perspective than other, more narrowly focused sectors. Nevertheless, "food safety" ranked the highest ($P < 0.05$) of the 7 quality factors, generating 46.5% of the shares of preference (Table 1). "Food safety" was most frequently described as "critically important" (32%) or as products being "produced in a safe environment" (19%) and "pathogen free" (9%) (Table 2). Additionally, 33% (Table 3) of companies required a guarantee of "food safety" prior to completing the purchase. Of the companies without "food safety" as a *must have*, 41% were prepared to pay a premium of 11.3% (Table 3). The level of attention paid to food safety from the Further Processing sector was made very clear by the vast majority of the respondents, "Food safety is what the industry is based upon. Number one factor in our production and for consumers buying our product."

Similar to all other sectors dealing directly with end consumers, "eating satisfaction" ranked second ($P < 0.05$) to "food safety" with 15.96% of the shares of preference (Table 1). "Eating satisfaction" was again defined as "customer satisfaction" by 35% of companies interviewed with "tenderness" and "flavor" gaining 13% and 10% of the definitions, respectively (Table 2). Curiously though, only 9% of the Further Processors required guaranteed "eating satisfaction" but more than half (57%) were willing to pay a premium for guaranteed "eating satisfaction" of 8.9% (Table 3).

"Weight and Size" was the third most important quality bucket for Further Processors and was defined as "cut Sizes" (25%), "subprimal size" (21%), "consistency" (10%) and "unimportant" (10%). With so many of the Further processors purveying steaks and roasts, the increasing cattle sizes are causing issues in regards to meeting customer specifications for thicknesses and weights. Therefore, it is not surprising that 66% (Table 3) of Further

Processors would be willing to pay a premium for a guaranteed weight and size, a steak purveyor said this about one of his customers, "White table cloths want smaller subprimals to control the portion and thickness of steaks." Other companies simply want the products they purchase to be more consistently sorted prior to reaching their facility, and other companies only grind, so the weight and size of raw trimmings they buy don't matter to them or were "Unimportant".

Cardinal rankings from companies participating in the market cow and bull beef industry can be found in (Table 4). The relative importance rankings of Further Processors for market cows and bulls very closely mirrored the rankings of Food Service providers. As with all rankings, "food safety" was far and away the most important ($P < 0.05$), garnering 62.7% of the shares of preference with "Lean, fat, and bone" gaining 11.7% as the second most important (Table 4).

Government and Trade Organizations

Although GTO do not purchase beef and were not subjected to the WTP question portion of the interview process, it is important to understand their perspective on the industry and to provide guidance as to the issues that are currently being discussed in regards to policy, trade, and developing sciences that will affect the industry in the coming cycles. All GTO were asked questions pertaining to both sectors of the beef industry, steers and heifers and market cows and bulls. The cardinal rankings for each sector were different other than "food safety" being the most important for both industries (Tables 1&4). "Food safety" was defined by GTO as "obligation to consumers" by 19%, "trade impacts" by 14%, "residues" by 12%, "crucial to business" by 12%, and 12% reported "food safety" as meaning "pathogen free" (Table 2). One GTO respondent had this to say about "food safety", "(It's the) baseline for being in the meat business. Without food safety, nothing else matters."

The second most important quality factor for steers and heifers was "eating satisfaction" (Table 1) and was most often described as "customer satisfaction" 16%, "customer experiences" 16%, "flavor" 12%, and "tenderness" 12%. For market cows and bulls, the second most important factor was "lean, fat, and bone" ($P < 0.05$; Table 4) with 27% of interviewees defining it as "yield" (Table 2), with the addition of multiple references to actual yield grades. The second most offered response included the impact that particular "Drug administration" can have on the

specific tissues (17%; Table 2). Third, ($P < 0.05$) was the "Lean to fat ratio" presented within the product, primarily from the perspective of trimmings produced by market cows and bulls.

"How and where the cattle were raised" was the third most important quality bucket ($P < 0.05$) for fed beef (Table 1), with the predominant definition described as "production practices" (32%; Table 2), followed by "geography" (20%) and "marketing" (10%). When discussing "production practices" respondents were primarily concerned with marketing claims and how to classify the animals produced under the premise of potential branding opportunities. "Geography" meant the location within the country the animals were raised, while "marketing" definitions primarily pertained to the ability to sell products within certain markets, e.g. exports or local vs non-local. "Eating satisfaction" was listed as the third most important factor ($P < 0.05$) for market cows and bulls (Table 4).

Not captured with the questions of the formal interview, but an important factor that should be noted when interviews were completed with GTO in Washington D.C. was the emergence of novel genetic technologies and the potential implications those technologies could have on the future of the beef industry. Clustered regularly spaced palindromic repeats (CRISPR) sequences and Cas (CRISPR-associated) proteins, were one of the largest topics that policy makers were concerned with during peripheral conversations following the formal interviews. CRISPR-Cas9 is a technology currently still in the proof of concept era, but is advancing at an exponential rate utilizing an organisms' natural virus defense system to specifically target genes within a piece of DNA. Following the targeting of a specific gene, scientists can either delete (knockout) the gene, or replace that gene with a new, more preferred alternative. Since CRISPR-Cas9 systems do not introduce genetic code from outside organisms, the method is currently legislated differently than genetically modified organisms (GMOs) as shown by a letter from USDA Animal and Plant Health Inspection Service (APHIS, 2016) to Dr. Yang of Pennsylvania State University. Since Dr. Yang's mushrooms, created using CRISPR, did not utilize genetic sequences from separate organisms such as with GMOs, CRISPR falls outside of the realm of GMO labeling and legislation. The USDA Agricultural Marketing Service defines GMOs as follows: "The term 'bioengineering', and any similar term as determined by the Secretary (USDA Secretary of Agriculture) with respect to a food, refers to a food A) that contains genetic

material that has been modified through in vitro recombinant deoxyribonucleic acid (DNA) techniques; and B) for

which the modification could not otherwise be obtained through conventional breeding or found in

nature"(Congress, 2016). Although the CRISPR/Cas9 technology is still gaining traction in the applied sciences, the

implications on trade and policy are a new frontier going forward.

Images, Strengths, Weaknesses, Potential Threats, Changes from Previous Audits

Questions regarding the images, strengths, weaknesses, potential threats, and changes from the previous

audits were asked to companies involved in either the steer and heifer industry, the market cow and bull industry, or

both depending on the company's business model. The question "What does your company/organization believe the

image of the steer and heifer industry/market cow and bull industry is?" generated polarizing opinions. The

companies answering from the steer and heifer perspective suggested the image is mostly positive; however,

respondents citing a negative image were represented in every sector except Food Service (Table 5). The image of

the market cow and bull beef sector had a lower frequency of "positive" and a higher frequency of "negative"

responses when compared to the steer and heifer beef industry (Table 6). It should also be noted that 25% of

Retailers and 16.6% of Food Service companies believed that the image of the market cow and bull sector was

either the "same as fed" or "unknown to customers", revealing the lack of consumer knowledge in regards to the

sources of beef items in the marketplace.

When asked about the strengths of the two industries it, was obvious that companies involved in the industry

are proud of the products being produced as shown by the "product quality" category being the most cited strength

of the steer and heifer industry from all market sectors (Table 7). Market cow and bull Packers, as well as Further

Processors, believed the "product quality" was the biggest strength, while the majority of Retailers and GTO

focused on the "value" and the positive "economics" of the products. Furthermore, 30.8% of Food Service

companies said they import the majority of their market cow and bull product (Table 8).

Retailers and Food Service companies cited "marketing" as the largest weakness within the steer and heifer

industry with "consumer communication" as the second largest weakness cited by Packers (Table 9). Multiple

quotes from Retailers and Food Service companies cited the beef industry's lack of progression towards consumers'

wants and needs in regards to specific production practices and process transparency. Weaknesses from the market cow and bull industry focused more on the "animal welfare" perspective than from the steer and heifer industry. Twenty-five percent of cow and bull Packers believed the "producers" were the largest weakness with special attention directed at the timeliness of marketing their animals. Food Service, Further Processors, and GTO all cited "animal welfare" either first or second as the largest weakness of the market cow and bull sector (Table 10). End point management and the timeliness of the culling decision seemed to be the roots of the animal welfare concerns from companies that seemingly understood that older, less mobile animals were the primary targets of the animal welfare complaints.

The potential threats reported within the steer and heifer industry were closely related to the weaknesses, as "poor marketing" has evidently translated into "public perception" being the most cited potential threat by Retailers, Food Service, and Further Processing companies (Table 11). "Animal Disease" was another concern that was consistently expressed across all sectors of the industry except GTO and, with the memories of Porcine Epidemic Diarrhea Virus and Avian Influenza, companies expressed concern that they did not believe the beef industry could survive similar outbreaks. Multiple government agencies discussed the discrepancies between beef, pork, and poultry in regards to the attention being paid to vaccine banks for known viral and bacterial zoonotic pathogens and the concern that they had for the beef industry if more resources were not allocated to developing a vaccine bank. The market cow and bull beef industry cited a multitude of factors as potential threats, with "residues" and "food safety" as the only truly common themes throughout the sectors (Table 12).

When asked about changes that companies had witnessed since the 2011 NBQA, more than 30% of Food Service and Further Processors stated "nothing" had changed, while Packers cited "grading" and "business expansion" as the primary changes. Retailers responded with "economics" and "nothing", while 13.7% of GTO said they had seen an "improvement" in the industry and another 13.7% said that "trade" has increased (Table 13). When asked what had changed since the 2007National Market Cow and Bull Beef Quality Audit (NMCBBQA) 50% of Retailers and 44.4% of Further Processors said that "nothing" had changed (Table 14). Packers believed that "supply" (19.5%) had decreased, but "animal welfare" (19.5%) had improved, while 23.1% of Food Service

companies believed that "Food safety" had improved and 35.7% of GTO stated that there was a better

"understanding of production" (Table 14).

CONCLUSIONS

Companies across all sectors of both industries ranked "food safety" as the highest priority ($P < 0.05$), often

garnering more than twice as many shares of preference as the second most important factor (Table 1). "Eating

satisfaction" (Table 1), described primarily as "customer satisfaction" (Table 2), was the second most important

factor ($P < 0.05$) to all steer and heifer industry sectors except for Packers. Therefore, producing a safe product that

meets the customer demands are the primary quality factors that companies involved in the steer and heifer industry

are concerned with. When companies were asked about the market cow and bull industry, they were primarily

answering questions in regards to the trimmings generated from those products and not the whole muscle cuts.

Partially due to the perspective in which the companies were answering the questions, "lean, fat, and bone" was the

second ($P < 0.05$) most important factor, and was described as "lean to fat ratio" by multiple sectors, except for

Retailers, who stated "visual characteristics" was the second ($P < 0.05$) most important quality factor (Table 4).

When compared to 2011-NBQA, more companies required guarantees of "food safety" across the board and 50%

of Food Service companies stated they required some guarantee of "food safety" before conducting business. The

responses also dictated that more companies were willing to pay premiums for guaranteed quality factors than in

2011, but were willing to pay less for those guarantees, on average (Table 3). Companies believe that the image of

the steer and heifer industry is polarizing with the majority believing beef is still viewed as "Positive" (Table 5)

with the primary strength being "product quality" (Table 7). Nevertheless, multiple companies believe the image is

"negative" with one of the largest weaknesses as "marketing" (Table 9) and one of the largest threats "public

perception. The market cow and bull sector is a less visible and is a less popular industry compared to the steer and

heifer industry. Additionally, the market cow and bull industry is often misunderstood by the general consumer.

Furthermore, purchasing agents within the Retail and Food Service industry were often unfamiliar with the sources

of trimmings or grinds they are buying. The market cow and bull beef industry has a less positive image than the

steer and heifer industry (Table 6) but is viewed as a high "value", high "quality" (Table 8) product that delivers

beef as a more economical alternative to steers and heifers. One of the largest weaknesses that continues to plague

the industry are "animal welfare" (Table 10) concerns linked to producers holding cows and bulls past their optimal

culling period. The potential threats to the industry varied across sectors with "animal welfare", "food safety", and

"animal activists" rising as common themes throughout the responses (Table 12). "Nothing" was most often cited

as the change from the 2007 NMCBBQA with "increased food safety initiatives" also mentioned (Table 14).

As consumer demands shift, it is paramount for the U.S. beef industry to also shift in order to maintain

viability. "The U.S. cattle industry cannot expect improvements in prices for its products/byproducts when 'quality'

doesn't warrant such increases." Identification of the relative importance of quality factors and estimation of the

industries WTP for those quality factors has provided targets of improvement to increase profitability within the

beef industry. In general, companies are willing to pay for additional quality guarantees, providing the industry and

opportunity to increase value to each of the marketing sectors.

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Tables

Table 1. Relative importance of quality factors for steer and heifer market with calculated shares of preference

Quality Bucket	Packer	Retailer	Food Service	Further Processor	GTO
How and Where Cattle were Raised	11.4[c]	6.3[d]	6.1[e]	5.3[f]	12.2[c]
Lean Fat and Bone	13.7[b]	4.7[f]	9.3[c]	9.2[d]	10.7[d]
Weight and Size	9.3[f]	6.1[e]	9.0[d]	10.2[c]	8.9[e]
Visual Characteristics	6.8[g]	9.3[c]	5.7[f]	7.4[e]	11.3[d]
Food Safety	36.7[a]	44.0[a]	46.3[a]	46.5[a]	30.2[a]
Eating Satisfaction	11.2[d]	23.6[b]	18.5[b]	16.0[b]	17.6[b]
Cattle Genetics	11.0[e]	6.0[e]	5.1[g]	5.4[f]	9.1[e]

[a-c] Percentages within each column without a common superscript differ ($P < 0.05$)

Table 2. Categorized responses from interviewed companies for explaining what the pre-identified quality categories mean to their company as it relates to all beef products

	Packer		Retailer		Food Service		Further Processors		GTO	
	Most freq.[1]	Definition	Most freq.	Definition	Most freq.	Definition	Most freq.	Definition	Most freq.	Definition
How and where the cattle were raised	38%	Source Location	47%	Geography	27%	Animal Welfare	29%	Geography	32%	Production Practices
	28%	Welfare/Handling	18%	Animal Well-Being	22%	Local/COOL	19%	Production Practices	20%	Geography
	13%	Feed	16%	Other	14%	Feed	10%	Welfare	10%	Marketing
Cattle Genetics	39%	Breeds	37%	Breed	43%	Breeds	48%	Breeds	26%	Breeds
	27%	Quality	26%	Quality	17%	Ability to Guarantee Quality	20%	Unimportant	19%	Improvements
	11%	Nothing*	13%	Bloodline	17%	Product Improvements	17%	Quality Improvement	16%	Eating Quality
Weight and Size	40%	Cattle Size	27%	Uniformity in Cuts	46%	Cut Sizes	25%	Cut Sizes	33%	Carcass Weights
	26%	Cut Sizes	24%	Cut Sizes	20%	Yield	21%	Size of the Subprimal	15%	Dosage Size
	22%	Carcass Weight	18%	Subprimal Weights	12%	Unimportant	10%	Consistency	15%	Cut Sizes
Visual Characteristics	45%	Live Cattle Composition	34%	Color	32%	Quality of the Product	23%	Appropriate Product Color	27%	Live Animal
	17%	Other	18%	Marbling	18%	Eye Appeal	16%	Lean/Trimmed Product	20%	Other
	13%	Animal Health	15%	Eye Appeal	16%	Nothing	12%	Marbling	17%	Hide Color
							11%	Unimportant		
Food Safety	40%	Critical	25%	Produced in a Safe Environment	19%	Top Priority	32%	Critically Important	19%	Obligation to Consumer
	29%	Pathogen Free	23%	Critical to Business	19%	Wholesomeness	19%	Produced in a Safe Environment	14%	Trade
	13%	Obligation to Consumer	18%	Obligation to Consumer	19%	Pathogen Testing	9%	Free of Pathogens	12%	Residues
					9%	Brand Protection	9%	Compliance	12%	Crucial to Business
					9%	Supplier Assurance			12%	Pathogen Free
Lean, Fat, and Bone	36%	Yield	27%	Yield	33%	Lean to Fat Ratio	21%	Lean to Fat Ratio	27%	Yields
	26%	Lean to Fat Ratio	22%	Lean to Fat Ratio	18%	Yield	20%	Boneless	17%	Drug Administration
	13%	Fat Thickness	14%	Lean to Bone	13%	Bones	14%	Yields	17%	Lean to Fat Ratio
							13%	Specifications		
Eating Satisfaction	29%	Customer Satisfaction	23%	Customer Satisfaction	26%	Customer Satisfaction	35%	Customer Satisfaction	16%	Customer Satisfaction
	17%	Tenderness	20%	Tenderness	18%	Flavor	13%	Tenderness	16%	Experiences
	14%	Flavor	13%	Flavor	11%	Tenderness	10%	Flavor	12%	Flavor
					11%	Quality	6%	Quality	12%	Tenderness
									9%	Returning Customers

[1]Most freq. = Top 3 most freq. and ties. responses. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses

Table 3. Probabilities of "must haves", paying premiums, and the average values (%) of paying premiums

Sector	WTP[1]	How and Where Cattle were Raised	Lean, Fat, and Bone	Weight and Size	Visual Characteristics	Food Safety	Eating Satisfaction	Cattle Genetics
Packers	*Must have*	32.5[a]	18.1[ab]	7.4%[b]	10.0[b]	29.6[a]	None[2]	10.0[b]
	Premium	36.7[bc]	77.4[a]	45.1[bc]	35.0[c]	69.0[ab]	55.3[abc]	54.4[abc]
	Premium %	4.9	6.5	10.8	5.2	11.1	10.1	8.5
Retailers	*Must have*	32.3[a]	17.6[ab]	5.8[b]	5.8[b]	26.5[a]	29.4[a]	23.5[ab]
	Premium	37.0[c]	55.3[bc]	66.6[ab]	62.9[bc]	47.0[bc]	85.4[a]	63.9%[abc]
	Premium %	6.0[b]	6.0[b]	7.0[ab]	6.6[b]	12.3[ab]	13.2[a]	11.6[ab]
Food Service	*Must have*	7.1[b]	17.8[b]	10.7[b]	14.3[b]	50.0[a]	39.3[a]	3.5[c]
	Premium	51.4[a]	34.1[ab]	60.7[a]	13.5[c]	50.9[a]	61.4[a]	27.1[bc]
	Premium %	9.8	7.6	6.8	6.7	15.6	8.9	7.3
Further Processors	*Must have*	10.9[b]	37.5[a]	10.9[b]	9.4[b]	32.8[a]	9.3[b]	4.7[b]
	Premium	45.5[b]	50.2[ab]	65.9[a]	36.7[b]	41.1[b]	56.7[ab]	39.4[b]
	Premium %	9.8	8.6	8.7	8.4	11.3	8.9	8.0

[a-c] Means within a row for each sector without a common superscript differ ($P < 0.05$)

[1] *Must have* = odds of a category identified as a *must have*, Premium = odds a sector would be willing-to-pay a premium WTP; Premium % = average percent premium WTP.

[2] No probabilities were calculated for the sector with 0 observations for this attribute.

Table 4. Relative importance of quality factors for market cow and bull market

Quality Bucket	Packer	Retailer	Food Service	Further Processor	GTO
How and Where Cattle were Raised	7.8^d	1.5^e	2.9^f	4.4^f	10.6^d
Lean Fat and Bone	13.4^b	6.1^d	11.1^b	11.7^b	14.0^b
Weight and Size	8.4^c	1.8^e	4.9^d	5.3^d	7.1^f
Visual Characteristics	4.5^f	21.2^b	4.2^e	4.9^e	9.2^e
Food Safety	56.3^a	52.3^a	66.4^a	62.7^a	39.0^a
Eating Satisfaction	5.4^e	15.9^c	8.4^c	8.2^c	13.0^c
Cattle Genetics	4.1^g	1.1^e	2.1^g	2.7^g	7.2^f

[a-c] Percentages within each column without a common superscript differ ($P < 0.05$)

Table 5. Categorized responses from interviewed companies explaining what they believed the image of steer and heifer beef industry is

Packer		Retail		Food Service		Further Processing		GTO	
Most freq[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
33.0%	Good Image	75.0%	Positive	55.2%	Positive Image	39.1%	Positive Image	51.5%	Positive Image
12.5%	Unknown	9.4%	Improving Image	10.3%	Uneducated Customers	27.5%	Negative	27.3%	Negative
12.5%	Improving Image	9.4%	Negative	10.3%	Improving Image	13.0%	Improving Image	6.1%	No Opinion
12.5%	Negative			10.3%	No position			6.1%	Family Farms and Old West

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 6. Categorized responses from interviewed companies explaining what they believed the image of market cow and bull beef industry is

Packer		Retail		Food Service		Further Processing		GTO	
Most freq.[1]	Responses	Most freq.	Responses	Most freq.	Responses	Most freq.	Responses	Most freq.	Responses
26.1%	Negative	50.0%	Positive Image	25.0%	Unknown	33.3%	Positive	35.7%	Positive Image
26.1%	Positive	25.0%	Same as Fed	16.6%	Good Image	13.3%	Negative	35.7%	Negative
21.7%	Improving Image	12.5%	Negative	16.6%	Unknown to Consumers	13.3%	No Image	21.4%	No Image
		12.5%	Improving Image	16.6%	Decreasing in Competition	6.7%	Unknown to Consumers		

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 7. Categorized responses from interviewed companies explaining what they believed the strengths of the steer and heifer beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
28.5%	Quality	26.9%	Product Quality	39.6%	Product Quality	28.6%	Product Quality	28.3%	Product Quality
11.9%	Taste	13.5%	Nutrition	14.6%	Food Safety	18.1%	Food Safety	19.6%	Production Practices
11.9%	Story	11.5%	Sustainability	8.3%	Supply	8.6%	Supply	15.2%	Marketing
11.9%	Food Safety	9.6%	Food Safety	8.3%	Market	6.7%	Animal Welfare		
						6.7%	Consistency		

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 8. Categorized responses from interviewed companies explaining what they believed the strengths of the market cow and bull beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
37.0%	Product Quality	33.3%	Value	30.8%	Don't Buy US	31.3%	Product Quality	30.0%	Economics
18.5%	Source	22.2%	Product	15.4%	Sustainability	18.8%	Supply	30.0%	Value
18.5%	Value	11.1%	Taste	15.4%	Food Safety	12.5%	Food Safety	10.0%	Tradition
								10.0%	Product Production
								10.0%	Cost

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 9. Categorized responses from interviewed companies explaining what they believed the weaknesses of the steer and heifer beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
29.4%	Market	18.6%	Poor Marketing	21.2%	Marketing	19.7%	Economics	23.5%	Production Practices
17.6%	Consumer Communication	11.6%	Supply	18.2%	Production Practices	15.5%	Cut Sizes	20.6%	Marketing
14.7%	Consistency	11.6%	Size	18.2%	Economics	9.9%	Supply	14.7%	Product Quality
		9.3%	Food Safety	12.1%	Too Fragmented	8.5%	Too Few Companies	8.8%	Public Perception
		9.3%	Environment	12.1%	Supply	7.0%	Too Fragmented	8.8%	Traceability

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 10. Categorized responses from interviewed companies explaining what they believed the weaknesses of the market cow and bull beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
25.0%	Producers	20.0%	Product	19.0%	Animal Welfare	21.4%	Supply	22.2%	Animal Welfare
22.2%	Supply	20.0%	Food Safety	14.3%	Too Fragmented	14.3%	Product Quality	16.7%	Residues
13.9%	Cost	20.0%	Media	14.3%	Residues	14.3%	Economics	16.7%	Traceability
				14.3%	Controversies	14.3%	Animal Welfare	16.7%	Quality
								16.7%	Supply

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses

Table 11. Categorized responses from interviewed companies explaining what they believed the potential threats for the steer and heifer beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
22.0%	Market	21.1%	Public Perception	17.8%	Public Relations	15.7%	Public Perceptions	20.4%	Activist Groups
15.9%	Animal Rights Activists	19.3%	Food Safety	16.1%	Animal Diseases	15.7%	Food Safety	14.3%	Regulations
13.6%	Animal Disease	12.3%	Media	16.1%	Economics	10.2%	Animal Disease	12.2%	Uninformed Consumer
13.6%	Food Safety	12.3%	Animal Disease	16.1%	Production Practices	9.3%	Economics	12.2%	Exports
13.6%	Resources					8.3%	Activist Groups	10.2%	Media

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses

Table 12. Categorized responses from interviewed companies explaining what they believed the potential threats of the market cow and bull beef industry are

Packer		Retail		Food Service		Further Processor		GTO	
Most freq. [1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
22.2%	Business	41.7%	Food Safety	17.6%	Animal Welfare	18.9%	Animal Disease	18.8%	Trade Issues
16.7%	Residues	16.7%	Public Perception	17.6%	Meat from Alternative Sources	10.8%	Activist Groups	18.8%	Policy
13.8%	Uneducated Consumers	8.3%	Activist Groups	11.8%	Media	10.8%	Economics	12.5%	Cost
11.1%	Animal Disease	8.3%	Animal Welfare	11.8%	Food Safety	10.8%	Food Safety	12.5%	Residues
				5.9%	Animal Rights Activists	8.1%	Federal Regulations		
				5.9%	Cost	8.1%	Nature		
				5.9%	Too Fragmented				
				5.9%	Environmental				

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 13. Categorized responses from interviewed companies explaining what they believed has changed since the 2011 NBQA

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
17.5%	Grading	22.4%	Economics	31.4%	Nothing	36.5%	Nothing	13.7%	Improvement
17.5%	Business Expansion	18.4%	Nothing	22.9%	Economics	15.9%	Products	13.7%	Trade
12.5%	Supply	14.3%	Improved Quality	11.4%	Consumer Demands/Perceptions	12.7%	Increased Food Safety Initiatives	11.8%	Cattle Size
12.5%	Nothing	8.1%	Consumer Awareness					7.8%	Competition
								7.8%	Nothing
								5.9%	Antibiotics
								5.9%	Alignment
								5.9%	Increased Food Safety Initiatives

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.

Table 14. Categorized responses from interviewed companies explaining what they believed has changed since the 2007 NMCBBQA

Packer		Retail		Food Service		Further Processor		GTO	
Most freq.[1]	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response	Most freq.	Response
19.5%	Supply	50.0%	Nothing	23.1%	Increased Food Safety Initiatives	44.4%	Nothing	35.7%	Understanding Production
19.5%	Animal Welfare	25.0%	Supply	15.4%	Marketing	18.5%	Increased Food Safety Initiatives	28.6%	Antibiotics
12.2%	Costs	12.5%	Improvements	15.4%	Improvement in Quality	11.1%	Economics	14.3%	Supply
12.2%	Food Safety	12.5%	Increased Food Safety Initiatives	7.7%	Animal Welfare				

[1]Most freq. = Top 3 most freq. responses and ties. Response data were evaluated as the number of times that interviewees in each market sector identified the attribute as a definition or description of the given category divided by the total number of responses.