THESIS

# EVALUATING THE ADOPTION LEVEL OF QUALITY-ORIENTED MANAGEMENT PRACTICES BY CATTLE PRODUCERS AND MOTIVATION FOR PARTICIPATION IN BEEF QUALITY ASSURANCE (BQA) PROGRAMS

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ABSTRACT

EVALUATING THE ADOPTION LEVEL OF QUALITY-ORIENTED MANAGEMENT PRACTICES BY CATTLE PRODUCERS AND MOTIVATION FOR PARTICIPATION IN BEEF QUALITY ASSURANCE (BQA) PROGRAMS

Consumers have become more concerned about animal well-being and animal welfare in the beef industry. Quality assurance programs have been created to address both of these concerns, but producer buy-in is relatively unknown and probably low. Three studies were conducted to further investigate the animal welfare concern of non-ambulatory (**NA**) animals in the California beef and dairy industries, implementation of BQA best management practices, BQA participation, and producer perceptions on "quality", and factors that influence a producer to participate in BQA and BQA-type programs.

The first study was a survey conducted to evaluate how California beef and dairy operations sell market cows and bulls and to identify key contributors to animals becoming disabled or NA. Surveys were mailed to 9,778 California beef and dairy producers and identical surveys were available via the internet and as printed surveys distributed at 2 cattle producer meetings. The survey instrument included 29 questions to evaluate producer characteristics, incidence of NA cattle on-farm or on-ranch, management and marketing practices utilized for market cows and bulls, and likely reasons animals become NA.

Completed surveys were received from 446 producers (n = 403 beef, n = 43 dairy). The mean age (± SD) for survey respondents was 62 ± 12.3 yr for beef producers and 55 ± 13.1 yr for dairy producers. Survey responses clearly indicated that most beef (77.5%) and dairy producers

(62.5%) marketed their animals at a livestock auction market, which was more ($P < 0.05$) than any other option. Rates of culling, euthanasia, and death loss among cows were 10.8, 1.2, and 1.3%, respectively for beef respondents, and 33.1, 2.1, and 3.3%, respectively for dairy respondents. Interestingly, 35.6% of beef and 95.2% of dairy respondents indicated they had at least 1 non-ambulatory cow in the previous 12 mo. The majority ($P < 0.05$) of beef and dairy survey respondents indicated they would consider on-farm euthanasia (92.1 and 88.1%, respectively). Dystocia was reported to be the primary cause ($P < 0.05$) of NA status in cows among beef (46.5%) and dairy (79.1%) respondents.

Results of this survey indicate that producers regularly had NA cattle on their operations, but they also had the opportunity to implement on-farm and on-ranch management practices to prevent NA cattle from occurring and/or entering the marketplace. Further, livestock auction markets can provide the best opportunity for disseminating information to producers about NA cattle.

The second study was a national survey that examined producer knowledge and implementation of Beef Quality Assurance (**BQA**)-related practices in the beef cattle industry as a part of the 2011 National Beef Quality Audit (**NBQA**). The survey instrument consisted of 43 questions that examined producer characteristics, views on beef quality, use of BQA-related practices, and knowledge of or participation in the BQA program. Surveys were collected from April 2011 to February 2012. The survey was available online and as a hard copy to obtain responses at industry meetings. A total of 3,755 producers responded to the survey. Means and frequency distribution were determined on a total respondent basis (overall), within industry sectors, and within some demographical categories.

Respondents were from 45 different states with the majority of respondents characterizing themselves as commercial cow/calf operators (74.8%). When asked "in what ways do you intentionally influence 'quality' as a beef producer", on an overall basis, the most common responses were: through "preventative health care (i.e. vaccination program)" and "use of good stockmanship and animal handling skills." Ultimately, those respondents who had been to a BQA-type meeting were more likely ($P < 0.05$) to follow the best management practices outlined in BQA principles. Only 3.6% of respondents indicated that they "do not intentionally influence beef quality."

After completion of the initial NBQA survey in 2011, a number of key issues regarding production practices were identified. Binary and multinomial logistic regression analyses were used to examine factors influencing producer behavior. Explanatory variables included: age, gender, years in the industry, and whether they agreed or disagreed with statements in regards to his/her views of his/her operation, farm characteristics, and the respondent's personal opinion of their operation. Results showed that the odds of whether or not a producer had been to a meeting addressing quality issues were influenced by ($P < 0.100$) the segment of industry they operated in, if cattle were their primary source of income, the region of country in which they were located, years involved in the industry, and if they agreed with statements regarding adoption of technologies and industry involvement. The odds of a producer hearing of BQA was influenced by ($P < 0.100$) the segment in which they operated, whether cattle were their primary source of income, the region in which the operation was located, the age of the producer, whether profitability was their greatest concern, and whether or not the respondent kept in touch with their local Extension agent. Overall, it appears that producers have access to BQA and BQA-type

programs and have the opportunity to use the technology and resources available to them to implement best management practices and avoid animal welfare issues on their operations.

**Key words:** Cattle producer, National Beef Quality Audit, Non-ambulatory, Survey

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# CHAPTER I

## REVIEW OF LITERATURE

For years, consumer concerns have been increasing regarding how meat products are impacted by management practices (Smith et al., 1997). In the 1980s, consumers were concerned primarily about drug and chemical residues in their beef (Smith et al., 1997; Roeber et al., 2001). In addition to consumer concerns, the price of beef was rising because of an increase in production costs, resulting in a decrease in market share as consumers opted for more affordable and more consistent proteins, like chicken and pork (Lambert, 1991; Smith et al., 1997). Currently, not only of concern are the price and residues, but also the welfare of animals, including moral and ethical considerations about how they are managed (Rollin, 2004). There are many different definitions but for the purpose of this study animal welfare encompasses quality of life, humane handling (recently coined humane), and the methods with which they are raised (Grandin, 1997; Grandin, 2001; Rollin, 2004). The beef industry must address these consumers concerns and the first step is to increase transparency in how cattle are raised and harvested.

A proactive response is required to address consumer concerns or more economic loss will be realized. One example of a lack of transparency was in the 'pink slime' battle in which consumers were not aware of what lean, finely textured beef was and that it was being used in school lunch programs. The beef industry failed to tell consumers what they were doing (Schultz, 2012). When the beef industry was not transparent in the manufacturing of this product,

antagonist parties ran with the story creating horror and outrage. The beef industry was slow to respond honestly to the issue resulting in damage that was irreversible (Schultz, 2012). This issue created economic loss to the packing houses when supermarkets opted to not buy the product anymore and created more suspicion and decreased consumer confidence in the beef industry (Schultz, 2012). A proactive beef industry response could have been to explain the added efficiency of using all protein from an animal in order to continue to provide a high quality, affordable product for the consumer.

Another area of consumer concern is that of animal welfare at the cattle production phase of the industry. What consumers and many producers do not realize is that animal welfare has always been and always will be crucial to the sustainability of the beef industry. According to Dr. Dave Lalman and Dr. Robert Smith at Oklahoma State University Extension, through the management practice of preconditioning, which intends to optimize "the animal's immune system and nutritional status while minimizing stress", value is added to the entire production system (Lalman and Smith, 2002). Keeping calves healthy shows "reduced incidence and associated costs of sickness, improved performance in terms of weight gain and feed efficiency, a reduction in drug use and the labor required to treat and manage sick cattle," and ultimately, results in an improved beef product quality (Lalman and Smith, 2002). This shows that it is profitable to provide quality of life, use low-stress handling, which in turn increases the health of the animal which decreases the opportunity of residues in beef. Cattle producers are proactive and willing to implement new and innovative management practices in order to provide a quality product. Voluntary process verified programs (**PVP**) and other voluntary quality assurance programs are still areas for potential improvement (Garcia et al., 2008). However, there is limited

documentation of the practices and on-farm/on-ranch incidences in the country and few studies on producer behavior, perception, and factors that influence the decision making process.

USDA's The National Animal Health Monitoring System (**NAHMS**) of USDA is one organization that conducts surveys to strictly document beef cattle producer population measurements and their implementation of practices. These surveys provide insight into the implementation of practices such as the use of individual animal identification, dehorning, castration, calving methods, and even the breeds used on an operation (USDA, 2009a). The 2007-08 survey provided insight into, and helps track previous problems that were determined to be management shortfalls in National Beef Quality Audits (**NBQA**) such as injection locations, method use to administer injections, and number of injections given (USDA, 2009b). Also in this report were the frequencies for familiarity and incidence of implementation of the Beef Quality Assurance (**BQA**) program (USDA, 2009a). One problem that was not recorded in this report and only reported in few other studies are details related to non-ambulatory (**NA**) cattle, including their incidence in the industry. Non-ambulatory animals are those that cannot stand or walk unassisted. Not only consumer concern for animal welfare but also the beef industries commitment to continuous improvement and animal well-being dictates that NA cattle are an issue as long as they are present in the industry.

According to USDA (2011b), during the 2010 calendar year 3.6 million beef cows, 2.8 million dairy cows, and 622,000 bulls were harvested in the U.S. which comprised 20.9% of all cattle harvested. Cull cows and bulls (commonly referred to as "market" cows and bulls) represent an important part of the total beef supply since they are widely used to supply beef to consumers via retail and food service outlets (NCBA, 1999).

The relative value of market cow and bull carcasses will likely continue to increase based on data collected during the 2007 National Market Cow and Bull Beef Quality Audit (**NMCBBQA**; Hale et al., 2007) which indicated that a higher percentage of cows were fabricated into higher-priced whole-muscle cuts in 2007 vs. 1999. This trend of increasing cow carcass value underscores the need to communicate to beef and dairy producers their critical role in the U.S. beef supply chain. However, Hale et al. (2007) also indicated that as of 2007 limited improvements had been made in addressing quality challenges specific to the market cattle population that were identified in previous audits in 1994 and 1999. Only recently have the dairy and beef industries begun to address this issue through research, science-based management recommendations, and BQA educational programming.

The existence of NA cattle in the U.S., or those that have the potential to become NA if subjected to a stressor (i.e. long-distance transport to slaughter), has become an animal welfare concern (Grandin, 1997). Consumers are demanding accountability with management practices such as humane handling, quality of care provided, and food safety concerns (Grandin, 2001; Schwartzkopf-Genswein et al., 2006; Stull et al., 2007; Gonzalez et al., 2012). During the NMCBBQA 2007, "animal welfare" issues and "condemnation rates of downers prior to slaughter" were both included on the list of "Top 10 Quality Challenges" that faced the market cow and bull beef industry from 1999 to 2007. This information was derived from interviews with packing plant management and USDA FSIS personnel (Hale et al., 2007). Although, the authors also reported that one of the most improved ante mortem traits for both beef and dairy cattle was the reduced prevalence of NA cattle between 1999 and 2007, the data is misleading as the decrease is likely due to implementation of the 2004 ban on harvesting NA cattle (Hale et al., 2007). This shows that this issue is not only a consumer concern, but also an in-house concern

therefore more research is needed to pinpoint causes of cattle becoming NA and ultimately educate producers how to prevent them from becoming NA.

Currently, governmental regulation is helping to discourage the presence of NA cattle in the marketplace via direct regulatory policy (Becker, 2009). In the USDA Meat Inspection and Humane Methods of Slaughter Act all NA animals need to be banned from use in the human food chain (Becker, 2009). The FSIS regulation said NA animals are more likely to have Bovine Spongiform Encephalopathy (**BSE**) and in March 2009 USDA Agriculture Secretary Tom Vilsack said the final rule would be that no animal that had been NA at any time before arriving at the processing facility or had become NA after arriving at the facility would be slaughtered (USDA, 2009c). They were to be condemned and disposed of in accordance with FSIS regulations (USDA, 2009c). However, the occurrence of NA cattle in the industry continues to be a challenge (USAHA, 2006). Few peer-reviewed estimates of NA incidence in the U.S. cattle industry are available, however, survey data collected in 2004 by the United States Animal Health Association (**USAHA**) indicated that most (78%) dairy operations had at least one NA cow on their operation at some point during the year (USAHA, 2006). Data from Green et al. (2007) revealed that the majority of dairies in the U.S. had at least one NA animal in a year. The USAHA survey data also said that an estimated 0.38 to 0.40% of all beef and dairy cattle nationwide (including all cows and calves) were NA for any reason at some point during the year (USAHA, 2006). Based on the July 1, 2011 U.S. total cattle inventory (USDA, 2011a), this equates to approximately 380,000 to 400,000 NA cattle occurring annually. Data collected during 2001 in both fed and market cattle in Canada, Doonan et al. (2003) reported that 90% of NA cattle were from dairy breeds compared to 10% from beef breeds. Further, few studies have

investigated the leading causes of NA status in market cattle or the actual frequency of incidence on-farm/on-ranch.

Data reported by NAHMS indicated that in 2006, 76% of dairy cows permanently culled from the herd were sold via livestock auction markets (USDA, 2007). Additionally, 67% of cattle evaluated during the NMCBBQA-2007 had an auction market "back tag" present (Hale et al., 2007). These studies clearly indicate that the majority of market cows and bulls are sold immediately before slaughter through livestock auction markets, and thus these facilities play a key role influencing the incidence of NA cattle through the lack of economic and other related signals (i.e. discounts).

The occurrence of NA cattle in the beef supply chain is a major animal welfare issue, since the handling of NA cattle, quality of care provided to them, and food safety concerns have become consumer issues (Stull et al., 2007). Concurrently, tremendous opportunity exists for beef and dairy cattle producers to improve the management, monitoring, and marketing of their market cows and bulls in response to consumer concerns. Unfortunately, cattle producers continue to focus primarily on income from calf sales and milk production, and generally pay little attention to the value and quality of market cows and bulls at harvest, even though clear market signals and demand are present (Ahola et al., 2011).

Since the initiation of the NMCBBQA in 1994, data collection related to quality defects and NA status in market cows and bulls has focused primarily in packing plant holding pens (Roeber et al., 2001; Delmore et al., 2006; Hale et al., 2007). More recent research evaluated the presence of quality defects at livestock auction markets (Ahola et al., 2011), but the incidence of NA cattle was not evaluated. Others have documented that minimal data exists quantifying the incidence of NA cattle at the farm- or ranch-level (Stull et al., 2007). Further, few studies have

investigated the leading causes of NA status in market cattle. One study looked at management practices that affected animal well-being on dairies, including methods of euthanasia, but not NA occurrence or producer behavior or perceptions related to welfare (Fulwider et al., 2007). However, the 2002 Farm Bill requested that the USDA investigate NA cattle including the frequency, causes, and handling practices associated with them in the U.S. (Green et al., 2007). This was the driving factor for researchers from USDA NASS to conduct a survey of U.S. dairies. The authors reported that 26.5% of operations had one or more NA cows in 2004 (NASS, 2005). The report however only shows frequencies of NA occurrence.

As a follow up to the NASS survey, USDA Animal and Plant Health Inspection Service (**APHIS**; Green et al., 2007) did an on-farm questionnaire to determine factors that were associated with NA animals. The authors looked at factors on a dairy that are associated with the occurrence and the recovery of NA animals. They found that operations where pasture was not the predominant surface were more likely to have NA animals (Green et al., 2007). The authors also reported hypocalcemia, cancer, clinical mastitis, digestive conditions, metabolic imbalances, neurological problems, and respiratory disease as causes of NA animals. In regards to recovery, they revealed that the characteristics were consistent with prolonged recumbency in that an animal was more likely to recover if they were NA for 24 h or less (Green et al., 2007). Thus, after 24 h the authors recommend humane euthanasia.

From 1989 to early 1991, several economic reports were published showing how beef had been consistently losing market share with their consumers due to inflation decreasing salaries, price of beef increasing, and economic losses at the packing house (Smith, 2000). Lambert's Lost Opportunities analysis suggested that by decreasing economic losses from "hot-iron branding, carcass/offal condemnations…" and other carcass issues, the price of beef at the

consumer level would lower and result in an increase in market share (Lambert, 1991; Smith, 2000). As a result, the NBQA was created to assess management shortfalls in response to these reports and the economic occurrences (Smith, 2000).

In 1986, the BQA program was created by the National Cattlemen's Association (now the National Cattlemen's Beef Association; **NCBA**) in an attempt to educate producers on management practices that could improve the overall end product they produced (Smith et al., 1997, Smith et al., 2005). The BQA Task Force (**BQATF**) was faced with the daunting task of addressing the growing issue of consumer concern about the safety and wholesomeness of beef (Smith et al., 1997). The National BQA Program was initially patterned after the BQA Program of the Texas Cattle Feeders Association (**TCFA**). The TCFA BQA Program had as its objective "To ensure that all cattle shipped from this feedlot are healthy, wholesome and meet FDA, USDA, and EPA specifications" (Smith et al., 1997). Even back in 1986, the BQATF realized that the industry's defensive efforts at improving the image of beef could not stand alone they knew that the answer "…lies with individual cattlemen who are willing to embark upon some kind of beef safety assurance program; a program which gives added assurance that all animal drugs and production chemicals are used properly and that no unacceptable residues are created" (Smith et al., 1997). Their end goal was "Enhancing the Image of Beef as a Safe and Wholesome Product" (Smith et al., 1997). The struggle to convince the consumer is still present.

The BQA Program is a voluntary quality assurance program funded by a self-imposed tax called the Beef-Checkoff (BQA, 2010). The Beef-Checkoff is a $1/animal tax collected every time an animal is sold (BQA, 2010). The fundamental principles of the BQA Program are: Empowering people…because producers can make a difference; Taking responsibility…because it's our job, no one else's; Working together…because product safety and wholesomeness is

everyone's business (BQA, 2010). BQA provides research-based guidelines for care and husbandry practices, feedstuffs, feed additives and medicines, processing/treatment records, and injectable animal health products (BQA, 2012). The structure of BQA is based off of HACCP, the hazard control point approach: to identify critical hazard control points where potential 'hazards' can be avoided in production ultimately improving profitability by reducing costly production losses and providing a better business plan (BQA, 2012). The National BQA Program ultimately is the quality assurance program meant to give the beef industry a proactive approach to reducing management shortfalls and economic loss while improving the image of beef and consumer confidence without government regulations (Smith et al., 1997).

The adoption and effectiveness of BQA has most often been evaluated by monitoring characteristics at slaughter (i.e. NBQA) or in small local/regional surveys since 1991. Each NBQA has provided an insight to the beef industry to reveal the management practices that fall short of maintaining a high quality standard. Producers must identify their management shortfalls, and identify areas in which educational efforts need to be focused (Smith et al., 2005). In the first audit in 1991, the report revealed that for every fed animal slaughtered in 1991, $279.82 was lost (Lorenzen et al., 1993, Smith et al., 1997). Smith et al. (1997) said that cattlemen could recover $219.25 of the loss by reducing carcass waste, $28.81 by improving beef palatability, $27.26 by improving management practices, and $4.50 by controlling carcass weight (Lorenzen et al., 1993, Smith et al., 1997). The problems found in the 1991 audit needing addressed were (1) attack waste, namely, injection-site lesions in beef carcass sirloins, (2) improve been palatability, especially by increasing tenderness, (3) improve management through reducing bruises, abscesses, and hot iron branding, and (4) control weight (Lorenzen et al., 1993; Smith, 2000). Once identified, the concerted, intensive efforts of the national and state BQA

educational programs resulted in cattle producers moving injection sites from the sirloin to the neck area, as well as a substantial decrease in the amount of fat on beef carcasses (Smith, 2000; Roeber et al., 2001). This resulted in tremendous advancements in beef quality and a substantial decrease in injection-site lesions that was shown as a result in the 1995 NBQA (Roeber et al., 2001).

Issues not improved by the 1995 NBQA were the problems of palatability and management (tough cuts, abscesses, bruises, and brands (Smith, 2000). In the 2000 audit (McKenna et al., 2002), showed that levels of quality defects remained relatively the same with a few exceptions: bruise incidence was the same, but severity was decreased, and carcass weights were increasing dramatically. Results from the 2005 NBQA showed that producers were actively making conscious management decisions to help decrease economic losses as it showed fewer hided brands, fewer *B. indicus* carcasses, and a decrease in bruising suggesting producers were changing how they handled animals (Garcia et al., 2008).

Since the first audit in 1991, the audits have strictly been conducted in processing facilities identifying issues that needed to be addressed in the five years following every NBQA (Boleman et al., 1998). Despite the improvement made there are still management issues affecting beef quality and the focus has been on identifying the end problem and not the source. While these audits have provided a snapshot of a few defects that may occur in cattle production sectors of the industry, they did not directly measure the level of adoption of BQA production practices at the cow/calf, seedstock, or stocker sectors of the cattle industry. There are a few studies that have looked in to this issue, but only the Beef-Cow Management and Dairy surveys completed by NAHMS (USDA, 2009a; USDA, 2009b; USDA, 2009c) have evaluated the adoption of BQA practices on a national scale. The NAHMS 2007 dairy study showed that on all

operations an average of 23.9% of the injections given were SubQ and that overall, 87.0% of respondents said their preferred location for injections was in front of the shoulder (USDA, 2009c). In the 2007 NAHMS beef-cow management data, the authors reported that only 51.3% of their respondents had heard of BQA and only 22.2% of those had attended a training (USDA, 2009a). A study done by Urie and Ahola (2011) surveyed BQA coordinators to acquire insight in to the actual producer buy-in and obtain accurate numbers of producers certified. Urie and Ahola showed that approximately 6.8% of all producers in the country were BQA certified. Glaze and Chahine (2009) looked at the adoption of BQA best management practices on Idaho dairies. The authors showed that 68% of respondents used the neck for IM injections and 80% for SubQ injections (Glaze and Chahine, 2009). The Idaho study also evaluated training programs, producer relationships with a veterinarian, and record keeping methods, all of which are included in BQA guidelines (Glaze and Chahine, 2009; BQA, 2012)

Few studies have looked at the effectiveness of the BQA program and what influences a producer to participate in BQA. There has not been a study to date that has asked the producer's perception, evaluated producer behavior, or what motivates producers to participate in a BQA program. Wulfhorst et al., 2012 attempted to look at producer behavior in regards to the use of feed efficiency data and the implementation of that data to make mating decisions (Wulfhorst et al., 2012). Glaze and Chahine (2009) asked respondents on a scale of 0 (low) – 4 (high) how important BQA was to their operation and the effect that dairy animals have on the industry and reported that dairies ranked the importance of BQA on their operation as a 2.6 and dairy animals effect a 2.5. Fulwider et al. (2007) looked at management practices of dairies in the North Central and Northeastern U.S. such as dehorning, tail-docking, euthanasia, and also asked respondents about animal welfare and how they felt about animal well-being had changed from

previous years. Beyond this data, there are few studies that have looked at producer behavior in regards to the use of best management practices and how they affect end product beef quality.

With these concerns a present issue in the beef cattle industry, the objectives of this thesis were to address the concern of NA animals by looking at the problem in the California beef and dairy industries, conduct and participate in the 2011 NBQA to address the issue of producer buy-in of the BQA program, and to attempt to identify factors that influence a producer to participate in the BQA program.

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# CHAPTER II

## Evaluation of the Incidence and Causes for the Occurrence of Disabled or Non-Ambulatory Cattle within the California Beef and Dairy Industries[1]

## INTRODUCTION

According to USDA (2011b) during the 2010 calendar year, 3.6 million beef cows, 2.8 million dairy cows, and 622,000 bulls were harvested in the U.S. Combined, these animals made up 20.9% of all cattle harvested. Cull cows and bulls (commonly referred to as "market" cows and bulls) represent an important part of the total beef supply since they are widely used to supply beef to consumers via retail and food service outlets (NCBA, 1999.)

The existence of non-ambulatory (**NA**) cattle in the U.S., or those that have the potential to become NA if subjected to a stressor (i.e. long-distance transport to slaughter), has become an animal welfare concern since the handling, quality of care provided, and food safety concerns have become consumer issues (Stull et al., 2007). During the National Market Cow and Bull Beef Quality Audit (**NMCBBQA**) 2007, "animal welfare" issues and "condemnation rates of downers prior to slaughter" were both included on the list of "Top 10 Quality Challenges" that faced the market cow and bull beef industry from 1999 to 2007, based on interviews with packing plant management and USDA FSIS personnel (Hale et al., 2007).

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Based on United States Animal Health Association (**USAHA**) survey data collected during 2003 and 2004, an estimated 0.38 to 0.40% of all beef and dairy cattle nationwide (including all cows and calves) were NA for any reason at some point during the year (USAHA, 2006). Based on the July 1, 2011 U.S. total cattle inventory (USDA, 2011a), this equates to approximately 380,000 to 400,000 NA cattle occurring annually. Further, few studies have investigated the leading causes of NA status in market cattle.

Therefore, the objectives of this study were to: 1) characterize how California dairy and beef operations currently market their cull cows and bulls, 2) identify characteristics which producers believe are key contributors to cows and bulls becoming disabled or NA, and 3) provide information to support future producer education efforts aimed at preventing animals from becoming disabled or NA.

## MATERIALS AND METHODS

In early 2011, 9,778 surveys were mailed to California beef and dairy producers using the California Beef Council's database. The survey instrument included 29 questions intended to evaluate beef and dairy producer characteristics, incidence of NA cattle on-farm or on-ranch, management and marketing practices utilized for market cows and bulls, and likely reasons animals become NA. Identical surveys were also available on-line (https://www.surveymonkey.com/s/CaliforniaBeefandDairyCullingSurvey) and via a printed survey that was distributed at 2 cattle producer meetings (California Cattlemen's Association and California Farm Bureau Federation). All survey responses were anonymous. Producers were

asked to complete the survey to the best of their knowledge, including providing estimates. On-line and mailed survey responses were accepted through July 2011.

Only responses in which the producer indicated they were in the cow/calf (beef), seedstock (beef), or dairy segment of the beef industry were included in the data analysis and results. Respondents who indicated they operated a calf ranch, feedlot, or had no cattle operation were removed from the dataset. Also, producers who operated in multiple industry segments (e.g. cow/calf and dairy) were asked to complete 2 surveys – one on behalf of each entity.

*Statistical analyses*. Survey data were compiled, incidence rates were determined using Microsoft Excel, and data were analyzed via t-tests and Chi-Square of SAS (SAS Institute Inc., Cary, NC). Raw incidence rates (raw percentages) are reported, and comparisons were made only within beef respondents or dairy respondents, but not across producer types.

## RESULTS AND DISCUSSION

Completed surveys were received from 446 producers (n = 403 beef, n = 43 dairy). The overall response rate for the mailed portion of the survey was 3.9%. The primary source of completed surveys was via mailing (86.1%), followed by completion at face-to-face producer meetings (11.9%) and on-line (2.0%). Data including respondent age and highest level of education completed by the respondent are included in Table 2.1. The mean age (± SD) for survey respondents was 62 ± 12.3 yr for beef cattle producers and 55 ± 13.9 yr for dairy producers. Some education beyond high school, possibly including completion of a bachelor's or advanced degree, was completed by 88.9% of beef cattle producers and 78.6% of dairy producers.

As seen in Table 2.2, 22.4% of beef cow operators had fewer than 50 cows; however, 39.9% had at least 200 cows. Almost 1% of beef survey respondents had 3,000 or more cows. In contrast, 63.6% of dairy operations had 500 cows or more, which included 5% with at least 5,000 cows. As would be expected, dairy cow producers had larger cow inventories than beef cow operators among survey respondents. Among beef cattle producers that responded to the survey, almost two-thirds had fewer than 10 bulls while 11.2% had at least 30 bulls (Table 2.3). In contrast, about one-third of dairy producers had at least 20 bulls, and 5% of respondents had 50 or more bulls. These data are consistent with beef and dairy cow inventory distributions observed in the current survey, where dairy producers had larger cow inventories vs. beef cattle producers.

When asked "What is the primary method of marketing for your cull/market cows and bulls", both beef and dairy cattle survey respondents clearly indicated that a livestock auction market was used more than any other option ($P < 0.05$; Table 2.4). And, the direct sale of market cows and bulls to a beef packer was the second most common outlet ($P < 0.05$) among both beef and dairy cattle survey respondents. Beef cattle operators used order buyers and other methods at a greater rate ($P < 0.05$) than buying stations; however, dairy operators used buying stations, order buyers, and other options at the same level. Consistent with our results, dairy survey data collected in 2006 and reported by NAHMS (USDA, 2007) indicated that 76% of dairy cows permanently culled from the herd were sold via livestock auction markets. Additionally, 67% of cattle evaluated during the NMCBBQA in 2007 had an auction market "back tag" present (Hale et al., 2007). These studies clearly indicate that the majority of market cows and bulls are sold immediately before slaughter through livestock auction markets, and thus these facilities play a key role influencing the incidence of NA cattle through economic related

signals. Thus, educational efforts aimed at reducing NA animal incidence should be focused on the relationship between cattle producers and livestock market owners. More recent research evaluated the presence of quality defects at livestock auction markets (Ahola et al., 2011), but the incidence of NA cattle was not evaluated. Others have documented that minimal data exist to quantify the incidence of NA cattle at the farm- or ranch-level (Stull et al., 2007).

The survey respondent (person who actually completed the survey) made the decision to market/cull a mature cow or bull among the majority of beef and dairy cattle operations (Table 2.5). Employees, family members, and other personnel made that decision on some operations, but in a fairly small number of cases among beef (less than 14% of the time) and dairy (less than 19% of the time) cattle respondents. It is clear that educating the owner and/or manager of a cattle operation about avoiding sending potentially NA cattle into the marketplace should be the highest priority.

As seen in Table 2.6, 10.8% of beef cows and 19.0% of beef bulls on survey respondents' inventories were culled annually. In contrast, dairy respondents culled 33.1 and 37.2% of their cow and bull inventories annually, respectively. Previously-published estimates for dairy cow culling rates range from 29 to 38% (Smith et al., 1994; Hadley et al., 2006). Due to the relatively large culling rate of cows in the dairy industry, educational efforts should also focus on dairy producers in order to prevent NA cows.

The culling rate for dairy bulls was numerically the highest of any class of cattle listed in Table 2.6; however, based on the widespread use of AI in the dairy industry and the relatively small number of dairy bulls used, more impact can be achieved by focusing on dairy cow management. In contrast, the majority of beef cattle producers do not use AI (78.6%; Table 2.7) resulting in a larger inventory and higher culling rate. In addition to their aggressive nature, all

these factors may contribute to injuries and likelihood of becoming NA. It appears that educational efforts among beef cattle producers should focus heavily on beef bulls.

When asked to estimate the percentage of culls sold by survey respondents that went directly to slaughter (vs. being purchased by another producer), both beef and dairy cattle producers indicated that the majority of their cows (83.1 to 78.2 %) and bulls (80.2 to 74.5 %) went straight to slaughter (beef and dairy, respectively; Table 2.8). Although estimates of incidences were not compared statistically between sexes or operation types, the largest range between mean respondent estimates was less than 10 percentage points overall (83.1% for beef cows vs. 74.5% for dairy bulls). Consistent with results from the current study, survey data from NAHMS (USDA, 1996) indicated that 84.9% of operations sent market dairy cows to a market/auction/stockyard after culling. The authors also reported that the direct sale to packing plants involved 26.4% of all operations utilizing this method for cull dairy cows.

Surveyed producers were asked to indicate the rate of euthanasia on their operation (i.e. number of cows and bulls euthanized annually on-farm or on-ranch as a percent of annual inventory), which ranged from 0.2 (dairy) to 0.7% (beef) for bulls and 1.2 (beef) to 2.1% (dairy) for cows (Table 2.9). Although not statistically compared, the rate of bull euthanasia was numerically lower than cow euthanasia among both beef and dairy cattle respondents.

To our knowledge, this was the first estimate of on-farm or on-ranch euthanasia rates within the beef and dairy cattle industries. The existence of on-farm and on-ranch euthanasia, albeit at a low rate according to our survey, suggests that some producers are actively working to avoid NA problems in the marketplace by euthanizing cattle instead of selling them into the marketplace.

Consistent with euthanasia rates, numerically more cows died of natural causes (1.3 and 3.3%, beef and dairy cattle, respectively) than bulls (0.8 and 0.5%, beef and dairy cattle, respectively; Table 2.10). Although not statistically compared, a higher number of dairy cows died of natural causes compared to beef cows. Due to the relatively high rate of culling, on-farm euthanasia, and on-farm deaths within the dairy industry, it's logical to assume that there is a greater likelihood for NA cows to come from dairy operations rather than beef cattle operations. Therefore, focusing Beef Quality Assurance (**BQA**) educational materials and efforts toward dairy producers to highlight factors that contribute to NA status would have the largest amount of impact on the industry, or rather collaborating with quality assurances already established in the dairy industry such as, the Milk and Dairy Beef Quality Assurance center (DQA Center, 2012). However, in 1996 only 10.6% of dairies actually participate in this program (USDA, 1996).

Interestingly, the rate of participation in BQA programs was numerically similar among beef and dairy cattle respondents (Table 2.11). However, a greater ($P < 0.05$) number of beef cattle operations indicated that they participated in BQA compared to not participating. Among dairy respondents, an equal number of producers participated in BQA as did not participate in BQA. Participation in BQA among the survey respondents was higher than rates reported previously among beef cattle producers (62.5% of beef respondents, 58.1% of dairy respondents). Perry et al., (2012) reported that 42.6% of all respondents were BQA certified. When surveyed about their knowledge of BQA, 51.3% of beef cow/calf respondents had heard of BQA (USDA, 2009) but only 22.2% of those who had heard of BQA had attended a BQA meeting or training session. The authors also reported that 57.2% of producers who attended a meeting were BQA Certified. In a dairy survey from NAHMS about half (47.3%) of all dairies

participated in any type of quality assurance program in 2006. This included any quality assurance programs provided by local milk cooperatives or processor supported (USDA, 2007). A study done at Colorado State showed that ultimately 6.8% of all producers were actually BQA Certified based on BQA Coordinator responses (Urie and Ahola, 2011).

Operations in which the survey respondent indicated they did not make culling decisions (which included 19.4 and 35.2% of beef and dairy cattle operations, respectively; Table 2.6) were asked if they conduct on-farm or on-ranch training to guide decisions on whether a cull cow or bull should be marketed or euthanized on-farm. Of those operations, no training was conducted by the majority (71.4%) of beef cattle producers and 51.4% of dairy operations (Table 2.12). Although most culling decisions are made at the owner- or manager-level, it's clear that when the owner or manager is not involved in a culling decision, personnel making that decision most likely lack adequate training and decision-making necessary to avoid an animal becoming NA in the marketplace.

Beef and dairy cattle producers were asked to prioritize factors they consider when deciding to market a cull cow or bull by ranking a list of criteria provided to them (Tables 2.13 and 2.14). Pregnancy status (i.e. open or late bred) was of high priority among three-quarters of beef cattle producers, and higher ($P < 0.05$) priority than any other factors. Two-thirds (66.5%) of producers said age (including the lack of adequate teeth) and about half (52.5%) said injury or illness were high priorities. Breed type (or hide color) and loss of production were indicated as high priorities by only about one-third (37.5 and 35.3%, respectively) of respondents. Traits generally considered of low priority among beef cow producers included inadequate feed availability (85.5%), calf performance or size (62.8% low), and current market price (59.3% low).

In contrast, the vast majority of dairy respondents indicated that loss of production (88.4%), pregnancy status (88.4%), and injury/illness (74.4%) were all of high priority, and higher ($P < 0.05$) than other factors (Table 2.14). In comparison, Hadley et al. (2006) reported causes for culling dairy cows to be primarily health reasons (including 79.5% of cows), which generally included health-related factors such as mastitis, injury, disease, and reproduction. In the current study, it is clear that a number of traits were of minimal (i.e. low) priority among dairy producers, likely due to the fact that they are not economically-relevant to dairy production (or are not considered problematic for dairy producers). These traits included breed type, feed availability, disposition, and age of the cow, as well as calf performance.

These results clearly indicated traits of most economic importance to beef and dairy cattle operations, and they provided insight into how producers make culling decisions. It should be noted that several traits were not related, or did not contribute, to the incidence of an animal becoming NA (i.e. breed type, calf performance, disposition, pregnancy status, etc.). However, several traits (i.e. age, injury/illness, etc.) were directly related, indicating the need for producers to consider them when making culling decisions.

In addition to evaluating how producers prioritized general culling criteria, our survey also documented if producers considered certain additional traits prior to determining if an animal has the potential to even enter the marketplace in the first place (i.e. cleared drug withdrawal, strong enough to tolerate pre-slaughter long-distance transport, etc.). The 2 most common criteria ($P < 0.05$) considered by both beef and dairy cattle operations when determining to market a cull cow or bull were “drug withdrawal clearance” and “soundness for transport” (Table 2.15). However, 18.0% of beef cattle producers and 9.3% of dairy producers did not consider an animal’s drug withdrawal status when determining if it could be marketed,

suggesting major implications with food safety and drug residue problems. Further, 22.5% of beef cattle respondents and 16.3% of dairy respondents did not indicate that soundness for transport was considered prior to sending a cull animal into the marketplace. Granted, it should be noted that every item on the list of criteria provided in the survey was considered by at least 50% of respondents. However, numerous criteria directly related to an animal's well-being, and possibly its likelihood of becoming NA, were not considered by a large number of survey respondents, including body condition and cancer eye, which were not considered by many beef (26.5 and 32.5%, respectively) and dairy (37.2 and 46.5%, respectively) cattle respondents.

Only about one-third (34.2% and 34.9%) of beef and dairy cattle producers, respectively, used some type of objective or subjective scoring system prior to sending a cull cow or bull into the marketplace (Table 2.16). Clear evaluation systems have been created in recent years (e.g. body condition score, locomotion score, etc.) in an attempt to reduce the marketing of cull animals that should not be placed into the marketplace. Although, it appears that most producers are not utilizing these readily-available scoring systems. The NAHMS (USDA, 2009) survey of beef cattle producers showed that only 14.3% of respondents used the BCS system.

A fairly large number of survey respondents indicated that in the past, animal-related factors were present on their operations which may have made an animal unfit to enter the marketplace. Beef cattle respondents indicated the presence of cows or bulls that were ill or injured (46.0%), had severe cancer eye (42.0%), or were severely lame (35.3%; Table 2.17). About one quarter (23.0%) of beef cattle producers indicated the presence of animals that had not cleared drug withdrawal. Only 25.0% of beef cattle producers indicated that they did not have any problems present previously. Numerically higher incidence rates were reported among dairy respondents, in which over two-thirds of producers had cows or bulls that were ill or injured

(72.1%), did not clear drug withdrawal time (69.8%), or were severely lame (67.4%). Only 11.6% of dairy respondents had no problems present previously. Factors shown to contribute to the incidence of NA status or food safety issues (i.e. violative drug withdrawals) are still occurring on beef and dairy cattle operations. Thus, efforts to assist producers in determining which of these factors contributes most to problems in the marketplace are needed.

Survey respondents were asked about their willingness to consider on-farm or on-ranch euthanasia, rather than sending an animal into the marketplace, if one of the characteristics in Table 2.17 were present in one of their animals. In response, the vast majority (92.1 and 88.1% of beef and dairy cattle respondents) indicated their willingness to use euthanasia (Table 2.18). Conversely, 1 in 13 beef cattle producers and 1 in 8 dairy producers responded that they would not consider euthanasia as an alternative to marketing an animal.

Among respondents who indicated that they would consider on-farm or on-ranch euthanasia (i.e. those that responded with "yes" in Table 2.18), the method most commonly used ($P < 0.05$) by 76.2% of beef cattle and 78.0% of dairy producers was a gunshot (Table 2.19). The next most common options included euthanasia by a licensed veterinarian (by 17.1% of dairies and 11.5% of beef cattle operators) and gunshot with bleed out (9.9% of beef cattle operators). Use of a captive bolt (with or without bleed out) was limited to 0.5% of beef and 4.9% of dairy cattle operations.

Among respondents who indicated willingness to use euthanasia (a response of "yes" in Table 2.18), more than half (52.3%) of beef cattle operators buried carcasses, which was the primary method ($P < 0.05$) of carcass disposal (Table 2.20). The use of a rendering service was the next most used method among 22.0% of respondents, but numerically lower than the dairy industry, probably due to the rural locations of most cow/calf operations and inability to use

scheduled rendering pickup services. There was minimal use of composting (13.8%), landfills (5.5%), or incineration (4.8%) among beef cattle producers. In contrast, the overwhelming majority (81.4%) of dairy respondents used a rendering service to dispose of carcasses, assumed to be via scheduled daily- or weekly-pickup of dead animals via a contract with a local rendering service. Burial (7.0%) and composting (4.7%) were used minimally, most likely due to local environmental quality laws regulating the use of these options for carcass disposal.

Since the use of a rendering service to dispose of carcasses from euthanized animals is a necessary aspect, particularly by the dairy industry, to reduce the presence of potential NA animals in the marketplace by promoting on-farm euthanasia, efforts may be necessary to increase the ability of rendering services to provide accessible services at an affordable rate. If cattle producers, beef or dairy, are faced with regulations that limit their ability to dispose of carcasses from euthanized animals (either via excessive costs or regulatory policy), the ability or interest of producers to humanely euthanize animals rather than market them could be jeopardized.

Among respondents who indicated that they would not consider on-farm or on-ranch euthanasia (i.e. those that responded with "no" in Table 2.18), the primary factors contributing to this decision were the expense of rendering services and the potential for lost revenue (45.2%) among beef cattle producers (Table 2.21). Many (19.4%) beef cattle respondents also listed limitations for on-farm burial as a major factor, while the lack of available rendering services or ability to euthanize were only listed by less than 10% of producers. In contrast, the dairy industry listed rendering service expense (40.0%), limitations for on-farm burial (40.0%), and lost revenue (20.0%) as reasons for not using on-farm euthanasia. Based on these data, it is clear that producers need access to reasonably-priced rendering services in order for euthanasia use to

become more widespread on cattle operations. Further, educational programs are needed to convey the importance of euthanasia to both beef and dairy cattle producers on NA incidence in the marketplace and its influence on animal welfare, in addition to increasing consumer concerns about animal management and handling methods used during the production of beef. Just as importantly, concerns among beef cattle producers about potential lost revenue must be addressed by focusing producers' attention on addressing industry-wide issues and challenges, rather than strictly their own profitability.

When asked about the incidence of NA animals on their operations, the majority of beef cattle respondents indicated that they have not had an NA cow (65.4%) or bull (84.6%) in the past 12 mo (Table 2.22). However, 18.1 and 10.4% of operations had one NA cow or bull, respectively, while 2 or more NA cows occurred on 16.5% of operations and 2 or more NA bulls were on 4.9% of operations. Dairy operations were similar to beef cattle operations in that few NA bulls have occurred in the last 12 mo (only 14.3% of dairy operations had 1 or more NA bulls). In contrast, 88.1% of dairy operations had more than 3 NA cows in the past 12 mo. Granted, this value is related to the larger mean herd size of dairy respondents in this survey (vs. beef cattle respondents); however, there is evidence suggesting that a very large percentage of dairies in California are dealing with NA cows on a regular basis. Evidence suggests that there is a greater incidence of NA animals among dairy vs. beef breeds, although this comparison has not been directly made in the U.S. Using data collected during 2001 in both fed and market cattle in Canada, Doonan et al. (2003) reported that 90% of NA cattle were from dairy breeds compared to 10% from beef breeds. This further supports the need for educational efforts targeted at helping dairies manage the incidence and management of NA (and potentially NA) cows. Currently, governmental regulation is helping to discourage the presence of NA cattle in the

marketplace via direct regulatory policy (Becker, 2009). However, the occurrence of NA cattle in the industry continues to be a challenge. Few peer-reviewed estimates of NA incidence in the U.S. cattle industry are available. Survey data collected in 2004 by the USAHA (2006) indicated that most (78%) of dairy operations had at least one NA cow on their operation at some point during the year.

One of the most important and unique aspects of this survey included the documentation of factors that beef and dairy cattle producers felt contributed to a cow or bull becoming NA. The intention was to identify critical control points that producers could focus their energy on in order to ultimately reduce NA incidence in their cows and bulls. When provided with a list of possible contributing factors to NA status (Table 2.23), beef and dairy cattle respondents both indicated that calving difficulty was clearly the primary cause of the incidence of NA cows (46.5% beef, 79.1% dairy), and higher ($P < 0.05$) in importance than all other factors. Beef cattle producers indicated that a broken leg (with no known cause) was the second-largest contributor ($P < 0.05$) to NA status. Stifle injury (21.0%) and general weakness (19.5%) were also noted by many beef cattle producers. In contrast, over half (58.1%) of dairy respondents indicated that metabolic diseases (including milk fever, ketosis, etc.), often associated with transition cows (those cows in the physiologically-intense phase transitioning from the third trimester of pregnancy to parturition and early lactation), contributed to NA incidence. In addition, factors including mastitis, general weakness, broken leg (of an unknown cause), hoof problem, and stifle injury were noted by more than 20% of respondents as contributing to NA status.

In bulls, beef cattle respondents indicated that broken leg (of a known cause, assumed to be fighting with other bulls) was the primary cause ($P < 0.05$) of NA status in beef bulls. Other

causes indicated by at least 10% of respondents included broken leg (of an unknown cause) and stifle injury. In dairy bulls, respondents indicated several factors, but at very low response rates. Consistent with the fairly small number of dairy bulls on inventory, and the low incidence of NA dairy bulls, these data suggested that causes for dairy bulls to become NA are few.

Limited data are available discussing the causes of the NA condition in cattle; however, a solid review was published by Stull et al. (2007). The authors indicated that dairy cows become NA typically around parturition, with hypocalcemia and dystocia being the primary risk factors, in addition to injuries caused by falling in some cases. Stull et al. (2007) further indicated that the primary reason for beef cows to become NA was due to calving paralysis, which is consistent with results of the current study. Also, the authors indicated that most NA cattle are of dairy origin. Future research investigating this relationship – in terms of what drives animal management, handling, and marketing decisions within each group especially on dairies – is needed in order to further address the incidence of NA cattle in the industry.

Methods and systems used by beef and dairy cattle producers to avoid marketing cull animals that have not met a drug withdrawal period were varied (Table 2.24). As expected, most beef (54.0%) and dairy (69.8%) cattle respondents indicated that hand-written records were used more ($P < 0.05$) than any other system. However, a considerable number of beef (26.8%) and dairy (16.3%) cattle operators depended on their memory to ensure an animal wasn't marketed too early. These numbers are consistent with the Perry et al. (2012) study that indicated that 11.7% of respondents overall "never" tracked withdrawal times with written records. However, interestingly, the percentage of dairy respondents that "never" used written records to track withdrawal times was much lower at 2.9% of respondents (Perry et al., 2012). Further, 11.0 and 11.6% of beef and dairy cattle respondents, respectively, indicated that they did not use drugs

that have withdrawal periods. While possible, this is highly unlikely due to the existence of drug withdrawal regulations associated with most all cattle pharmaceuticals including vaccines and anthelmintics, which are widely used in the cattle industry. It's more likely that producers are unaware of drug withdrawals in some products they are using.

Of most concern, are the 2.0 (beef) and 2.3% (dairy) of respondents who indicated that they did not track drug withdrawal information. Producers who do not have a system in-place to avoid the marketing of animals that have not met drug withdrawal time periods jeopardize the entire beef production industry. Although limited in number, it is clear that additional BQA education focused on these producers is warranted.

In conclusion, data from the current study indicated that producers have an opportunity to use management tools to keep NA cattle from entering in to the market. Further, efforts to reduce NA incidence on-farm or on-ranch should be focused on likely causes of NA status (e.g. dystocia). These data also showed a need for the industry to help producers by emphasizing the tracking of drug withdrawal times to prevent cattle from entering the market too early. There is also a need to promote the concept of euthanasia, including before animals become NA, and to remove barriers to using euthanasia by ensuring access to affordable options for disposal of dead animals. Finally, livestock auction markets can provide the best opportunity for disseminating information to producers about NA cattle.

**Table 2.1.** Means (± SD) and percentages for age and highest level of education completed, respectively, among survey respondents by operation type and education level

| Variable | Operation type | |
|---|---|---|
| | Beef | Dairy |
| Age, yrs | 62.1 ± 12.3 | 54.8 ± 13.1 |
| Highest level of education: | | |
| High school, % | 11.9 ± 33.0 | 21.4 ± 39.1 |
| Some college, % | 32.0 ± 46.7 | 26.2 ± 46.6 |
| Bachelor's degree, % | 36.7 ± 48.3 | 45.2 ± 50.0 |
| Advanced degree, % | 19.4 ± 39.6 | 7.1 ± 24.2 |

**Table 2.2.** Mean (± SD) of respondents and the number of beef and dairy cows that they had on inventory on an annual basis, by operation type and size

| Variable | Mean (± SD) |
|---|---|
| Beef cow operations: | |
| 1 to 49 cows | 22.4 ± 41.7 |
| 50 to 99 cows | 17.8 ± 38.3 |
| 100 to 199 | 19.8 ± 39.9 |
| ≥200 cows | 39.9 ± 49.0 |
| Dairy operations: | |
| <100 cows | 6.8 ± 25.2 |
| 100 to 499 cows | 29.6 ± 45.8 |
| ≥5000 cows | 63.6 ± 49.0 |

**Table 2.3.** Mean (± SD) number of breeding age (i.e. mature) bulls that survey respondents had on inventory on an annual basis, by operation type

| Variable | Mean (± SD) |
|---|---|
| Beef cow operations: | |
| <10 bulls | 63.5 ± 48.8 |
| 10 to 29 bulls | 25.3 ± 43.6 |
| ≥30 bulls | 11.2 ± 31.6 |
| Dairy operations: | |
| <20 bulls | 67.5 ± 50.4 |
| 20 to 49 bulls | 27.5 ± 40.8 |
| ≥50 bulls | 5.0 ± 29.1 |

**Table 2.4.** LSMeans (± SEM) for primary method of marketing cull beef and dairy cows and bulls used by survey respondents, by operation type

| | Operation type | |
|---|---|---|
| Marketing option | Beef | Dairy |
| Livestock auction market | $77.5^{a} \pm 1.66$ | $62.5^{a} \pm 6.37$ |
| Sold direct to harvest facility | $11.7^{b} \pm 1.68$ | $22.9^{b} \pm 6.2$ |
| Buying station | $1.5^{d} \pm 0.65$ | $6.3^{c} \pm 3.46$ |
| Order buyer or private treaty | $4.6^{c} \pm 1.11$ | $4.2^{c} \pm 3.46$ |
| Other | $4.6^{c} \pm 1.11$ | $4.2^{c} \pm 2.86$ |

[a-d]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.5.** LSMeans (±SEM) for the person on the survey respondent's operation who makes the decision to cull a market cow or bull, by operation type

| | Operation type | |
|---|---|---|
| Variable | Beef | Dairy |
| Survey respondent, % | 80.6[a] ± 1.18 | 64.8 [a] ± 5.33 |
| An employee, % | 3.6[c] ± 1.00 | 18.5[b] ± 6.03 |
| A family member, % | 13.6[b] ± 1.82 | 16.7[b] ± 5.81 |
| Other, % | 2.1[c] ± 0.78 | 0.0 [c] ± 0.0 |

[a-c]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.6.** The estimated mean (±SD) percent of each survey respondent's cow and bull inventory culled in the past 12 mo, by operation type[1]

| | Operation type | |
|---|---|---|
| Variable | Beef | Dairy |
| Cow inventory culled, % | 10.8 ± 13.1 | 33.1 ± 15.8 |
| Bull inventory culled, % | 19.0 ± 24.7 | 37.2 ± 31.5 |

[1]Data were not evaluated statistically.

**Table 2.7.** LSMeans (± SEM) of beef and dairy survey respondents that used AI

| | Operation type | |
|---|---|---|
| Response | Beef | Dairy |
| Yes, % | $21.4^{b} \pm 2.05$ | $90.7^{a} \pm 5.44$ |
| No, % | $78.6^{a} \pm 2.05$ | $9.3^{b} \pm 5.44$ |

[a,b]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.8.** The estimated mean (±SD) percent of each survey respondent's cows and bulls that were culled in the past 12 mo that went directly to slaughter, by operation type[1]

| | Operation type | |
|---|---|---|
| Variable | Beef | Dairy |
| Culled cows direct to slaughter, % | 83.1 ± 33.4 | 78.2 ± 34.9 |
| Culled bulls direct to slaughter, % | 80.2 ± 38.1 | 74.5 ± 42.6 |

[1]Data were not evaluated statistically.

**Table 2.9.** The estimated mean (±SD) percent of each survey respondent's cow and bull inventory euthanized on the operation in the past 12 mo, by operation type[1]

| | Operation type | |
|---|---|---|
| Variable | Beef | Dairy |
| Cows, % | 1.2 ± 5.77 | 2.1 ± 1.91 |
| Bulls, % | 0.7 ± 3.65 | 0.2 ± 0.35 |

[1]Data were not evaluated statistically.

**Table 2.10.** Estimated mean (±SD) percent of each survey respondent's cow and bull inventory that died of natural causes on the operation in the past 12 mo, by operation type[1]

| | Operation type | |
|---|---|---|
| Variable | Beef | Dairy |
| Cows, % | 1.3 ± 1.47 | 3.3 ± 2.42 |
| Bulls, % | 0.8 ± 3.39 | 0.5 ± 1.09 |

[1]Data were not evaluated statistically.

**Table 2.11.** LSMeans (±SEM) for rate of participation in Beef Quality Assurance (BQA) Programs among survey respondents, by operation type[1]

| | Operation type | |
|---|---|---|
| Response | Beef | Dairy |
| Yes, % | 62.5[a] ± 2.42 | 58.1[a] ± 7.06 |
| No, % | 37.5[b] ± 2.42 | 41.9[a] ± 7.06 |

[1]Answers are in response to the question "Have you or the person responsible at your operation for culling decisions participated in beef quality assurance educational programs (beef or dairy)?"

[a,b]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.12.** LSMeans (±SEM) percentage of survey respondents that use on-farm or on-ranch training to guide marketing and euthanasia decisions on the operation, among operations where the survey respondent did not make the culling decisions, by operation type[1]

| | Operation type | |
|---|---|---|
| Response | Beef | Dairy |
| Yes, % | 28.6[b] ± 2.26 | 48.6[a] ± 7.2 |
| No, % | 71.4[a] ± 2.27 | 51.4[a] ± 7.2 |

[1]Answers are in response to the question "If someone besides you makes culling decisions, has there been any on-farm or ranch training to guide decisions on whether a mature cow or bull should be marketed or euthanized on-farm?"
[a,b]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.13.** LSMeans (±SEM) for beef survey respondents' prioritization (high, medium, or low) of criteria considered when deciding to market a cull cow or bull, by operation type[1]

| Variable[1] | Priority | | |
|---|---|---|---|
| | High | Med | Low |
| Loss of production (i.e. milk) | $35.3^{d} \pm 2.39$ | $20.5^{cd} \pm 2.02$ | $44.3^{c} \pm 2.49$ |
| Not pregnant or late bred | $75.3^{a} \pm 2.16$ | $9.8^{e} \pm 1.49$ | $15.0^{f} \pm 1.79$ |
| Age and(or) inadequate teeth | $66.5^{b} \pm 2.37$ | $16.5^{d} \pm 1.86$ | $17.0^{f} \pm 1.88$ |
| Injury and(or) illness | $52.5^{c} \pm 2.50$ | $19.0^{cd} \pm 1.97$ | $28.5^{e} \pm 2.26$ |
| Current market price | $15.0^{f} \pm 1.79$ | $22.3^{bc} \pm 2.08$ | $62.8^{b} \pm 2.42$ |
| Calf performance, including size | $26.3^{e} \pm 2.21$ | $37.3^{a} \pm 2.42$ | $36.5^{d} \pm 2.41$ |
| Disposition | $37.5^{d} \pm 2.43$ | $27.0^{b} \pm 2.23$ | $35.5^{d} \pm 2.40$ |
| Breed type or hide color | $5.5^{g} \pm 1.15$ | $8.8^{e} \pm 1.42$ | $85.5^{a} \pm 1.75$ |
| Inadequate feed available | $18.3^{f} \pm 1.94$ | $19.3^{cd} \pm 1.98$ | $62.5^{b} \pm 2.43$ |

[1]Survey respondents were allowed to mark more than one variable as high, medium, or low priority

[a-f]For beef, means in the same column without a common superscript differ ($P < 0.05$).

**Table 2.14.** LSMeans (±SEM) for dairy survey respondents' prioritization (high, medium, or low) of criteria considered when deciding to market a cull cow or bull, by operation type[1]

| Variable[1] | Priority | | |
|---|---|---|---|
| | High | Med | Low |
| Loss of production (i.e. milk) | 88.4$^{a}$ ± 5.69 | 7.0$^{d}$ ± 4.03 | 4.7$^{f}$ ± 4.46 |
| Not pregnant or late bred | 88.4$^{a}$ ± 5.44 | 7.0$^{d}$ ± 4.46 | 4.7$^{f}$ ± 3.54 |
| Age and(or) inadequate teeth | 7.0$^{bc}$ ± 4.46 | 39.5$^{ab}$ ± 7.13 | 53.5$^{d}$ ± 7.29 |
| Injury and(or) illness | 74.4$^{a}$ ± 6.32 | 11.6$^{cd}$ ± 4.46 | 14.0$^{f}$ ± 5.15 |
| Current market price | 16.3$^{b}$ ± 5.15 | 51.2$^{a}$ ± 7.29 | 32.6$^{e}$ ± 7.06 |
| Calf performance, including size | 4.7$^{bc}$ ± 2.91 | 20.9$^{bc}$ ± 5.92 | 74.4$^{bc}$ ± 6.32 |
| Disposition | 4.7$^{bc}$ ± 4.03 | 34.9$^{b}$ ± 6.97 | 60.5$^{cd}$ ± 7.23 |
| Breed type or hide color | 2.3$^{c}$ ± 2.91 | 4.7$^{d}$ ± 3.54 | 93.0$^{a}$ ± 4.46 |
| Inadequate feed available | 2.3$^{c}$ ± 3.54 | 11.6$^{cd}$ ± 4.82 | 86.0$^{ab}$ ± 5.69 |
| Other | 7.0$^{bc}$ ± 4.03 | 0.0$^{d}$ ± 0.0 | 93.0$^{a}$ ± 4.03 |

[1]Survey respondents were allowed to mark more than one variable as high, medium, or low priority

[a-f]For dairy, means in the same column without a common superscript differ ($P < 0.05$).

**Table 2.15.** LSMeans (±SEM) for criteria typically considered by survey respondents when determining if a cull cow or bull has the potential to enter the marketplace, by operation type[1]

| | Operation type | |
|---|---|---|
| Criteria[1] | Beef | Dairy |
| Cleared drug withdrawal period | 82.0[a] ± 1.89 | 90.7[a] ± 4.11 |
| Soundness for transport | 78.5[ab] ± 2.03 | 83.7[a] ± 4.91 |
| Market price | 59.0[d] ± 2.46 | 55.8[b] ± 7.33 |
| Body condition | 73.5[bc] ± 2.18 | 62.8[b] ± 6.87 |
| Cancer eye presence/severity | 67.5[c] ± 2.33 | 53.5[b] ± 7.23 |
| Other | 8.3[e] ± 1.39 | 0.0[c] ± 0.0 |

[1]Survey respondents were allowed to mark more than one variable.
[a-f]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.16.** LSMean (±SEM) percentage of survey respondents that use an objective or subjective scoring system to evaluate an animal's fitness to enter the marketplace, by operation type[1]

| | Operation type | |
|---|---|---|
| Response | Beef | Dairy |
| Yes, % | 34.2[b] ± 2.41 | 34.9[a] ± 6.87 |
| No, % | 65.8[a] ± 2.42 | 65.1[b] ± 6.87 |

[1]Answers are in response to the question "Are any objective or subjective scoring systems used to evaluate an animal's fitness to enter the marketplace (e.g. lameness score, body condition score, temperature, etc.)?"
[a,b]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.17.** LSMeans (±SEM) for the factors in cull cows or bulls in the past that a survey respondent felt made the animal unfit to enter the marketplace, by operation type[1,2]

| | Operation type | |
|---|---|---|
| Factors | Beef | Dairy |
| Severe lameness | 35.3[b] ± 2.50 | 67.4[a] ± 6.87 |
| Extremely thin | 23.8[c] ± 2.24 | 30.2[b] ± 6.87 |
| Ill and(or) severely injured | 46.0[a] ± 2.58 | 72.1[a] ± 6.63 |
| Has not cleared drug withdrawal time | 23.0[c] ± 2.21 | 69.8[a] ± 6.87 |
| Severe cancer eye | 42.0[ab] ± 2.56 | 41.9[b] ± 7.23 |
| None | 25.0[c] ± 2.35 | 11.6[c] ± 4.82 |
| Other | 4.5[d] ± 1.10 | 0.0[c] ± 0.0 |

[1]Answers are in response to the question "In the past, have there been any factors present in cull cows/bulls on your operation that might have made an animal unfit to enter the marketplace? (check all that apply)?".
[2]Survey respondents were allowed to mark more than one factor.
[a-d]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.18.** LSMean (±SEM) percent of survey respondents that would consider on-farm or on-ranch euthanasia rather than taking an animal to market, by operation type[1]

| | Operation type | |
|---|---|---|
| Response | Beef | Dairy |
| Yes would consider euthanasia, % | 92.1[a] ± 1.37 | 88.1[a] ± 4.92 |
| No would not consider euthanasia, % | 7.9[b] ± 1.37 | 11.9[b] ± 4.92 |

[1]Answers are in response to the question "If an animal had one of the previously mentioned characteristics, would you consider on-farm or on-ranch euthanasia, rather than sending the animal to market?"

[a,b]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.19.** LSMeans (±SEM) for method of euthanasia used among survey respondents willing to use euthanasia, by operation type

| | Operation type | |
|---|---|---|
| Method | Beef | Dairy |
| Gunshot only | 76.2[a] ± 2.07 | 78.0[a] ± 5.06 |
| Gunshot and bleed out | 9.9[b] ± 1.62 | 0.0[c] ± 0.0 |
| Captive bolt | 0.5[d] ± 0.39 | 4.9[c] ± 3.33 |
| Captive bolt and bleed out | 0.0[d] ± 0.0 | 0.0[c] ± 0.0 |
| Euthanasia by a licensed veterinarian | 11.5[b] ± 1.82 | 17.1[b] ± 5.82 |
| Other | 1.8[d] ± 0.73 | 0.0[c] ± 0.0 |

[a-d]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.20.** LSMeans (±SEM) for method of on-farm or on-ranch carcass disposal among survey respondents that use euthanasia, by operation type[1]

| | Operation type | |
|---|---|---|
| Method[1] | Beef | Dairy |
| Burial | $52.3^{a} \pm 2.61$ | $7.0^{b} \pm 5.06$ |
| Compost | $13.8^{c} \pm 1.92$ | $4.7^{b} \pm 3.33$ |
| Rendering service | $22.0^{b} \pm 2.29$ | $81.4^{a} \pm 5.06$ |
| Landfill | $5.5^{d} \pm 1.28$ | $0.0^{b} \pm 0.0$ |
| Incinerate | $4.8^{d} \pm 1.27$ | $0.0^{b} \pm 0.0$ |
| Other | $0.0^{e} \pm 0.0$ | $0.0^{b} \pm 0.0$ |

[1]Survey respondents were allowed to mark more than one method.
[a-e]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.21.** LSMeans (±SEM) for factors that contributed to that position among survey respondents not willing to consider on-farm or on-ranch euthanasia, by operation type[1]

| Factor[1] | Operation type | |
|---|---|---|
| | Beef | Dairy |
| Lost revenue | 45.2[ab] ± 10.55 | 20.0 ± 24.45 |
| Limitations for on-farm burial | 19.4[b] ± 10.11 | 40.0 ± 24.45 |
| Rendering services too expensive | 48.4[a] ± 10.11 | 40.0 ± 24.45 |
| Rendering services unavailable | 9.7[c] ± 7.83 | 0.0 ± 0.0 |
| No means to euthanize an animal | 9.7[c] ± 7.83 | 0.0 ± 0.0 |
| Other | 0.0[c] ± 0.0 | 0.0 ± 0.0 |

[1]Survey respondents were allowed to mark more than one factor.
[a-c]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

**Table 2.22.** LSMeans (±SEM) percentage of survey respondents with non-ambulatory (NA) animals on their operation in the past 12 mo, by operation type

| | Operation type | | | |
|---|---|---|---|---|
| | Beef | | Dairy | |
| Number of NA animals | Cows | Bulls | Cows | Bulls |
| 0 | $65.4^{a} \pm 2.46$ | $84.6^{a} \pm 1.94$ | $4.8^{b} \pm 3.60$ | $85.7^{a} \pm 6.52$ |
| 1 | $18.1^{b} \pm 1.99$ | $10.4^{b} \pm 1.65$ | $0.0^{b} \pm 2.97$ | $7.1^{b} \pm 5.23$ |
| 2 | $8.8^{c} \pm 1.44$ | $2.6^{c} \pm 0.86$ | $0.0^{b} \pm 0.0$ | $3.6^{b} \pm 3.12$ |
| 3 | $3.2^{d} \pm 0.94$ | $0.6^{d} \pm 0.41$ | $7.1^{b} \pm 4.11$ | $0.0^{b} \pm 0.0$ |
| >3 | $4.5^{d} \pm 1.07$ | $1.7^{cd} \pm 0.70$ | $88.1^{a} \pm 5.80$ | $3.6^{b} \pm 3.12$ |

[a-d]Within a column, means without a common superscript differ ($P < 0.05$).

**Table 2.23.** LSMeans (±SEM) for the most common reasons contributing to the incidence of non-ambulatory cows and bulls on survey respondents' operations in the past 5 yrs, by operation type[1]

| | Operation type | | | |
|---|---|---|---|---|
| | Beef | | Dairy | |
| Reason | Cows | Bulls | Cows | Bulls |
| Mastitis | 5.0$^{e}$ ± 1.22 | n/a | 32.6$^{cd}$ ± 6.63 | n/a |
| Calving difficulty | 46.5$^{a}$ ± 2.56 | n/a | 79.1$^{a}$ ± 6.31 | n/a |
| Metabolic disease (milk fever, ketosis) | 4.0$^{e}$ ± 1.10 | n/a | 58.1$^{b}$ ± 7.29 | n/a |
| Other disease | 12.8$^{d}$ ± 1.85 | 3.0$^{d}$ ± 1.02 | 4.7$^{d}$ ± 2.91 | 0.0$^{a}$ ± 0.0 |
| General weakness (i.e. inadequate body condition) | 19.5$^{c}$ ± 2.17 | 2.3$^{d}$ ± 0.88 | 23.3$^{cd}$ ± 6.48 | 4.7$^{a}$ ± 3.64 |
| Broken leg – unknown cause | 33.8$^{b}$ ± 2.52 | 12.8$^{b}$ ± 1.97 | 34.9$^{c}$ ± 6.97 | 7.0$^{a}$ ± 3.64 |
| Broken leg – known cause | 11.8$^{d}$ ± 1.79 | 27.8$^{a}$ ± 2.58 | 4.7$^{d}$ ± 2.08 | 4.7$^{a}$ ± 3.64 |
| Hoof problem | 13.5$^{d}$ ± 1.89 | 7.3$^{c}$ ± 1.54 | 27.9$^{cd}$ ± 6.48 | 4.7$^{a}$ ± 3.64 |
| Stifle injury | 21.0$^{c}$ ± 2.23 | 12.0$^{d}$ ± 1.92 | 20.9$^{cd}$ ± 5.69 | 0.0$^{a}$ ± 0.0 |
| Other | 11.8$^{d}$ ± 1.79 | 4.8$^{cd}$ ± 1.27 | 16.3$^{d}$ ± 5.69 | 0.0$^{a}$ ± 0.0 |

[1]Survey respondents were allowed to mark more than one reason.
[a-d]Within a column, means without a common superscript differ ($P < 0.05$).

**Table 2.24.** LSMeans (±SEM) for methods and systems used by survey respondents to avoid marketing animals that have not met a drug withdrawal period, by operation type[1]

| | Operation type | |
|---|---|---|
| Method | Beef | Dairy |
| Hand-written records | 54.0[a] ± 2.55 | 69.8[a] ± 6.63 |
| Additional ear tag(s) | 11.0[d] ± 1.65 | 4.7[c] ± 2.91 |
| Leg bands | 0.3[f] ± 0.26 | 27.9[bc] ± 6.63 |
| Computer records | 14.5[cd] ± 1.85 | 37.2[b] ± 6.97 |
| Depend on memory | 26.8[b] ± 2.40 | 16.3[cd] ± 5.43 |
| No drugs used with withdrawals | 11.0[d] ± 1.65 | 11.6[cd] ± 4.82 |
| Withdrawal information not tracked | 2.0[e] ± 0.74 | 2.3[d] ± 2.08 |
| Mark/identify with another method | 16.0[c] ± 1.93 | 14.0[cd] ± 5.15 |

[1]Survey respondents were allowed to mark more than one method.
[a-e]Within beef or dairy, means without a common superscript differ ($P < 0.05$).

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# CHAPTER III

## National Beef Quality Audit – 2011 Phase III: Quality Enhancement by the Seedstock, Cow/calf, and Stocker Sectors[1]

## INTRODUCTION

In 1986, the National Cattlemen's Beef Quality Assurance (**BQA**) Task Force and the BQA Program were formed to address the growing issue of consumer concern about the safety and wholesomeness of beef by educating producers to improve end product quality (Smith et al., 1997). BQA efforts have resulted in tremendous advancements in beef quality, including the reduction of injection site blemishes in the sirloin area of beef carcasses (Roeber et al., 2001).

The adoption and effectiveness of BQA has most often been evaluated by monitoring characteristics at slaughter [i.e. National Beef Quality Audits (**NBQA**)], in processing facilities, or in small local/regional surveys since 1991. Each NBQA has provided an insight to the beef industry to help producers see their management shortfalls, and it has shown areas in which educational efforts need to be focused (Smith et al., 2005). While these audits have provided a snapshot of a few defects that may occur in cattle production sectors of the industry, they did not directly measure the level of adoption of BQA production practices at the cow/calf, seedstock, or stocker sectors of the cattle industry.

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Thus, a national survey that specifically examines producer knowledge and implementation of BQA-related practices in the seedstock, cow/calf, and stocker industry sectors was needed. The objectives of this study were to: 1) determine cattle producer views on "quality" including how they may influence it, 2) quantify the adoption of BQA-related production and management practices being used by cattle producers throughout the beef production industry, 3) develop a benchmark against which to measure BQA adoption at future points-in-time, and 4) provide a foundation from which to direct future educational initiatives for cattlemen to further enhance the safety and quality of beef and improve the competitiveness of beef products with consumers.

## MATERIALS AND METHODS

*Survey Instrument Development.* In order to determine BQA adoption and assess current management practices used among cattle producers across the U.S., a survey instrument consisting of 43 questions was developed. A committee of State BQA Coordinators and BQA educators from across the U.S. was assembled to assist in developing the survey instrument. Surveygizmo (Boulder, CO; www.surveygizmo.com) was the online software system used for developing and delivering this survey.

Cattle producers had access to the survey in an online format at the website www.cattlesurvey.com. And, a printed copy of the survey was also developed for the purpose of obtaining responses at state, regional, and national cattlemen's meetings. Surveys were collected online and in written form from April 2011 to February 2012. In total, 3,755 surveys were collected. Questions in the survey were designed to collect the following information: 1)

biographical information about the respondent (i.e. age, primary source of income, years in the industry, etc.) as well as demographic information that characterized the respondent's type and size of cattle operation, 2) views on "quality", including how it may be influenced, 3) information that quantified the respondent's knowledge of BQA principles and whether the respondent implemented practices consistent with BQA guidelines, and 4) knowledge of, or participation in, the BQA Program, including attending a BQA educational meeting and/or becoming BQA Certified.

The survey contained questions where the respondent, based on their response to a question, was routed to a set of additional questions that asked more specifically about a related area of BQA production practice adoption. As a result, not all respondents answered every survey question.

In addition to the national survey, there were 5 regional pilot projects where additional data collection efforts were focused. These pilot projects addressed more specific segments of the cattle industry. These pilot projects were coordinated by state BQA personnel and included: Pennsylvania (cow/calf and dairy), Southeast U.S. (cow/calf), Minnesota (dairy), Oklahoma (stocker/yearling), and California (dairy). Results from all pilot projects and the nationwide effort were included in the dataset.

*Data analyses.* Means and standard deviation and frequency distributions were determined on a total respondent basis (overall), within industry sectors, and within some demographical categories using the means and frequency procedures in SAS (SAS Institute Inc., Cary, NC). Means and frequencies were based on the total number of respondents answering a specific question. A Chi-square test was used to separate means.

## RESULTS AND DISCUSSION

A total of 3,755 cattle producers completed the survey instrument. Of surveys completed, 2,056 were submitted online and 1,699 surveys were completed using the printed version. The majority of respondents characterized themselves as commercial cow/calf (Table 3.1). In addition, 25.3% of respondents represented themselves as seedstock producers, and 36.8% as a backgrounder/preconditioner or stocker operator. A small percentage (<1%) of respondents were involved in more than one sector of the beef production industry. Sixty-three percent of respondents' primary involvement with the cattle industry was in the commercial cow/calf sector (Table 3.2).

Overall, and in each of the industry sectors, the majority of respondents were intricately involved in the day-to-day activities of their cattle operation, based on the fact that the majority of the respondents (89.2%) characterized themselves either as the owner of the operation or the owner/manager/herdsman (Table 3.3). Of all survey respondents, 34.7% said that their cattle business was their primary source of income. Over two-thirds (68.2%) of responding commercial cow/calf producers said that cattle were not their primary source of income (Table 3.4). These numbers are higher than reported in every area of the country in the 2009 USDA National Animal Health Monitoring Systems' (**NAHMS**) survey (USDA, 2009a). The NAHMS survey indicated that a cow/calf operation was the primary source of income for 24.6% of respondents in the Western United States versus the 31.8% of commercial cow/calf respondents in the current survey.

Overall, and within each industry sector, the vast majority of respondents had worked in the cattle industry for more than 10 years. And, over 50% of responding cattle producers had

more than 25 years of experience in their industry sector (Table 3.5). Cattle producers from 45 states responded to the survey. As a result, the dataset includes responses from different regions of the U.S. and consequently different cattle production systems. Evaluating the characteristics of survey respondents, over one-third of participants of the survey were over 60 years of age, 19.5% were less than 40 years of age, and 84.2% of respondents were male (Tables 3.6 and 3.7).

Tables 3.8, 3.9, and 3.10 include the mean number of cattle on inventory by industry sector, for all classes of cattle. Based on the means and SD, a diversity of operation sizes were represented in this dataset. The median number of cows was 50 for seedstock and 70 for cow/calf respondents. Further, 41.9% of respondents whose primary sector was seedstock had 40 or fewer cows, and 35.4% of commercial cow/calf sector respondents had 40 cows or less.

When producers were asked what their primary method of marketing was, respondents overall, and for the commercial cow/calf, backgrounder/preconditioner, and stocker/yearling operator, most often sold their cattle through a livestock market auction (39.6% overall), followed by selling cattle directly to a feedlot (Table 3.11). Overall, one-fourth of cattle producers that responded to the survey sold cattle through a special sale (i.e. preconditioned, weaned, graded, or special breed calf sale; Table 3.12). This is consistent with the 2009 NAHMS survey in which 90.0% of respondents overall marketed their animals through a sale/auction (USDA, 2009a). In the current study, the second most common method of marketing cattle was directly to another beef operation (11.2% of respondents). In comparison, the 2007 National Market Cow and Bull Beef Quality Audit (**NMCBBQA**) showed that 67% of cattle evaluated had an auction market back tag (Hale et al., 2007).

To characterize respondents' operations, they were first asked if they retained ownership of cattle in the previous calendar year (2010). Overall, almost one-fourth of calves were retained

during 2010 (Table 3.13). As expected, a numerically higher percentage of heifers were retained by respondents who said they were dairy producers than their counterparts in the beef industry (Table 3.14).

In the survey, respondents were asked, "When you hear the term "quality" in relation to the beef industry, what comes to mind?" They were provided with a 5-point scale: "strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; and "strongly disagree" = 5. As seen in Table 15, phrases with the lowest numerical mean were "producing beef that provides safe and wholesome beef" and "raising cattle and calves that are healthy." This indicates that respondents agreed with these statements at the highest rates. And, the phrases with the highest numerical means were "USDA Quality Grade of Choice or Prime" and "producing cattle that allow others to be profitable," which were agreed to at the lowest rates. All phrases had means less than 2.1, both overall and within the industry sectors; therefore, on average, respondents either "strongly agreed" or "agreed" that each term was synonymous with quality. For all phrases, the most frequent response was "strongly agreed." Overall, the most respondents (74.3%; Table 3.16) said they "strongly agreed" that when they think of "quality" in the beef industry the phrase "producing beef that provides safe and wholesome beef" comes to mind, followed closely with 73.2% of respondents that said they "strongly agreed" with the phrase "raising cattle and calves that are healthy". At least half of the respondents "strongly agreed" that every phrase was synonymous with quality in regards to the beef industry.

When asked "in what ways do you intentionally influence 'quality' as a beef producer", on an overall basis, the most common responses were: through "preventative health care (i.e. vaccination program)" and "use of good stockmanship and animal handling skills" (Table 3.17). A similar trend was found in all industry sectors. A high percentage of producers responded

positively to each of the management practices on the list, thus demonstrating that cattle producers perform a host of management practices with the aim to enhance the quality and safety of beef. "Implementation of my state's Beef Quality Assurance (BQA) protocols" was frequently cited (55.7%, overall) as a way in which respondents felt they intentionally influenced the quality of beef. However, it was numerically lower than 6 other options. Only 3.6% of respondents said that they "do not intentionally influence beef quality". Interestingly, 11.5% of dairy respondents responded to this question by saying they do not influence beef quality.

Hale et al. (2007) indicated that as of 2007, limited improvements had been made in addressing quality challenges specific to the market cattle population that were identified in previous NMCBBQA in 1994 and 1999. Data from the current study suggests that there are still a number of producers who do not actively choose to impact the quality of beef they produce, particularly dairy producers. The relative value of market cow and bull carcasses will likely continue to increase based on data collected during the 2007 NMCBBQA which indicated that a higher percentage of cow carcasses were fabricated into higher-priced whole-muscle cuts in 2007 vs. 1999 (Hale et al., 2007). This trend of increasing cow carcass value underscores the need to communicate to beef and dairy producers their critical role in the U.S. beef supply chain.

In several past NBQAs, it has been recommended that a larger percentage of cattle be individually identified. Of those responding to the current survey, 78.3% indicated they used individual tags to keep track of cattle receiving animal health products (Table 3.18). When asked about following/tracking the withdrawal time for animal health products, over 95% of respondents said that they "always" or "usually" verified that they followed the proper withdrawal time (Table 3.19). It should be noted that 2.0% of respondents overall indicated that they "never" verified withdrawal times for animal health products. This shows that there is still

work to be done on drug residue education. The USDA must condemn any carcass with violative residues, resulting in an economic loss to the industry. Further, public concern about residues in meat has long caused consumers to believe that beef may not be as safe and wholesome as other products, ultimately continuing to drive down demand (Cordle, 1988).

One of the main BQA principles is for cattle producers to keep track of the use of animal health products with written records (BQA, 2012). Overall, of those responding to the question that asked respondents "Do you keep track of withdrawal times with written records?", 73.6% of survey respondents said they "always" or "usually" use written records to track animals that have been given an animal health product (Table 3.20). However, it should be noted that 11.7% of respondents (overall) never used written records to track withdrawals. Further, the sector that indicated the use of written records at some level ("always", "usually", or "sometimes") was highest (97.1%) among dairy respondents. In contrast, the highest rate of not tracking withdrawal times with written records occurred among stocker/yearling operators.

Producers were asked what information they collect when tracking animal health products used in cattle with written records (Table 3.21). Of respondents to the question "When an animal health product is given to an animal, which of the following pieces of information are recorded and retained in the operation's records?" overall 48.1% said they collect all information recommended by the BQA program: brand name, route of administration, location of administration, expiration date, and serial/lot numbers on the product packaging.

Another major BQA principle is that cattle producers should have a formal working relationship with a veterinarian – a veterinarian-client-patient relationship (**VCPR**) (BQA, 2012). Almost 9 out of 10 (89.4%) survey respondents said they had a working relationship with a veterinarian, with 87.5% of commercial cow/calf producers having a working relationship with a

veterinarian (Table 3.22). Seventy-four percent of the overall respondents to the question "Do you use any medications other than as directed on a drug product's label, without being directed to by a veterinarian?" indicated that they "never" used an animal health product in a manner other than what was described on the label without a veterinarian's direction (Table 3.23). Following the direction of a veterinarian when making a decision to use a certain animal health product or not is a principle taught by BQA educators (BQA, 2012). Among dairy producers, only 55.6% of respondents indicated that they "never" used a medication off-label.

Injection site management has been a cornerstone issue discussed in BQA trainings from the first NBQA when it was first noticed as an issue (Roeber et al., 2001; BQA, 2012). It is taught that when both intramuscular (**IM**) and subcutaneous (**SubQ**) routes are allowed on the label, the preferred route of administration is SubQ, because this route will reduce the incidence of injection site lesions occurring in the neck (Hale et al., 2007). In compliance with this guideline, 84.2% of respondents in the current study said that their preferred route of administration was SubQ (Table 3.24). This is consistent with the 2009 Beef-cow NAHMS survey data, in which 76.3% of all injections given by survey respondents were given SubQ (USDA, 2009b). In comparison, the 2007 NAHMS dairy survey data showed that on all operations an average of 23.9% of the injections given were SubQ (USDA, 2009c). In addition, cattle producers are taught that the preferred location for injectable products is in the neck area of the animal (i.e. in front of the shoulder; BQA, 2012) to prevent the likelihood of injection-site blemishes in meat products (Roeber et al., 2001; Hale et al., 2007). Overall, 87.0% of respondents said their preferred location for injections was in front of the shoulder (neck; Table 3.25). Dairy respondents had the fewest producers indicating that they preferred to place injections in the neck area (46.4%). Dairy respondents in the current study most often reported

that they preferred to give injections in the neck, but it should be noted that 22.1% preferred to give injections in the lower rear leg. In the 2007 NAHMS dairy survey (USDA, 2009c), the majority of injections were given in the hind leg (45.3%) followed by 34.2% of injections being given in the neck. Interestingly, in the NAHMS data, the smaller operations gave a higher percentage of injections in the hind leg than in the neck versus the bigger operations (USDA, 2009c). In a study by Glaze and Chahine (2009) of dairies in Idaho, 68% of respondents used the neck for IM injections and 80% for SubQ injections.

Another principle taught in BQA trainings is that electric prods should not be used as a primary driving aid because it increases stress when used (Correa et al., 2010). Overall, 98.4% of respondents said that they did not use an electric prod as their primary driving tool. A sorting stick was cited as the most common primary driving tool among all respondents (51.9%; Table 3.26). Several respondents said that they did not use any driving tool when working cattle (15.3%). Forty percent of dairy respondents indicated that no driving tool was used on their operations. Table 3.27 shows that 93.0% of the cattle producers responding to the survey never used an electric prod or used an electric prod on less than 10% of their cattle. This is in compliance with the BQA National Manual (BQA, 2012).

To implement a biosecurity plan on-ranch/on-farm, the BQA program suggests vaccinating to control diseases within herd, keeping written records of this plan and to conduct training to familiarize workers with herd health management (BQA, 2012). Overall, and for every industry sector, over 85% of respondents said that they "always" or "usually" had a routine set of diseases that they vaccinated cattle for in order to prevent future health problems (Table 3.28). When asked whether they had written protocols of health treatments, 31.3% of the overall respondents said they had a written protocol (Table 3.29). For those respondents who had health

protocols (Table 3.30), 97.7% said that they "always" or "usually" followed those health protocols. Overall, and for each industry sector, over half of respondents said that they conducted trainings to familiarize their workers with their operation's health management plan (Table 3.31). Training people at the ranch or operation level is important to make sure that best management practices are used when conducting the day-to-day operations. In the Glaze and Chahine (2009) study, the authors reported that 90% of workers on Idaho dairies were trained.

Vaccinating and training calves to eat hay/grass/grain and drink water immediately after weaning can reduce potential stress on calves (Lalman and Smith, 2002; BQA, 2012). Overall, almost 7 out of 10 respondents said that they vaccinated calves and trained calves to eat and drink out of bunks/buckets at weaning (Table 3.32). Keeping calves past weaning before sending them to another location (such as to a stocker operation or feedlot) has been shown to reduce potential stress on cattle (Lalman and Smith, 2002). Overall, 57.2% of respondents said that they kept calves greater than 40 d before shipping them off of their operation. Of commercial cow/calf operators that responded to the survey, 18.7% said that they shipped calves immediately after weaning (Table 3.33).

Training cattle producers about best management practices is essential at the grassroots level for continued improvement and BQA principles were created to do just that (BQA, 2012). According to survey responses, 77.9% of all respondents had actually attended an educational program that addressed how to avoid beef quality defects, injection site lesions, antibiotic and chemical residues, and other quality shortcomings in cattle and beef products. Less than half (44.4%) of the dairy respondents attended an educational program that addressed quality issues (Table 3.34).

Eight survey questions evaluated BQA educational programs and trainings. With the exception of the dairy industry, consistent percentages are found among each of the industry sectors with regard to BQA educational programs and training. When respondents were asked if they had ever heard of BQA, 86.8% said they had heard of BQA (Table 3.35). Of those respondents that had heard of BQA, 70.9% had attended BQA training or completed an online training (Table 3.36). And, of those taking this type of BQA training, 78.6% of the respondents said that a certificate of completion was offered at the BQA training that they attended (Table 3.37). Of those attending a BQA meeting in which a certificate was offered, 93.3% of the overall respondents said they received the certificate (Table 3.38). In the NAHMS 2009 data, the frequency is much lower with only 51.3% of their respondents having heard of BQA and only 22.2% of those had attended a training (USDA, 2009a). A study done at Colorado State showed that ultimately 6.8% of all producers were actually BQA Certified based on BQA Coordinator responses (Urie and Ahola, 2011).

Based on the total number of overall respondents that answered either "yes" or "no" to the question "Have you ever heard of BQA?", approximately 42.6% of respondents said they had received a certificate of completion after attending a BQA training (based on the number of respondents saying "yes " – the respondent received a certificate after completing BQA training). Of the commercial cow/calf respondents that had attended BQA training and received a BQA certificate after attending, 66.1% responded that they had attended additional BQA-type meetings and 72.3% of those respondents indicated that they believed their BQA certification was still valid (Tables 3.39 and 3.40). Among commercial cow/calf producers that at least attended a BQA-type training, 98.5% of those respondents stated that they "always" or "usually" followed best management practices consistent with BQA on their operation (Table 3.41). The

NAHMS 2007 beef-cow survey asked respondents if they changed their practices after attending a BQA meeting, they showed that about 20% of producers who attend BQA training will change their practices after attending a meeting (USDA, 2009a).

When respondents were asked why they chose to follow best management practices consistent with BQA, overall 87.0% indicated because "it was the right thing to do" and 83.9% responded because "I am committed to continuous improvement on my cattle operation" (Table 3.42). Thirty-five percent responded that they chose to follow best management BQA practices because they received a premium when they sold their cattle. Only 12% indicated that "the buyer of my cattle requires it." The data from the current study implies that there is not enough producer buy-in to create economic signals to encourage participation. This is consistent with the Urie and Ahola study (2011) which showed that producer buy-in was a future challenge for the BQA program.

Follow-up questions asked respondents their reasons for either not getting, or not staying, BQA certified. The reasons why a respondent was once BQA certified, but is no longer certified, were varied (Table 3.43). A common reason why respondents did not continue to stay certified was that certification was not required to participate. Also, 30.8% of the backgrounder/preconditioners said they were no longer certified because they did not have time.

Table 3.44 shows the reasons why respondents that had heard about BQA had not become certified. The most common responses were "buyers were not asking for documentation that BQA procedures were used" (36.7%, overall) and "the meetings weren't convenient or available" (35.5%, overall). To our knowledge, this is the first documentation of reasons why producers participate in BQA. The Urie and Ahola study documented BQA coordinator

perceptions of reasons why BQA programs succeed, where current challenges lie, and areas that will cause future challenges (Urie and Ahola, 2011).

A study by Wulfhorst et al. (2012) that looked at producer behavior in regard to feed efficiency was used as a basis for social science type questions in an attempt to acquire valuable research into why producers do or do not participate in BQA. In order to further characterize respondents that completed the survey, cattle producers were asked to indicate how strongly they agreed (or disagreed) with each of 7 statements. A 5-point scale was used ("strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; and "strongly disagree" = 5; Table 3.45). For overall responses, respondent mean ratings suggested that most of the responses were in the "agree" category (between 1 and 2) for the statements "my hope is to have my children continue farming/ranching on my operation" and "I regularly read articles or attend meetings or programs where new management practices are discussed". Table 3.46 shows the distribution of rankings for each statement, most notable is that 42.2% of all producers said that they "strongly agreed" that they regularly read articles or attend meetings or programs where new management practices are discussed. Also, only 12.2% of survey respondents said that they "wait until I see how a new practice works for others before I adopt it" showing that producers are actively keeping up with new technology and implementing it in hopes of improving their operations.

Industry publications (82.2%) and veterinarians (77.1%) were the most commonly cited source of information by respondents, overall and within each industry sector (Table 3.47). A large percentage of respondents also received information from friends and neighbors, the Internet, extension agents, and producer meetings. In comparison, the 2009 beef-cow management survey from NAHMS showed that the top three sources deemed "very important"

to their cow/calf operation were: veterinarians; Extension service, university, or VoAg instructors; and, other producers (USDA, 2009a).

In order to determine the impact of cattle producers attending a BQA-type education program, the adoption of BQA practices were compared between respondents who, in the survey, responded that they had, or had not ever, attended a BQA-type program ("Have you ever been to, or participated in, an educational program that addressed how to avoid beef quality defects, injection site lesions, antibiotic and chemical residues, and other quality shortcomings in cattle and beef products?"). Table 3.48 shows that adoption of certain BQA practices was higher for respondents who have attended a BQA-type education program. Respondents who attended BQA-type training were more likely ($P < 0.05$) to use individual animal ID, keep written records, have a working relationship with a veterinarian, give injections in the neck area SubQ, and train their workers on the operation in BQA principles.

In conclusion, data from this study suggest that many cattle producers are engaged in best management practices consistent with BQA guidelines and principles on their operations. Producer-level training is a valuable tool to change production practices of cattle producers. Continued educational efforts should increase the adoption of best management practices. Continued development of on-farm/on-ranch educational tools regarding BQA will further enhance the adoption of these principles at the grassroots level.

**Table 3.1.** Distribution of survey respondents by industry sector[1]

| | Sector | | | | | | |
|---|---|---|---|---|---|---|---|
| | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy | Other |
| % of respondents (n = 3,749) | 25.3 | 74.8 | 17.8 | 19.0 | 16.2 | 5.0 | 5.3 |

[1]Survey respondents could express their involvement with multiple sectors by answering more than one sector, thus values do not sum to 100%.

**Table 3.2.** Distribution of survey respondents by primary industry sector in which they were involved

| | | Sector | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Comm cow/calf[1] | Backgr/ precond[2] | Stocker/ yearling | Feedlot | Dairy | Other |
| % of respondents (n = 3,660) | 14.7 | 63.0 | 2.7 | 4.6 | 8.2 | 3.9 | 2.2 | 0.8 |

[1]Commercial cow/calf
[2]Backgrounder/preconditioner

**Table 3.3.** Distribution of survey respondents and their primary role within the operation, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Role | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| Owner | 36.3 | 41.3 | 35.0 | 32.7 | 36.5 | 35.3 | 45.4 |
| M/H[1] | 7.4 | 5.4 | 6.0 | 5.1 | 6.0 | 17.7 | 13.5 |
| O/M/H[2] | 52.9 | 51.8 | 56.9 | 57.1 | 56.3 | 36.7 | 29.1 |
| Hired[3] | 2.8 | 1.1 | 1.9 | 3.1 | 1.2 | 9.7 | 10.6 |
| Contract[4] | 0.6 | 0.4 | 0.3 | 2.0 | 0.0 | 0.7 | 1.4 |

[1]M/H = manager/herdsman.
[2]O/M/H = owner/manager/herdsman.
[3]Hired = hired labor.
[4]Contract = contract labor.

**Table 3.4.** Percentage of survey respondents that agreed that cattle were their primary source of income, overall and by industry sector

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ Preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| % of respondents (n = 3,300) | 34.7 | 26.9 | 31.8 | 44.8 | 37.4 | 54.0 | 70.8 |

**Table 3.5.** Percentage of years of consecutive involvement in the beef industry, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Years | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| 1 to 3 | 3.5 | 3.0 | 3.5 | 2.0 | 1.8 | 4.0 | 7.0 |
| 4 to 10 | 12.6 | 10.1 | 12.6 | 21.4 | 10.7 | 12.7 | 15.5 |
| 11 to 25 | 28.7 | 27.2 | 29.2 | 21.4 | 33.3 | 29.0 | 31.7 |
| 26 to 50 | 44.1 | 48.1 | 43.1 | 42.9 | 44.6 | 50.0 | 38.0 |
| >50 | 11.1 | 11.6 | 11.7 | 12.2 | 9.5 | 4.3 | 7.8 |

**Table 3.6.** Distribution of ages among survey respondents, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Age (yr) | Overall | Seedstock | Comm cow/calf[1] | Backgr/ precond[2] | Stocker/ yearling | Feedlot | Dairy |
| < 20 | 1.6 | 1.9 | 1.1 | 2.1 | 0.0 | 2.0 | 9.9 |
| 20 to 29 | 7.5 | 7.2 | 6.5 | 8.3 | 4.9 | 11.0 | 21.1 |
| 30 to 39 | 10.4 | 10.4 | 9.9 | 9.4 | 9.2 | 11.7 | 14.1 |
| 40 to 49 | 16.1 | 14.0 | 14.9 | 24.0 | 16.6 | 22.4 | 19.7 |
| 50 to 59 | 29.6 | 31.8 | 29.1 | 33.3 | 26.4 | 30.8 | 25.4 |
| > 60 | 34.9 | 34.7 | 38.5 | 22.9 | 42.9 | 22.1 | 9.9 |

[1]Commercial cow/calf
[2]Backgrounder/preconditioner

**Table 3.7.** Percentage of survey respondents by sex, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Sex | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Male | 84.2 | 82.1 | 84.3 | 81.1 | 88.6 | 90.2 | 71.4 |
| Female | 15.8 | 17.9 | 15.7 | 19.0 | 11.5 | 9.8 | 28.6 |

**Table 3.8.** Mean (± SD) number of animals on inventory within the last 12 mo among survey respondents overall, and in the seedstock and commercial cow/calf industry sectors

| | | Sector | |
|---|---|---|---|
| Category of Animals | Overall | Seedstock | Commercial cow/calf |
| Breeding females[1] | 177.4 ± 750.6 | 111.2 ± 172.8 | 191.8 ± 840.3 |
| Calves[2] | 133.7 ± 643.6 | 91.9 ± 169.6 | 142.7 ± 719.2 |
| Cull (market) cows[3] | 20.1 ± 146.9 | 11.3 ± 19.1 | 22.4 ± 165.3 |
| Cull (market) bulls[4] | 2.5 ± 9.1 | 3.1 ± 9.0 | 2.3 ± 9.0 |

[1]Breeding age beef females on inventory.
[2]Number of beef calves on inventory around the time of weaning.
[3]Cull (market) beef cows sold in the previous calendar year (2010).
[4]Cull (market) beef bulls sold in the previous calendar year (2010).

**Table 3.9.** Mean (± SD) number of animals on inventory within the last 12 months for survey respondents overall, and involved in the backgrounding/preconditioning, stocker/yearling, and feedlot sectors

| | | Sector | | |
|---|---|---|---|---|
| No. of animals | Overall | Backgrounder/ Preconditioner | Stocker/ yearling | Feedlot |
| Backgrounded[1] | 946.0 ± 5,605.4 | 697.7 ± 1,550.4 | 309.1 ± 1,107.8 | 1,583.9 ± 8,152.6 |
| Out on pasture[2] | 827.2 ± 4,954.8 | 291.9 ± 672.8 | 496.5 ± 1,015.1 | 1,408.4 ± 7,235.0 |
| In a feedlot[3] | 18,607.2 ± 128,521.1 | 357.6 ± 1421.1 | 128.5 ± 925.2 | 39,863.2 ± 187,732.0 |

[1]Cattle in a backgrounding yard.
[2]Stocker or yearling cattle out on pasture.
[3]Cattle in a feedlot on a finishing diet.

**Table 3.10.** Mean (± SD) number of animals on inventory within the last 12 months for survey respondents involved in the dairy industry

| | | Sector |
|---|---|---|
| No. of Animals | Overall | Dairy |
| Breeding age females[1] | 125.9 ± 471.8 | 130.4 ± 237.1 |
| Heifers[2] | 104.5 ± 263.4 | 116.2 ± 200.1 |
| Dairy bulls or steer calves | 174.2 ± 800.9 | 31.1 ± 121.0 |
| Cull (market) cows sold | 32.3 ± 141.3 | 31.4 ± 68.7 |
| Cull (market) bulls sold | 6.3 ± 22.8 | 8.7 ± 26.4 |

[1]Breeding age dairy females.
[2]Dairy heifers (birth to first calf).

**Table 3.11.** Mean percentage of cattle (± SD), among survey respondents, sold using different marketing methods, overall and by industry sector

| | | Sector (% of cattle) | | | |
|---|---|---|---|---|---|
| Method | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling |
| Consignment/production sale[1] | 6.5 ± 19.0 | 30.1 ± 32.5 | 2.3 ± 11.0 | 1.6 ± 9.2 | 1.3 ± 8.0 |
| Livestock auction market[2] | 39.6 ± 42.2 | 25.3 ± 28.8 | 44.0 ± 43.8 | 35.0 ± 42.0 | 20.2 ± 34.9 |
| Video or satellite[3] | 6.3 ± 20.9 | 3.0 ± 12.9 | 7.8 ± 23.2 | 12.3 ± 28.5 | 0.6 ± 5.7 |
| Direct – feedlot[4] | 26.9 ± 39.8 | 17.1 ± 28.1 | 32.7 ± 43.1 | 31.8 ± 40.2 | 5.8 ± 20.1 |
| Direct – packer[5] | 8.4 ± 25.1 | 2.6 ± 11.0 | 4.0 ± 16.5 | 7.2 ± 24.3 | 56.5 ± 40.1 |
| Direct – consumer[6] | 7.8 ± 22.2 | 13.6 ± 26.5 | 5.6 ± 18.7 | 7.0 ± 23.9 | 14.4 ± 31.9 |
| Other | 2.7 ± 13.9 | 5.1 ± 16.3 | 4.6 ± 20.5 | 2.8 ± 15.9 | 1.4 ± 11.5 |

[1]A seedstock consignment or production sale.
[2]Livestock auction market.
[3]Video, satellite, telephone, or Internet auction.
[4]Direct sale (private treaty) to a feedlot or order buyer.
[5]Direct sale (private treaty) to a packer.
[6]Direct sale (private treaty) to consumers.

**Table 3.12.** Mean percentage (± SD) of survey respondents that sold cattle in a special sale **(**preconditioned, weaned, graded, or special breed calf sale), overall and by industry sector

| | | Sector | | | |
|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling |
| % of respondents (n = 3,653) | 25.1 | 34.5 | 25.9 | 38.1 | 21.0 |

**Table 3.13.** Mean percentage (± SD) of animals retained by survey respondents in 2010, overall and in the seedstock, commercial cow/calf, backgrounding/preconditioning, stocker/yearling, and feedlot sectors

| | | Sector | | | | |
|---|---|---|---|---|---|---|
| Animals retained (%) | Overall | Seedstock | Comm cow/calf[4] | Backgr/ precond[2] | Stocker/ yearling | Feedlot |
| Stockers/ backgrounders[1] | 24.1 ± 39.3 | 16.6 ± 31.9 | 25.1 ± 39.9 | 36.0 ± 44.0 | 48.7 ± 48.1 | 11.3 ± 29.7 |
| Feedlot cattle[2] | 17.8 ± 34.4 | 11.3 ± 24.9 | 12.7 ± 29.7 | 17.2 ± 30.6 | 12.6 ± 31.4 | 69.2 ± 40.4 |
| Repl. heifers[3] | 8.4 ± 21.3 | 11.5 ± 24.8 | 8.7 ± 21.5 | 2.0 ± 8.0 | 5.6 ± 18.8 | 3.3 ± 13.7 |

[1]Beef stocker/backgrounder calves where ownership of calves was retained.
[2]Beef feedlot cattle on a finishing diet where ownership of animals was retained.
[3]Replacement beef heifers developed as a service by a custom heifer developer.
[4] Commercial cow/calf
[5] Backgrounder/preconditioner

**Table 3.14.** Mean percentage (± SD) of male and female animals retained by survey respondents in 2010, overall and in the dairy industry

| | | Sector |
|---|---|---|
| Animals | Overall | Dairy |
| Male calves[1] | 8.4 ± 25.2 | 17.1 ± 34.3 |
| Female calves[2] | 76.6 ± 39.4 | 84.5 ± 32.7 |

[1]Male dairy calves on a calf ranch.
[2]Female dairy calves on a calf ranch.

**Table 3.15.** Mean (± SD) agreement level of survey respondents on a scale of 1 to 5 for the question "When you hear the term "quality" in relation to the beef industry, what comes to mind?"[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Trait | Overall | Seedstock | Comm cow/calf[9] | Backgr/ precond[10] | Stocker/ yearling | Feedlot | Dairy |
| Quality Grade[2] | 1.65 ± 0.8 | 1.66 ± 0.8 | 1.68 ± 0.8 | 1.52 ± 0.7 | 1.52 ± 0.7 | 1.59 ± 0.8 | 1.58 ± 0.7 |
| Eating satisfaction[3] | 1.39 ± 0.6 | 1.34 ± 0.6 | 1.40 ± 0.6 | 1.35 ± 0.5 | 1.37 ± 0.5 | 1.30 ± 0.6 | 1.59 ± 0.7 |
| Safe and wholesome beef[4] | 1.32 ± 0.6 | 1.36 ± 0.6 | 1.31 ± 0.6 | 1.24 ± 0.4 | 1.27 ± 0.6 | 1.27 ± 0.6 | 1.40 ± 0.6 |
| Healthy cattle[5] | 1.34 ± 0.7 | 1.43 ± 0.7 | 1.31 ± 0.6 | 1.26 ± 0.5 | 1.38 ± 0.6 | 1.42 ± 0.7 | 1.42 ± 0.7 |
| Free from defects[6] | 1.46 ± 0.7 | 1.51 ± 0.7 | 1.44 ± 0.7 | 1.40 ± 0.7 | 1.45 ± 0.6 | 1.43 ± 0.7 | 1.66 ± 0.8 |
| Profitable cattle for you[7] | 1.55 ± 0.8 | 1.59 ± 0.8 | 1.50 ± 0.8 | 1.52 ± 0.8 | 1.72 ± 0.9 | 1.68 ± 1.0 | 1.71 ± 1.0 |
| Profitable cattle for others[8] | 1.73 ± 0.9 | 1.57 ± 0.8 | 1.72 ± 0.9 | 1.63 ± 0.8 | 1.99 ± 1.1 | 1.83 ± 1.0 | 1.98 ± 1.1 |

[1]5-point scale: "strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; "strongly disagree" = 5
[2]"USDA Quality Grade of Choice or Prime".
[3]"Producing beef that provides a high level of eating satisfaction to consumers".
[4]"Producing beef that provides safe and wholesome beef".
[5]"Raising cattle and calves that are healthy".
[6]"Ensuring cattle under your care are free from defects (injection site blemishes, bruises, etc.)".
[7]"Producing cattle that are profitable for you".
[8]"Producing cattle that allow others to be profitable".
[9]Commercial cow/calf
[10] Backgrounder/preconditioner

**Table 3.16.** The frequency of responses among survey respondents to the question "When you hear the term "quality" in relation to the beef industry, what comes to mind?" on a scale of 1 to 5, overall combined industry segments

| | Ranking[1] (% of responses) | | | | |
|---|---|---|---|---|---|
| Trait | 1 | 2 | 3 | 4 | 5 |
| USDA Quality Grade[2] | 50.6 | 37.3 | 9.0 | 2.3 | 0.8 |
| Eating satisfaction[3] | 67.5 | 28.3 | 2.9 | 0.7 | 0.6 |
| Safe and wholesome beef[4] | 74.3 | 21.5 | 3.0 | 0.5 | 0.7 |
| Healthy cattle[5] | 73.2 | 21.4 | 3.8 | 0.9 | 0.7 |
| Free from defects[6] | 64.6 | 28.0 | 5.4 | 1.3 | 0.8 |
| Profitable cattle for you[7] | 62.2 | 25.4 | 8.7 | 2.5 | 1.1 |
| Profitable cattle for others[8] | 50.7 | 31.7 | 13.0 | 2.8 | 1.8 |

[1]5-point scale: "strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; "strongly disagree" = 5
[2]"USDA Quality Grade of Choice or Prime".
[3]"Producing beef that provides a high level of eating satisfaction to consumers".
[4]"Producing beef that provides safe and wholesome beef".
[5]"Raising cattle and calves that are healthy".
[6]"Ensuring cattle under your care are free from defects (injection site blemishes, bruises, etc.)".
[7]"Producing cattle that are profitable for you".
[8]"Producing cattle that allow others to be profitable".

**Table 3.17.** Ways in which survey respondents feel they intentionally influence "quality" as a beef producer, overall and by industry sector

| | | Sector (%)[1] | | | | | |
|---|---|---|---|---|---|---|---|
| Method | Overall | Seedstock | Comm cow/calf[11] | Backgr/ precond[12] | Stocker/ yearling | Feedlot | Dairy |
| Genetics[2] | 78.7 | 98.9 | 82.9 | 63.9 | 48.8 | 48.7 | 47.5 |
| Preventative health[3] | 89.1 | 94.2 | 88.4 | 93.8 | 92.2 | 85.9 | 81.3 |
| Animal handling[4] | 92.9 | 94.7 | 92.7 | 95.9 | 97.0 | 93.0 | 81.3 |
| Best mgmt practices[5] | 84.0 | 90.2 | 82.3 | 92.8 | 86.7 | 85.9 | 74.1 |
| Market targets[6] | 50.1 | 61.3 | 47.8 | 61.9 | 55.2 | 58.1 | 19.4 |
| Nutritional program[7] | 85.3 | 92.1 | 83.9 | 90.7 | 87.9 | 90.3 | 72.7 |
| Documentation[8] | 66.2 | 79.3 | 64.9 | 68.0 | 59.5 | 64.4 | 51.1 |
| BQA protocols[9] | 55.7 | 63.4 | 53.0 | 65.0 | 55.8 | 68.1 | 28.1 |
| Do not influence[10] | 3.6 | 1.3 | 3.7 | 3.1 | 4.9 | 2.4 | 11.5 |
| Other | 2.2 | 4.3 | 1.7 | 2.5 | 1.7 | 3.0 | 0.0 |

[1]Overall will not add up to 100% because each answer was analyzed individually and respondent could answer more than one.
[2]"Genetic selection and breeding systems".
[3]"Preventative health care (i.e. vaccination program)".
[4]"Use of good stockmanship and animal handling skills".
[5]"Implementation of best management practices, including how vaccinations and antibiotics are administered".
[6]"Matching management strategies to specific market targets".
[7]"Implementation of a sound nutritional program".
[8]"Documentation of management practices (possibly including age, source, etc.)".
[9]"Implementation of my state's Beef Quality Assurance (BQA) protocols".
[10]"I do not intentionally influence quality".
[11]Commercial cow/calf
[12]Backgrounder/preconditioner

**Table 3.18.** Methods of keeping track of withdrawal times and the percent of survey respondents who utilize them, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Method | Overall | Seedstock | Comm cow/calf[4] | Backgr/ precond[5] | Stocker/ yearling | Feedlot | Dairy |
| Individual ID[1] | 78.3 | 88.8 | 76.9 | 73.4 | 61.9 | 77.9 | 83.2 |
| Animal in a group[2] | 11.0 | 4.3 | 10.8 | 12.8 | 22.5 | 15.5 | 11.7 |
| Tracking groups[3] | 9.1 | 6.6 | 10.6 | 9.6 | 13.8 | 5.5 | 3.7 |
| More than one | 1.6 | 0.4 | 1.7 | 4.3 | 1.9 | 1.0 | 1.5 |

[1]By recording the individual ID of an animal.
[2]By identifying only animals in a group that are treated.
[3]By tracking groups of cattle where individuals within the group were treated.
[4]Commercial cow/calf
[5]Backgrounder/preconditioner

**Table 3.19.** Frequency at which survey respondents verify withdrawal times for animal health products, overall and by industry sector[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Always | 85.8 | 89.9 | 84.4 | 85.3 | 85.5 | 92.3 | 81.0 |
| Usually | 9.8 | 7.8 | 11.0 | 10.5 | 8.4 | 3.7 | 12.0 |
| Sometimes | 2.4 | 1.5 | 2.3 | 1.1 | 4.8 | 2.4 | 5.6 |
| Never | 2.0 | 0.8 | 2.3 | 3.2 | 1.2 | 1.7 | 1.4 |

[1]Results in response to the question, "Does your operation verify that withdrawal times for animal health products (such as antibiotics, vaccines, or dewormers) have been met before cattle are marketed?"

**Table 3.20.** Frequency at which survey respondents keep track of withdrawal times with written records, overall and by industry sector[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Always | 46.7 | 49.4 | 42.4 | 52.2 | 39.9 | 66.6 | 59.3 |
| Usually | 26.9 | 29.5 | 28.0 | 21.7 | 28.8 | 17.4 | 24.3 |
| Sometimes | 14.8 | 13.4 | 15.9 | 19.6 | 12.9 | 10.2 | 13.6 |
| Never | 11.7 | 7.7 | 13.8 | 6.5 | 18.4 | 5.8 | 2.9 |

[1]Results in response to the question, "Do you keep track of drug withdrawal information with written records?"

**Table 3.21.** For survey respondents who answered they always, usually, or sometimes kept written withdrawal records, the percentage of respondents keeping certain types of information when an animal health product was given, overall and by industry sector

| | | Sector (%)[1] | | | | | |
|---|---|---|---|---|---|---|---|
| Information | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Brand name[2] | 94.7 | 95.7 | 93.5 | 91.7 | 92.5 | 97.9 | 97.5 |
| Route of admin[3] | 72.5 | 67.6 | 71.6 | 73.3 | 76.9 | 78.0 | 73.7 |
| Location of admin[4] | 61.8 | 56.5 | 63.6 | 61.4 | 69.4 | 65.4 | 37.0 |
| Expiration date | 52.6 | 51.1 | 55.5 | 64.4 | 45.6 | 48.1 | 28.8 |
| Serial/lot number | 48.1 | 46.2 | 50.9 | 61.4 | 43.3 | 45.6 | 17.6 |
| Other | 11.5 | 11.8 | 12.0 | 8.1 | 14.3 | 9.3 | 9.3 |

[1]Overall will not add up to 100% because each answer was analyzed individually and respondent could answer more than one.
[2]Brand name of product.
[3]Route of administration (subcutaneous, intramuscular, intravenous, topical, etc.)
[4]Location of administration on the animal (neck, hip, etc.)

**Table 3.22.** Percent of survey respondents who had a working relationship with a veterinarian in regard to the use of animal health products, overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| % of respondents (n = 3,683) | 89.4 | 96.8 | 87.5 | 88.8 | 87.4 | 93.0 | 92.3 |

[1]Results in response to the question, "Do you have a working relationship with a veterinarian in regard to the use of animal health products for cattle under your care?"

**Table 3.23.** Frequency distribution of responses regarding the use of medications other than as directed on a drug product's label without being directed by a veterinarian, overall and by industry sector[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| Always | 4.2 | 4.3 | 4.1 | 4.2 | 1.8 | 4.4 | 5.6 |
| Usually | 4.1 | 4.0 | 4.2 | 5.3 | 3.6 | 2.7 | 5.6 |
| Sometimes | 17.5 | 16.5 | 17.9 | 7.4 | 12.0 | 14.1 | 33.1 |
| Never | 74.2 | 75.2 | 73.9 | 83.2 | 82.6 | 78.9 | 55.6 |

[1]Results in response to the question, "Do you use any medications other than as directed on a drug product's label, without being directed to by a veterinarian?"

**Table 3.24.** Percentage of survey respondents, overall and by industry sector, for their preferred route of injection for animal health products

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Route of administration | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| IM[1] | 15.8 | 14.3 | 14.5 | 16.3 | 12.1 | 15.2 | 51.8 |
| SubQ[2] | 84.2 | 85.7 | 85.5 | 83.7 | 87.9 | 84.9 | 48.2 |

[1]IM = intramuscular.
[2]SubQ = subcutaneous.

**Table 3.25.** Percentage of survey respondents by preferred location of administration of animal health products on the animal, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Injection location | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ Yearling | Feedlot | Dairy |
| Top of the hip | 4.9 | 2.6 | 5.2 | 3.2 | 4.9 | 2.7 | 18.6 |
| Lower rear leg | 1.7 | 1.7 | 0.6 | 1.1 | 1.2 | 1.3 | 22.1 |
| Caudal fold[1] | 1.0 | 0.8 | 0.7 | 1.1 | 1.2 | 0.3 | 8.6 |
| Along the topline[2] | 0.7 | 0.6 | 0.7 | 0.0 | 0.0 | 0.7 | 1.4 |
| Under front leg[3] | 1.4 | 0.9 | 1.6 | 2.1 | 1.2 | 0.7 | 0.7 |
| Front of shoulder (neck)[4] | 87.0 | 91.3 | 88.0 | 88.4 | 87.2 | 91.0 | 46.4 |
| Front of shoulder (dewlap region)[5] | 3.3 | 2.1 | 3.3 | 4.2 | 4.3 | 3.3 | 2.1 |

[1]"In the caudal fold (next to tail head)".
[2]"Along the topline, on either side of the backbone".
[3]"Underneath the front leg".
[4]"In front of the shoulder (in the neck)".
[5]"In front of the shoulder (in the dewlap region)".

**Table 3.26.** Percentage of survey respondents by primary driving tool used when working/sorting cattle, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Driving tool | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Electric prod[1] | 1.6 | 0.4 | 1.8 | 2.1 | 1.8 | 1.0 | 4.3 |
| Flag | 6.0 | 3.6 | 6.3 | 5.3 | 10.4 | 7.7 | 2.9 |
| Sorting stick | 51.9 | 53.8 | 54.1 | 43.2 | 45.7 | 49.5 | 37.9 |
| Rattle paddle | 14.7 | 11.7 | 14.5 | 22.1 | 24.4 | 20.7 | 2.9 |
| Cane | 4.6 | 3.2 | 4.8 | 3.2 | 4.3 | 5.4 | 8.6 |
| No driving tools[2] | 15.3 | 21.6 | 12.8 | 20.0 | 9.8 | 10.7 | 40.0 |
| Other | 4.6 | 5.1 | 4.4 | 3.2 | 3.7 | 4.4 | 3.6 |
| Multiple | 1.4 | 0.8 | 1.4 | 1.1 | 0.0 | 0.7 | 0.0 |

[1]Electric prod (e.g. hot shot).
[2]"I don't use any driving tools".

**Table 3.27.** Estimated percentage of cattle among survey respondents in which an electric prod (hot shot) was used as a driving tool in a typical day of working cattle (processing or loading), overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Rate of electric prod use | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Don't use prod[1] | 49.7 | 63.4 | 48.3 | 37.5 | 38.2 | 45.1 | 49.7 |
| <10% of cattle | 43.3 | 34.5 | 44.3 | 44.8 | 50.3 | 47.5 | 45.4 |
| 10 to 49% of cattle | 6.0 | 1.9 | 6.4 | 16.7 | 10.3 | 6.4 | 1.4 |
| 50 to 74% of cattle | 0.9 | 0.2 | 1.0 | 0.0 | 1.2 | 0.3 | 2.8 |
| 75 to 100% of cattle | 0.1 | 0.0 | 0.0 | 1.0 | 0.0 | 0.7 | 0.7 |

[1]"I don't use an electric prod".

**Table 3.28.** Frequency distribution of responses to the question "Do you have a routine set of diseases that you vaccinate your cattle for, and standardized treatments for routine diseases (e.g. pneumonia, foot rot, pinkeye, calf scours, etc.)?", overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Always | 65.4 | 76.8 | 62.5 | 69.5 | 65.1 | 65.3 | 62.0 |
| Usually | 21.8 | 17.7 | 22.7 | 27.4 | 22.9 | 18.9 | 25.4 |
| Sometimes | 7.8 | 3.6 | 8.9 | 2.1 | 9.6 | 8.8 | 8.5 |
| Never | 5.0 | 1.9 | 5.8 | 1.1 | 2.4 | 7.1 | 4.2 |

**Table 3.29.** Percentage of survey respondents who indicated that the cattle health treatment protocols they use were written down, overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of respondents (n = 3,478) | 31.3 | 33.4 | 26.9 | 38.3 | 27.5 | 52.2 | 36.0 |

[1]Results in response to the question, "Is your plan for administering health treatments and protocols in writing?"

**Table 3.30.** Frequency distribution of responses for following standard vaccination and treatment directions (including employees, family, friends, etc.) for their cattle, overall and by industry sector[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Always | 76.5 | 79.8 | 76.4 | 78.7 | 78.0 | 78.6 | 58.5 |
| Usually | 21.2 | 18.7 | 21.5 | 21.3 | 20.8 | 19.3 | 29.6 |
| Sometimes | 1.8 | 0.8 | 1.6 | 0.0 | 1.3 | 1.8 | 8.9 |
| Never | 0.6 | 0.8 | 0.4 | 0.0 | 0.0 | 0.4 | 3.0 |

[1]Results in response to the question, "Does everyone on your operation (including employees, family, friends, etc.) follow your standard vaccination and treatment directions?"

**Table 3.31.** Percentage of survey respondents who conducted periodic training to familiarize others with their health management plan, overall and by industry sector

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of respondents (n = 3,475) | 52.8 | 53.3 | 50.1 | 54.7 | 54.7 | 68.8 | 51.1 |

**Table 3.32.** Weaning management practices used by survey respondents, including getting them accustomed to bunks/waterers and vaccinating, overall and for seedstock and cow/calf sectors

| | | Sector (%) | |
|---|---|---|---|
| Method | Overall | Seedstock | Commercial cow/calf |
| Don't vaccinate or train[1] | 9.3 | 3.2 | 10.7 |
| Only vaccinate[2] | 13.7 | 6.2 | 15.6 |
| Only train to bunks/waterers[3] | 7.2 | 2.6 | 8.4 |
| Vaccinate and train[4] | 69.9 | 88.0 | 65.3 |

[1]"I don't vaccinate or train to bunks/waterers".
[2]"I only vaccinate".
[3]"I only train to bunks/waterers".
[4]"I vaccinate and train to bunks/waterers".

**Table 3.33.** Number of days that survey respondents waited after weaning to ship calves off their operation, overall and for seedstock and cow/calf sectors

| | | Sector (%) | |
|---|---|---|---|
| Days | Overall | Seedstock | Commercial cow/calf |
| Immediately[1] | 15.8 | 4.0 | 18.7 |
| 1 to 5 | 4.1 | 2.5 | 4.4 |
| 6 to 20 | 8.0 | 9.0 | 8.0 |
| 21 to 40 | 15.0 | 18.9 | 14.2 |
| 41 to 60 | 26.2 | 26.5 | 26.3 |
| >60 | 31.0 | 39.2 | 28.4 |

[1]Immediately = shipped same day calves were weaned.

**Table 3.34.** Percentage of survey respondents who had ever been to an educational program that addressed quality shortcomings in cattle and beef products, overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of Respondents (n = 3,671) | 77.9 | 87.6 | 76.8 | 76.8 | 78.3 | 83.1 | 44.4 |

[1]Percentage that responded "yes" they had "been to, or participated in, an educational program that addressed how to avoid beef quality defects, injection site lesions, antibiotic and chemical residues, and other quality shortcomings in cattle and beef."

**Table 3.35.** Percentage of survey respondents who had ever heard of Beef Quality Assurance (BQA), overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of Respondents (n = 3,650) | 86.8 | 95.2 | 85.0 | 92.6 | 87.3 | 91.6 | 72.1 |

[1]Percentage responding "yes" the question, "Have you ever heard of Beef Quality Assurance (BQA)?"

**Table 3.36.** Percentage of survey respondents who had ever attended a Beef Quality Assurance (BQA) meeting or training or completed an online training, overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ Preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of Respondents (n = 3,050) | 70.9 | 73.3 | 69.3 | 70.1 | 73.1 | 84.2 | 36.6 |

[1]Percentage responding "yes" to the question, "Have you ever attended a Beef Quality Assurance meeting or training or completed an on-line training?" Percentage based on the number of respondents who said they had heard of BQA.

**Table 3.37.** Percentage of survey respondents who said that a certificate of completion was offered for attending the BQA meeting, overall and by industry sector[1]

| % of Respondents | Overall | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| No | 9.3 | 8.4 | 10.3 | 11.5 | 3.9 | 6.3 | 17.7 |
| Yes | 78.6 | 77.7 | 78.1 | 82.0 | 78.6 | 84.2 | 64.7 |
| I don't know | 12.2 | 13.9 | 11.6 | 6.6 | 17.5 | 9.5 | 17.7 |

[1]Percentage based on the number of respondents who said they had attended a BQA training or completed training online. (n = 2,132)

**Table 3.38.** Percentage of survey respondents who received a certificate of completion after attending a Beef Quality Assurance (BQA) training, overall and by industry sector[1]

| % of Respondents | Overall | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| No | 3.9 | 4.1 | 4.1 | 2.0 | 7.5 | 1.1 | 13.6 |
| Yes | 93.3 | 92.9 | 93.7 | 96.0 | 85.0 | 97.3 | 81.8 |
| I don't know | 2.8 | 3.0 | 2.2 | 2.0 | 7.5 | 1.6 | 4.6 |

[1]Percentage based on the number of respondents who said they had received a certificate of completion after attending the BQA training. (n = 1,664)

**Table 3.39.** Percentage of survey respondents who attended additional Beef Quality Assurance (BQA) meetings and received additional or updated certificates, overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| % of Respondents (n = 1,501) | 67.8 | 65.3 | 66.1 | 77.1 | 73.9 | 73.3 | 72.2 |

[1]Percentage based on the number of respondents who said they had received a certificate of completion after attending the BQA training.

**Table 3.40.** Percentage of survey respondents who indicated that their most recent Beef Quality Assurance (BQA) certificate was still valid (current within the last 3 years), overall and by industry sector[1]

| | | Sector | | | | | |
|---|---|---|---|---|---|---|---|
| % of respondents | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| No | 13.6 | 17.8 | 12.6 | 16.7 | 19.1 | 13.3 | 0.0 |
| Yes | 72.0 | 66.0 | 72.3 | 77.1 | 69.1 | 76.1 | 83.3 |
| I don't know | 14.4 | 16.2 | 15.1 | 6.3 | 11.8 | 10.6 | 16.7 |

[1]Percentage based on the number of respondents who said they had received a certificate of completion after attending the BQA training. (n = 1,532)

**Table 3.41.** Frequency distribution that survey respondents felt they followed best management practices consistent with Beef Quality Assurance (BQA) on their operation, overall and by industry sector [1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Always | 66.5 | 68.1 | 66.1 | 63.9 | 56.0 | 72.7 | 44.1 |
| Usually | 31.9 | 31.1 | 32.4 | 32.8 | 42.0 | 26.5 | 47.1 |
| Sometimes | 1.6 | 0.9 | 1.5 | 3.3 | 2.0 | 0.5 | 8.8 |
| Never | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.5 | 0.0 |

[1]Percentage based on the number of respondents who said they had attended a BQA-type training. (n = 2,129)

**Table 3.42.** Percentage of survey respondents by the reason(s) they chose to follow best management practices consistent with Beef Quality Assurance (BQA), overall and by industry sector[1]

| | | Sector (%)[2] | | | | | |
|---|---|---|---|---|---|---|---|
| Reason | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| The right thing to do[3] | 87.0 | 86.4 | 86.1 | 90.3 | 93.0 | 89.9 | 80.6 |
| Receive a premium[4] | 35.4 | 31.0 | 38.8 | 41.9 | 34.0 | 28.1 | 19.4 |
| Required by buyer[5] | 12.0 | 8.6 | 12.8 | 11.3 | 11.0 | 15.4 | 8.3 |
| Committed to improvement[6] | 83.9 | 83.9 | 85.9 | 82.3 | 80.0 | 79.0 | 75.0 |
| Other | 4.3 | 4.5 | 4.2 | 0.0 | 6.0 | 4.1 | 3.0 |

[1]"Percentage based on the number of respondents who said they had attended a BQA-type training".
[2]Overall will not add up to 100% because each answer was analyzed individually and respondent could answer more than one.
[3]I"It's the right thing to do".
[4]"I receive a premium when I sell my cattle".
[5]"It's required by the buyer of my cattle".
[6]"I am committed to continuous improvement on my cattle operation".

**Table 3.43.** Percentage of survey respondents by the reasons they were Beef Quality Assurance (BQA) certified at one time, but were no longer certified, overall and by industry sector

| | | Sector (%)[1] | | | | | |
|---|---|---|---|---|---|---|---|
| Reason | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Wasn't valuable[2] | 15.5 | 17.3 | 15.3 | 15.4 | 13.8 | 15.4 | 33.3 |
| No financial incentive[3] | 15.5 | 16.4 | 18.1 | 0.0 | 6.9 | 11.5 | 0.0 |
| It's not required[4] | 25.7 | 26.9 | 25.6 | 46.2 | 27.6 | 17.3 | 33.3 |
| I don't have time | 18.2 | 20.2 | 17.3 | 30.8 | 10.3 | 25.0 | 0.0 |
| Costs too much[5] | 12.8 | 14.4 | 12.5 | 15.4 | 13.8 | 11.5 | 0.0 |
| Meetings aren't convenient or available[6] | 2.0 | 2.9 | 2.0 | 0.0 | 3.5 | 1.9 | 0.0 |
| Other | 31.6 | 29.8 | 32.3 | 23.1 | 41.4 | 36.5 | 0.0 |

[1]Overall will not add up to 100% because each answer was analyzed individually and respondent could answer more than one.
[2]"Getting re-certified wasn't valuable to me".
[3]"There is no financial incentive for me to participate".
[4]"It's not required for me to participate".
[5]"It costs too much money".
[6]"The meetings to get re-certified aren't convenient or available".

**Table 3.44.** Among survey respondent that had heard of Beef Quality Assurance (BQA), reasons they were not BQA certified, overall and by industry sector

| | | Sector (%)[1] | | | | | |
|---|---|---|---|---|---|---|---|
| Reason | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| I don't know what BQA is[2] | 13.4 | 11.3 | 13.3 | 14.8 | 16.7 | 12.9 | 17.9 |
| No financial incentive[3] | 23.9 | 25.8 | 23.2 | 25.9 | 21.4 | 25.8 | 28.4 |
| Documentation no asked for[4] | 36.7 | 48.3 | 33.4 | 48.2 | 42.9 | 33.9 | 37.3 |
| Not required to participate[5] | 28.4 | 31.8 | 25.8 | 33.3 | 26.2 | 25.8 | 47.8 |
| I don't have time | 24.8 | 25.2 | 25.5 | 29.6 | 21.4 | 19.4 | 26.9 |
| Costs too much[6] | 5.3 | 6.6 | 4.6 | 3.7 | 4.8 | 3.2 | 11.9 |
| Meetings aren't convenient or available[7] | 34.5 | 33.1 | 36.9 | 25.9 | 33.3 | 29.0 | 25.4 |

[1]Overall will not add up to 100% because each answer was analyzed individually and respondent could answer more than one.
[2]"I don't really know what BQA is".
[3]"There is no financial incentive for me to participate".
[4]"Buyers are not asking for documentation that BQA procedures were used".
[5]"It's not required for me to participate".
[6]"It costs too much money".
[7]"The meetings aren't convenient or available".

**Table 3.45.** Mean (± SD) agreement level of survey respondents on a scale of 1 to 5 for several statements, overall and by industry sector[1]

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Statement | Overall | Seedstock | Comm cow/calf[9] | Backgr/ precond[10] | Stocker/ yearling | Feedlot | Dairy |
| Children continue operation[2] | 1.95 ± 1.1 | 2.00 ± 1.1 | 1.93 ± 1.1 | 2.04 ± 1.1 | 2.17 ± 1.1 | 1.86 ± 1.1 | 1.76 ± 0.9 |
| Profitability[3] | 2.14 ± 0.9 | 2.18 ± 0.9 | 2.17 ± 0.9 | 1.97 ± 0.9 | 2.24 ± 0.8 | 1.92 ± 0.9 | 1.90 ± 0.9 |
| Aggressive adopter [4] | 2.03 ± 0.9 | 1.87 ± 0.8 | 2.08 ± 0.9 | 1.80 ± 0.9 | 1.99 ± 0.8 | 1.95 ± 0.9 | 2.17 ± 0.9 |
| Economically sustainable[5] | 2.06 ± 0.9 | 2.00 ± 0.8 | 2.10 ± 0.9 | 2.03 ± 1.1 | 1.96 ± 0.9 | 1.81 ± 0.8 | 2.18 ± 0.9 |
| Wait to adopt new practices[6] | 2.75 ± 1.1 | 2.92 ± 1.0 | 2.72 ± 1.1 | 2.76 ± 1.1 | 2.66 ± 1.1 | 2.68 ± 1.1 | 2.62 ± 1.0 |
| Regularly read or attend meetings[7] | 1.79 ± 0.8 | 1.71 ± 0.8 | 1.78 ± 0.8 | 1.96 ± 0.9 | 1.67 ± 0.8 | 1.84 ± 0.9 | 1.97 ± 0.9 |
| Extension Educators [8] | 2.17 ± 1.1 | 2.15 ± 1.1 | 2.12 ± 1.1 | 2.30 ± 1.2 | 2.21 ± 1.1 | 2.40 ± 1.2 | 2.42 ± 1.2 |

[1]5-point scale: "strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; "strongly disagree" = 5
[2]"My hope is to have my children continue farming/ranching on my operation".
[3]"Profitability is my greatest concern on my operation".
[4]"I consider myself to be an aggressive adopter of new production practices".
[5]"I consider my current production practices to be economically sustainable".
[6]"I tend to wait until I see how a new practice works for others before I adopt it".
[7]"I regularly read articles or attend meetings or programs where new management practices are discussed".
[8]"I keep in contact with University Extension Educators in my area to stay abreast of new production methods".

[9]Commercial cow/calf
[10]Backgrounder/preconditioner

**Table 3.46.** The frequency of responses among survey respondents by how strongly they agreed/disagreed on a scale of 1 to 5 with each of these statements, overall combined industry segments

| | Ranking[1] (%) | | | | |
|---|---|---|---|---|---|
| Statement | 1 | 2 | 3 | 4 | 5 |
| Hope children continue on my operation [2] | 46.7 | 22.9 | 22.9 | 3.9 | 3.5 |
| Profitability is my greatest concern[3] | 23.6 | 46.9 | 22.4 | 5.9 | 1.2 |
| Aggressive adopter of new practices[4] | 29.1 | 45.4 | 19.7 | 5.0 | 0.8 |
| Economically sustainable[5] | 27.0 | 48.8 | 17.4 | 5.3 | 1.5 |
| Wait to adopt new practices[6] | 12.2 | 32.9 | 28.8 | 20.1 | 6.0 |
| Regularly read or attend meetings on new practices[7] | 42.2 | 42.8 | 10.5 | 3.4 | 1.2 |
| Keep in contact with Extensio Educators[8] | 33.5 | 32.5 | 21.3 | 8.6 | 4.1 |

[1]5-point scale: "strongly agree" = 1; "agree" = 2; "neutral" = 3; "disagree" = 4; "strongly disagree" = 5
[2]"My hope is to have my children continue farming/ranching on my operation".
[3]"Profitability is my greatest concern on my operation".
[4]"I consider myself to be an aggressive adopter of new production practices".
[5]"I consider my current production practices to be economically sustainable".
[6]"I tend to wait until I see how a new practice works for others before I adopt it".
[7]"I regularly read articles or attend meetings or programs where new management practices are discussed".
[8]"I keep in contact with University Extension Educators in my area to stay abreast of new production methods".

**Table 3.47.** Percentage of survey respondents by where they found answers to their questions, overall and by industry sector

| | | Sector (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Source | Overall | Seedstock | Commercial cow/calf | Backgrounder/ preconditioner | Stocker/ yearling | Feedlot | Dairy |
| Friends & neighbors | 47.9 | 39.3 | 50.9 | 37.5 | 45.5 | 43.8 | 52.6 |
| Industry publications[1] | 82.2 | 86.5 | 83.1 | 80.2 | 81.8 | 76.4 | 70.1 |
| Internet[2] | 46.5 | 53.7 | 46.8 | 44.8 | 56.4 | 38.4 | 27.7 |
| Extension Agent[3] | 37.1 | 37.1 | 40.5 | 40.6 | 37.0 | 19.9 | 15.3 |
| Producer meetings[4] | 51.5 | 58.9 | 50.2 | 47.9 | 52.7 | 53.9 | 36.5 |
| Local feed store[5] | 20.4 | 16.0 | 22.7 | 14.6 | 17.0 | 16.5 | 15.3 |
| Veterinarian | 77.1 | 84.8 | 77.0 | 76.0 | 68.5 | 74.4 | 73.0 |

[1]"Industry publications (weekly and monthly cattle newspapers, magazines, and newsletters)".
[2]"On the Internet via a search engine (e.g. Google, Yahoo, etc.)".
[3]"Calling and visiting with the local Extension County Agent".
[4]"Face-to-face producer meetings".
[5]"Employees of the local feed store".

**Table 3.48.** Comparison of the responses from cattle producers who had and had not ever attended a Beef Quality Assurance (BQA)-type training[12]

| Trait | "Yes" Had attended BQA (%) | "No" Had NOT attended BQA (%) |
|---|---|---|
| Always or usually verify withdrawal time[3] | 97.1 | 90.2 |
| Track and verify withdrawal with individual ID[4] | 81.0 | 68.4 |
| Always or usually keep written records for withdrawal[5] | 77.4 | 59.9 |
| Have a working relationship with a veterinarian[6] | 92.8 | 59.9 |
| Preferred route of injection administration is SubQ[7] | 88.3 | 69.2 |
| Preferred location of injections is the neck area[8] | 90.1 | 72.6 |
| Uses electric prod as a primary driving tool[9] | 1.3 | 2.9 |
| Trains workers on the ranch or farm in BQA[10] | 57.9 | 33.2 |
| Ship calves immediately after weaning[11] | 13.6 | 23.6 |

[1]Number of responses indicating "yes" or "no" to the question "Have you attended a BQA-type training?" (yes, n = 2,858; no, n = 813).
[2]All means differ ($P < 0.05$)
[3]Results for this trait in Table 19
[4]Results for this trait in Table 18
[5]Results for this trait in Table 20
[6]Results for this trait in Table 22
[7]Results for this trait in Table 24
[8]Results for this trait in Table 25
[9]Results for this trait in Table 26
[10]Results for this trait in Table 31
[11]Results for this trait in Table 33

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# CHAPTER IV

## Factors That Motivate Cattle Producers to Participate in Beef Quality Assurance[1]

## INTRODUCTION

In 1991, Lambert's Lost Opportunities analysis suggested that by decreasing economic losses from "hot-iron branding, carcass/offal condemnations…" and other carcass issues, the price of beef at the consumer level would lower and result in an increase in market share (Lambert, 1991; Smith, 2000). In response to Lambert's and other similar analyses, the National Beef Quality Audit (**NBQA**) was created to assess management shortfalls (Smith, 2000). Since the first audit in 1991, the audits have strictly been conducted in processing facilities identifying management issues that needed to be addressed in the five years following every NBQA. Up to this point, much of the focus has been on identifying problems, which has been very successful. However, identifying the source of the problem will help create better educational resources for beef producers.

In 1986, the Beef Quality Assurance (**BQA**) program was created by the National Cattlemen's Association (now the National Cattlemen's Beef Association) in an attempt to educate producers on the management practices that would improve the overall end product of the beef they produced (Smith et al., 1997, Smith et al., 2005). However, few studies have

[1] M.V. Perry, J. C. Hadrich, D.L. VanOverbeke, J.K. Ahola

looked at the effectiveness of the BQA program and what influences a producer to participate in BQA. The 2011 NBQA Phase III sought to broaden the scope of the audits to include a survey of producers to look at management practices. However, Perry et al. (2012) studied only the frequencies of each practice and not the factors driving the producer's decision to implement a certain practice. The objective of this study is to use the data from the NBQA and determine farm level factors as reported in the NBQA survey that may have motivated producers to participate in BQA and follow best management practices.

## MATERIALS AND METHODS

*Survey Instrument*. The 2011 NBQA Phase III was available online at www.cattlesurvey.com (SurveyGizmo, Boulder, CO) and at producer meetings and conventions across the United States. Producers were directed to the website through advertising in industry magazines, websites, and association publications. Paper surveys were made available at booths at conventions such as the World Dairy Expo and the National Cattlemen's Beef Association annual convention in Nashville, Tennessee in 2011. In addition to the conventions, producer meetings across the nation handed surveys out during their meetings during 2011 and early 2012. There were also 5 pilot projects chosen in different regions of the country were additional efforts were made to collect surveys in each industry segment. The survey consisted of 43 questions that examined producer characteristics, views about beef quality, use of BQA-related practices, and knowledge of/participation in BQA. Surveys were collected from April 2010 to February 2011. A total of 3,755 surveys were collected.

*Summary Statistics.* The majority of respondents characterized themselves as commercial cow/calf operators. In addition, 25.3% of respondents represented themselves as seedstock producers, and 36.8% as a backgrounder/preconditioner or stocker/yearling operator. A small percentage (<1%) of respondents were involved in more than one sector of the beef cattle industry. Sixty-three percent of respondents' primary involvement with the cattle industry was in the commercial cow/calf sector. Of all survey respondents, 34.7% said that their cattle business was their primary source of income. The vast majority of overall respondents had worked in the cattle industry for more than 10 years with over 50% of responding cattle producers having more than 25 years of experience in their industry sector (Table 4.1).

*Data Analyses.* Regressions were generated using both binary and multinomial logistic regression models in STATA (StataCorp LP, College Station, TX) to predict producers' use of a particular management practice. An alpha level of 0.10 was set to determine significance. In a (binary) logit model, the probability of an event occurring can be expressed as:

(1) $$Y_l^* = X\eta + e_l$$

$$Y_l^* = \begin{cases} 1 \\ 0 \end{cases}$$

where $Y_l$ is a binary variable equal to one if the respondent answered yes, and zero if the respondent answered no to the question, **X** denotes an array of variables that are hypothesized to affect the probability of a positive answer, $\eta$ is a vector of parameters, $e_l$ is the error term, and $l$ indexes survey respondent. A logit model was used instead of a probit model because the distribution is assumed to be non-normal.

For the regressions with the dependent variable as categorical data, a multinomial logit was used. Dummy variables were used to code the dependent variable. For this model, the probability of a respondent answering a certain category would be expressed as:

(1) $$Pr(y_i = j) = \frac{\exp(x_i\beta_j)}{\sum_j^J \exp(x_i\beta_j)}$$

where $Pr(y_i = j)$ is the probability of belonging to group $j$, $x_i$ is a vector of explanatory variables and  are the coefficients, which are estimated using maximum odds estimation.

The probability of the adoption of a particular production practice was predicted using various responses to questions from the 2011 NBQA. The predictor variables used in this model were grouped together into two different groups: farm characteristics and producer characteristics. The explanatory variables and the coding are listed under the appropriate category in Table 4.1.

*Farm characteristics.* Farm characteristics included the respondent's primary source of income (primary source of income), the number of cows on his/her operation (No. of cows), the segment of industry the respondent operated in (primary segment: seedstock, commercial cow/calf, backgrounder/preconditioner, stocker/yearling, feedlot, dairy, other, multiple), and the region on the country where the operation was located (Region: North, West, and South).

*Producer characteristics.* Producer characteristics were age of respondent, gender of the respondent, and the number of years the respondent had been in his/her industry. Also included in producer characteristics was whether the respondent "agreed" or "disagreed" with each of the statements: "Profitability is my greatest concern on my operation", "I consider myself to be an aggressive adopter of new production practices", "I regularly read articles or attend meetings or programs where new management practices are discussed", and "I keep in contact with University Extension Educators in my area to stay abreast of new production methods". Analyses were conducted on the first 'issue' of whether a respondent had heard of BQA or had ever attended a meeting addressing quality issues and then these two 'issues' were added as explanatory variables for the rest of the regression models.

Several questions in the survey were designed to gain an insight in to producers' opinions of specific statements. The respondents were to answer to what degree they agreed with the statement. These responses were coded as follows: "strongly agree" = 5; "agree" = 4; "neutral" = 3; "disagree" = 2; "strongly disagree" = 1. For this analysis, the responses "strongly agree" and "agree" were pooled together and identified as 1. Also, the categories "strongly disagree", "disagree", and "neutral" were pooled together and coded as 0. This was done due to the difficulty in distinguishing the differences between "strongly agree/disagree" and "agree/disagree". In other questions the respondents were asked to respond with "always", "usually", "sometimes", and "never" regarding the frequency that they completed production practices. For these questions, the two categories "sometimes" and "usually" were pooled together. This also was done for ease of interpreting the results.

For the explanatory variables that had more than one option, a base dummy was chosen to compare the other options against. In each case the option that was most common was chosen. For example, the base dummy for the industry segment was the commercial cow/calf segment. This means that the odds of the other segments are compared to the commercial cow/calf operator segment. The base dummy for region is the South so the respondents with operations in the North and the West were compared to those from the South. For the multinomial logit regressions, there was a base scenario dependent variable chosen for each regression. In the models, the option that followed BQA guidelines was chosen as the base category so the odds of the other categories are compared to that category. In the tables, the base explanatory variables are identified with "base". In the multinomial logit, the base category is identified by "base scenario".

*Regression Equations.* The first two regressions evaluated what motivates a producer to participate in the BQA program or any program that addresses quality issues. Regression 1 attempted to predict what factors influenced a producer to attend a meeting addressing beef quality issues (Table 4.2). Regression 2 attempted to predict what influenced a producer hearing about BQA (Table 4.3) regardless of who was putting on the meeting.

In addition to determining what influenced a producer to attend a meeting and affected if the respondent had heard of BQA. Four additional issues were identified as management shortfalls from the frequencies reported in the Phase III data resulting in five regressions. Regression 3 was the animal handling/primary driving tool issue with many producers still over-using electric prods (Table 4.4). Regressions 4 and 5 predicted if the producer used health protocols and whether or not they had them in writing (Table 4.5 and 4.6, respectively). And, the last issue was the use of =records to verify withdrawal times before marketing cattle (Regression 6, Table 4.7). These issues were chosen because they are part of the recommended best management practices from BQA guidelines. After the issues were identified, 11 farm and producer characteristics were identified within the survey questions to help identify what may have potentially motivated producers to participate in BQA and/or use the production practices outlined in BQA guidelines.

## RESULTS AND DISCUSSION

Currently, to our knowledge, there is no other social study that has looked at the factors that influence a producer's management practices and their perception on BQA and quality. This

marks the first time that input was sought at the grassroots level involving the producer's perception of quality and other social aspects (Perry et al., 2012.)

*Factors Influencing Likelihood of a Respondent Having Been to a Meeting Addressing Quality*

Of the surveys collected, 77.9% of all survey respondents "had ever been to, or participated in, an educational program that addressed how to avoid beef quality defects, injection site lesions, antibiotic and chemical residues, and other quality shortcomings in cattle and beef products, overall and by industry sector" (Perry et al., 2012).

Results for the logit analysis determining the factors that affect the odds that a survey respondent attended a meeting addressing BQA issues are presented in Table 4.2. The probability of a survey respondent attending a meeting that addressed quality issues was influenced by the primary segment of the industry they were involved in. The data showed that the odds of attending a quality-oriented meeting increased by a factor of 2.022 ($P < 0.001$) if the producer was a seedstock producer compared to a commercial cow/calf producer. The odds that the dairy and backgrounder/preconditioner sectors attended quality-orientated meetings changed by a factor of 0.172 ($P < 0.001$) and 0.533 ($P = 0.031$) compared to a commercial cow/calf producer, respectively. This may indicate that seedstock producers keep more up-to-date with the industry such as, new technologies and programs available (e.g. BQA) and therefore more likely to follow best management practices. The odds of a producer attending a meeting was also influenced if (1.366, $P = 0.01$) cattle were their primary source of income. This makes sense because a management decision on an operation that provides a producer's main income affects not only their business but also their livelihood. Best management practices were designed for the sustainability of an operation. Not only are they the right thing to do, they are designed to

increase profitability by reducing costly production issues (BQA, 2012). If the operation was in the North or the West regions of the country, the odds of a producer having been to a quality-oriented meeting changed 1.867 and 2.021, respectively ($P < 0.001$). In addition, for each change in category for the respondent's years in the industry, the odds changed by 1.244 ($P < 0.001$).

Producers were asked their perception on a range of questions. The results showed that if the respondent agreed to the statement "I consider myself to be an aggressive adopter of new production practices" the odds increased for a respondent going to a meeting by 1.241 ($P < 0.001$). If the respondent agreed with the following statement "I regularly read articles or attend meetings or programs where new management practices are discussed" the odds increased by 1.250 ($P < 0.001$). Finally, if the respondent agreed with the statement "I keep in contact with University Extension Educators in my area to stay abreast of new production methods", the odds greatly increased by 3.081 ($P < 0.001$). These statements show that producers who keep up with the industry and follow new technologies are more likely to implement best management practices and participate in the BQA program. This shows that using industry publications and Extension programming to promote and teach BQA is effective and a valid means of marketing. In areas, such as the South, where producers are less likely to have heard of BQA, using industry publications and Extension would help to increase producer knowledge on best management practices.

*Factors Influencing the Likelihood of a Respondent Having Heard of BQA*

Results for the logit analysis determining factors that affect the likelihood of a respondent having heard of BQA are in Table 4.3. Results suggest that the segment of the industry makes a

difference in the odds that a producer had heard of BQA. Compared to commercial cow/calf respondents, seedstock producers were more likely to have heard of BQA (2.857; $P < 0.001$), the odds were decreased if the producer was either in the dairy industry (0.234; $P < 0.001$) or operated in multiple segments (0.210; $P = 0.007$). Once again the region of the country had an influence, with the North and West regions having substantially increased odds of having heard of BQA by 3.512 and 5.503, respectively ($P < 0.001$). Because the odds of a producer in the South hearing of BQA were lower, this possibly translates into a lack of knowledge of best management practices and a lower likelihood of producers implementing them. In this analysis, the age of the respondent had an influence of 0.896 ($P = 0.068$) on the odds of producer having heard of BQA. This shows that older producers were not aware of BQA, which means they were not being reached by the wealth of industry correspondence and/or the BQA coordinators and may not be following best management practices. Not surprisingly, again if cattle were the respondent's primary source of income, the odds were influenced by 1.370 ($P = 0.04$).

In response to the statements about producer perceptions, the odds of a producer having heard of BQA was increased if the producer agreed with the statement "Profitability is my greatest concern on my operation" by 1.170 ($P = 0.029$). This makes intuitive sense because the respondent's primary source of income influences a producer's likelihood to have heard of BQA, profitability would be a part of that same equation. The odds were also increased if the producer regularly read articles and/or attended industry meetings (1.185; $P = 0.031$), and also if they kept in touch with Extension personnel by 2.621($P < 0.001$). This highlights the fact that producers do have an underlying objective of farm profitability and associate BQA with profitability. They also recognize the connection between additional education through articles/meetings, Extension, and BQA. This corresponds the 2007-2008 National Animal Health Monitoring Services

(**NAHMS**) survey that said 22.1% of their respondents considered the Extension service, university, or VoAg instructors to be very important for information to their commercial cow/calf operation (USDA, 2008).

*Factors Influencing the Likelihood of a Respondent Using an Electric Prod and the Frequency*

A multinomial logit analysis was used for this regression as the frequency of electric prod use was broken into categories. In the NBQA survey, there were five categories of frequency (in percentage of their cattle): 1) I don't use an electric prod; 2) Less than 10%; 3) 10 to 49%; 4) 50 to 74%; and 5) 75 to 100%. For the purpose of this regression analysis, we were interested in the respondents who didn't use an electric prod, those that only used it on less than 10% of his/her cattle and those that used it over 10%. Dummy variables were created using the three categories described above. Since the use of an electric prod causes stress to an animal and reduces the ease of handling, as well as carcass defects (Correa et. al., 2010), we used the category "I do not use an electric prod" as the base scenario (Table 4.4).

Results show that if the respondent's primary source of income came from cattle, the odds of the respondent using an electric prod on fewer than 10% of their cattle changed by 1.651 ($P < 0.001$) as compared to those that do not use an electric prod. The segment of the industry they were involved in also made a difference. If the producer was in the seedstock industry the odds of the respondent answering <10% versus never decreased by a factor of 0.728 as compared to commercial cow/calf producers ($P = 0.006$) and increased when the respondent was in the stocker/yearling sector (1.439; $P = 0.075$) or dairy industry (1.659; $P = 0.04$). The region of the country in which they were located had an influence on the odds, decreasing when the respondent was from the North versus the South for a respondent answering <10% versus never

using an electric prod. The respondent's gender also had an effect, changing the odds by a factor of 0.620 ($P < 0.001$) when the respondent was a female rather than a male, and as the number of years the respondent had been in the industry increased, so did the odds of them responding <10% versus never using a prod (1.099; $P = 0.063$)

The data for the respondents who answered >10%, showed that if the producer was a seedstock producer the odds changed by a factor of 0.206 when compared to cow/calf producers ($P < 0.001$), and by 3.653 ($P = 0.001$) for backgrounder/preconditioners compared to commercial cow/calf producers. Because most backgrounder/preconditioner operators handle more cattle in a year than most commercial cow/calf producers, it would be expected that they use electric prods on a higher percentage of their cattle. This shows where future education on the stress and defects, resulting in economic loss of the use of electric prods may need to be focused. The odds also increased drastically when the respondent was a stocker/yearling operator (2.589; $P = 0.002$) compared to a commercial cow/calf operator for using an electric prod on >10% versus never. Primary source of income also had an effect with a 1.805 change in odds when cattle were the primary source ($P = 0.001$). Once again, the region of the country had an influence on the odds. The North in relation to the South changed the odds by a factor of 0.256 ($P < 0.001$). The odds were also affected by the age (0.693; $P < 0.001$), gender (0.550; $P = 0.017$), and years in industry (1.240; $P = 0.037$).

The odds were also affected by whether the producer had heard of BQA (0.641; $P = 0.085$) and if the respondent said that they regularly read articles and attended producer meetings, the odds decreased by 0.842 ($P = 0.095$).

*Factors Influencing the Likelihood of a Respondent Having a Health Protocol*

This analysis used a multinomial logit regression to evaluate the factors that affect the question worded "Do you have a routine set of diseases that you vaccinate your cattle for, and standardized treatments for routine diseases (e.g. pneumonia, foot rot, pinkeye, calf scours, etc.)?" and the responses were "always", "usually/sometimes", or "never". The base dummy for this question was "always" since having a routine vaccination schedule is a BQA recommended best management practice.

Results for the "usually/sometimes" category (Table 4.5) showed an influence with the odds of having a variable vaccination schedule ("usually/sometimes") compared to set schedule ("always") changed by 0.579 ($P < 0.001$) for seedstock producers compared to commercial cow/calf producers. When compared to the Southern region, cattle operations located in the North and the West regions had a decreased odds (0.848, $P = 0.099$; 0.574, $P < 0.001$) of using a variable vaccination schedule compared to a set schedule. This shows that farms located in the North and the West tend to rely on a set schedule, and may have lower disease prevalence in their cattle. If the respondent's cattle were their primary source of income, the odds were affected by 0.795 ($P = 0.022$). If the respondent was female, the odds were decreased by 0.655 ($P = 0.001$) that the respondent would answer "usually/sometimes" rather than "always". Something to note is that if the respondent had heard of BQA, the odds were affected by 0.774 ($P = 0.088$).

Once again if the producer agreed that profitability was their greatest concern on their operation and if they were an aggressive adopter of new practices the odds changed by a factor of 0.888 ($P = 0.019$) and 0.819 ($P < 0.001$), respectively. Also, if they agreed that they kept in contact with Extension, the odds changed by a factor of 0.683 ($P < 0.001$). These two statements

are a reoccurring theme, which shows that the producers who are more likely to keep up with new practices and Extension are more likely to follow best management practices.

Evaluating the "never" category versus the "always" category, we see an influence if cattle were the respondent's primary source of income with a change of 0.561 ($P = 0.018$). Compared to commercial cow/calf operators, a seedstock respondent decreased the odds by 0.243 ($P < 0.001$). This shows that seedstock operators were more likely to follow the best management practice of having a regular health protocol. Respondents in the North compared to the South increased the odds by 1.751 ($P = 0.009$) and if the respondent was female, the odds decreased by 0.609 ($P = 0.076$). The more years a respondent had been in the industry the odds changed by 0.820 ($P = 0.052$).

When evaluating the questions pertaining to beef quality assurance, if a respondent had attended a meeting , the odds were changed by 0.486 ($P = 0.001$) and if they had heard of BQA, the odds decreased by 0.613 ($P = 0.061$).This suggests that beef quality assurance programs are influencing producer behavior, potentially helping them to improve their business plan.

The producer perception factors that had an influence when comparing these two categories were again if the producer agreed that they were an aggressive adopter of new practices (0.713; $P = 0.002$) and if they kept in contact with Extension (0.583; $P = 0.008$). Despite these results, "never" and "always" are 2 extremes and a better insight might be gained from further evaluating "usually/sometimes".

*Factors Influencing the Likelihood of a Producer Having Written Health Protocols*

A logit analysis was used to fit a regression to predict the odds of a producer having written health protocols. The factors influencing if a producer kept written records of their health

protocol included: the segment of the industry, the region of the country in which the operation was located, the respondent's gender, the years they have been in the beef cattle industry, whether the respondent had attended a meeting, whether profitability was the respondent's greatest concern on their operation, whether or not they considered themselves to be an aggressive adopter of new practices, and whether or not the respondent kept in contact with their Extension personnel (Table 4.6). If the producer was a seedstock operator, the odds of them keeping written records increased by a factor of 1.220 ($P = 0.093$) compared to a commercial cow/calf producer. The odds increased when the respondent was also a feedlot operator (1.529, $P = 0.017$) and if the respondent was a dairy operator (1.561, $P = 0.078$). When compared to operations located in the South, the odds of operations in the North keeping written health protocols changed by 1.479 ($P < 0.001$) and by 1.527 for operations in West ($P = 0.002$).

Evaluating producer characteristics reveals that gender (1.333, $P = 0.016$) and years in industry (0.873, $P = 0.013$) influenced whether the producer responded "never" versus "always". In regards to quality assurance, again if the producer had been to a meeting addressing quality issues, the odds increased that a producer would have their health protocols in writing. As for producer perception, the odds of having written records changed by a factor of 1.100 ($P = 0.077$) when the producer agreed that profitability was the greatest concern on their operation, the odds changed by a factor of 1.367 ($P < 0.001$) when the producer agreed that they considered themselves aggressive adopter of new practices and changed by 1.478 ($P < 0.001$) when they agreed that they kept in contact with Extension.

*Factors Influencing the Likelihood of a Producer Tracking Withdrawal Records*

Another principle of the BQA program is keeping track of withdrawal records before marketing cattle therefore the answer "always" was chosen as the base category. The original question asked was "Does your operation verify that withdrawal times for animal health products (such as antibiotics, vaccines, or dewormers) have been met before cattle are marketed?" The results from this multinomial analysis are presented in Table 4.7.

Not as many factors were found to influence someone choosing "usually/sometimes" versus "always" for verifying withdrawal times before marketing cattle compared to earlier analyses. However once again, it was influenced by the region; when the respondent was from the North region it decreased the odds by a factor of 0.553 ($P < 0.001$) of a respondent answering "usually/sometimes" versus "always" to verifying withdrawal times. Interestingly, in this instance, segment of the industry did not influence the producer behavior. Age changed the odds by 0.907 ($P = 0.078$) for every ten years older. This regression was also influenced by if a respondent had gone to a meeting addressing quality (0.759; $P = 0.087$) as well as if the respondent had heard of BQA (0.723, $P = 0.087$). If the respondent regularly read articles and attended producer meetings, the odds were decreased by 0.870 ($P = 0.076$).

Comparing "never" offenders to "always", there were only a couple factors that had an impact on the odds of how the respondents answered. One of the factors that had an influence was if the respondent had attended a meeting addressing quality issues, decreasing the odds by 0.445 ($P = 0.022$). The other category illustrated that if the respondent kept in touch with their Extension agent, the odds also decreased by 0.523 ($P = 0.049$) of a producer answering "never" versus "always" to using verifying withdrawal times.

There were several reoccurring factors that had an influence in many of the regressions. The first factor was if cattle were a respondent's primary source of income. Intuitively this

makes sense because a management decision on an operation that provides a producer's main income affects not only their business but also the sustainability of their operation. It is in their best interest to stay current on programs and technologies in the industry. Along with this was the statement that profitability is the greatest concern on their operation, which appeared several times in the factors having an influence on their responses.

Region was an influencing factor in almost every regression. The effect was not the same in every regression, but often the South was less likely to follow BQA recommended practices. However, because the odds of a producer in the South hearing of BQA were lower, this translates into a lack of knowledge of best management practices; therefore, it is not surprising that they would have higher odds of not following a BQA guideline. This may be a result of different BQA programs or it may be the result of different producer perceptions in the regions.

Two more factors that repeatedly came out in the results were if a respondent read articles and attended industry meetings and if the respondent kept in touch with Extension. This would be expected as these are means of getting the word out, or "marketing", the BQA program and its principles. This demonstrates that these methods are still effective. However, the problem appears to be getting producers that don't currently make use of these resources to use them.

**Table 4.1.** Coding, mean, and standard deviation of independent and dependent variables

| Variables | Coding | Mean | St. Dev. |
|---|---|---|---|
| *Independent variables* | | | |
| *Farm Characteristics* | | | |
| Primary Source of Income | (0/1) | 0.35 | 0.48 |
| No. of Cows | (Continuous) | 312.70 | 2473.61 |
| *Industry Segment* | | | |
| Seedstock | (0/1) | 0.15 | 0.35 |
| Commercial cow/calf | | 0.63 | 0.48 |
| Backgrounder/preconditioner | (0/1) | 0.03 | 0.16 |
| Stocker/yearling | (0/1) | 0.05 | 0.21 |
| Feedlot | (0/1) | 0.08 | 0.27 |
| Dairy | (0/1) | 0.04 | 0.19 |
| Other | (0/1) | 0.02 | 0.15 |
| Multiple segments | (0/1) | 0.01 | 0.09 |
| *Region* | | | |
| North | (0/1) | 0.45 | 0.5 |
| West | (0/1) | 0.14 | 0.35 |
| South | (0/1) | 0.41 | 0.49 |
| *Producer Characteristics* | | | |
| Age | (1-5) | 4.69 | 1.32 |
| Gender | (0/1) | 0.16 | 0.36 |

| | | | |
|---|---|---|---|
| Yrs in Industry | (1-5) | 3.47 | 0.97 |
| *Producer Perception*[1] | | | |
| Profitability is greatest concern | (0/1) | 0.71 | 0.46 |
| Aggressive adopter of new practices | (0/1) | 0.75 | 0.44 |
| Read articles/attend meetings | (0/1) | 0.85 | 0.36 |
| In contact with Extension | (0/1) | 0.66 | 0.47 |
| *Dependent Variables* | | | |
| Using electric prod[2] | (1-3) | 1.57 | 0.62 |
| Routine set of diseases[3] | (1-3) | 1.40 | 0.58 |
| Verify withdrawal times[4] | (1-3) | 1.16 | 0.42 |

[1]Producer perception variable responses were coded "agree"/"strongly agree" = 1 and "neutral"/"disagree"/"strongly disagree" = 0.
[2]The frequency and percentage of cattle on which a respondent used an electric prod (I don't use an electric prod = 1; Respondent used an electric prod on <10% of cattle = 2; Respondent used an electric prod on >10% of cattle = 3; Table 4.4).
[3]The frequency with which a respondent had a routine set of diseases they vaccinated their cattle against. The responses were coded "always" = 1; "usually"/"sometimes" = 2; "never" = 3 (Table 4.5).
[4]The frequency with which a respondent verified withdrawal times before marketing an animal. The responses were coded "always" = 1; "usually"/"sometimes" = 2; "never" = 3 (Table 4.7).

**Table 4.2.** Factors influencing the likelihood of a respondent having been to a meeting addressing beef quality[1]

| Variables | Coefficient | Std. Err. | P>z | Odds Ratio |
|---|---|---|---|---|
| *Farm Characteristics* | | | | |
| Primary Source of Income | 0.312 | 0.121 | 0.01 | 1.366 |
| No. of Cows | 0.000 | 0.000 | 0.108 | 1.000 |
| *Industry Segment* | | | | |
| Seedstock | 0.704 | 0.164 | <0.001 | 2.022 |
| Commercial cow/calf | (base) | | | |
| Backgrounder/preconditioner | -0.629 | 0.291 | 0.031 | 0.533 |
| Stocker/yearling | -0.066 | 0.226 | 0.769 | 0.936 |
| Feedlot | 0.330 | 0.239 | 0.167 | 1.391 |
| Dairy | -1.759 | 0.253 | <0.001 | 0.172 |
| Other | -0.537 | 1.369 | 0.695 | 0.585 |
| Multiple segments | -0.541 | 0.572 | 0.345 | 0.582 |
| *Region* | | | | |
| North | 0.624 | 0.116 | <0.001 | 1.867 |
| West | 0.704 | 0.169 | <0.001 | 2.021 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | -0.036 | 0.045 | 0.108 | 1.000 |
| Gender | -0.075 | 0.141 | 0.428 | 0.928 |
| Yrs in Industry | 0.218 | 0.058 | <0.001 | 1.244 |

| | | | | |
|---|---|---|---|---|
| *Producer Perception* | | | | |
| Profitability is greatest concern | 0.083 | 0.058 | 0.15 | 1.087 |
| Aggressive adopter of new practices | 0.216 | 0.061 | <0.001 | 1.241 |
| Read articles/attend meetings | 0.222 | 0.063 | <0.001 | 1.250 |
| In contact with Extension | 1.125 | 0.108 | <0.001 | 3.081 |
| Constant | -2.390 | 0.441 | <0.001 | 0.092 |
| | | | | |
| Chi-square | 395.5 | | | |
| Probability > Chi-square | 0.000 | | | |
| Log-likelihood | -1270.2 | | | |
| Pseudo R-square | 0.1347 | | | |
| Sample size | 2872 | | | |

[1] Have you ever been to, or participated in, an educational program that addressed how to avoid beef quality defects, injection site lesions, antibiotic and chemical residues, and other quality shortcomings in cattle and beef products?"

**Table 4.3.** Factors influencing the likelihood of a respondent having heard of the Beef Quality Assurance (BQA) program[1]

| Variables | Coefficient | Std. Err. | P>z | Odds Ratio |
|---|---|---|---|---|
| *Farm Characteristics* | | | | |
| Primary Source of Income | 0.315 | 0.154 | 0.04 | 1.370 |
| No. of Cows | 3.48E-05 | 8.55E-05 | 0.684 | 1.000 |
| *Industry Segment* | | | | |
| Seedstock | 1.050 | 0.246 | <0.001 | 2.857 |
| Commercial cow/calf | (base) | | | |
| Backgrounder/preconditioner | 0.312 | 0.486 | 0.521 | 1.366 |
| Stocker/yearling | 0.011 | 0.289 | 0.97 | 1.011 |
| Feedlot | -0.196 | 0.301 | 0.515 | 0.822 |
| Dairy | -1.452 | 0.319 | <0.001 | 0.234 |
| Other | -1.038 | 1.390 | 0.455 | 0.354 |
| Multiple segments | -1.561 | 0.580 | 0.007 | 0.210 |
| *Region* | | | | |
| North | 1.256 | 0.158 | <0.001 | 3.512 |
| West | 1.705 | 0.269 | <0.001 | 5.503 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | -0.109 | 0.060 | 0.068 | 0.896 |
| Gender | -0.084 | 0.186 | 0.65 | 0.919 |

| | | | | |
|---|---|---|---|---|
| Yrs in Industry | -0.009 | 0.073 | 0.899 | 0.991 |
| *Producer Perception* | | | | |
| Profitability is greatest concern | 0.157 | 0.072 | 0.029 | 1.170 |
| Aggressive adopter of new practices | 0.120 | 0.076 | 0.114 | 1.127 |
| Read articles/attend meetings | 0.170 | 0.079 | 0.031 | 1.185 |
| In contact with Extension | 0.964 | 0.137 | <0.001 | 2.621 |
| Constant | -0.347 | 0.558 | 0.534 | 0.707 |
| | | | | |
| Chi-square | 261.7 | | | |
| Probability > Chi-square | 0.000 | | | |
| Log-likelihood | -864.9 | | | |
| Pseudo R-square | 0.1314 | | | |
| Sample size | 2858 | | | |

[1]"Have you ever heard of Beef Quality Assurance (BQA)?"

**Table 4.4.** Factors influencing the likelihood of a respondent using an electric prod and the frequency[1]

| Response | Variables | Coefficient | Std. Err. | P>z | Odds Ratio |
|---|---|---|---|---|---|
| Don't use | | (base scenario) | | | |
| <10% | *Farm Characteristics* | | | | |
| | Primary Source of Income | 0.502 | 0.097 | <0.001 | 1.651 |
| | No. of Cows | 0.001 | 0.000 | <0.001 | 1.001 |
| | *Industry Segment* | | | | |
| | Seedstock | -0.318 | 0.116 | 0.006 | 0.728 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | 0.320 | 0.285 | 0.261 | 1.377 |
| | Stocker/yearling | 0.364 | 0.204 | 0.075 | 1.439 |
| | Feedlot | 0.195 | 0.181 | 0.283 | 1.215 |
| | Dairy | 0.507 | 0.246 | 0.04 | 1.659 |
| | Other | -0.536 | 1.260 | 0.671 | 0.585 |
| | Multiple segments | 0.026 | 0.502 | 0.959 | 1.026 |
| | *Region* | | | | |
| | North | -0.982 | 0.098 | <0.001 | 0.375 |
| | West | 0.142 | 0.136 | 0.297 | 1.153 |
| | South | (base) | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *Producer Characteristics* | | | | |
| | Age | -0.057 | 0.039 | 0.146 | 0.945 |
| | Gender | -0.477 | 0.121 | <0.001 | 0.620 |
| | Yrs in Industry | 0.094 | 0.051 | 0.063 | 1.099 |
| | Attended a quality meeting | 0.092 | 0.120 | 0.446 | 1.096 |
| | Heard of BQA | 0.102 | 0.152 | 0.504 | 1.107 |
| | *Producer Perception* | | | | |
| | Profitability is greatest concern | 0.069 | 0.049 | 0.163 | 1.071 |
| | Aggressive adopter of new practices | 0.076 | 0.054 | 0.157 | 1.079 |
| | Read articles/attend meetings | 0.077 | 0.059 | 0.188 | 1.080 |
| | In contact with Extension | -0.109 | 0.098 | 0.265 | 0.896 |
| | Constant | -0.539 | 0.395 | 0.172 | 0.583 |
| >10% | *Farm Characteristics* | | | | |
| | Primary Source of Income | 0.591 | 0.179 | 0.001 | 1.805 |
| | No. of Cows | 0.001 | 0.000 | <0.001 | 1.001 |
| | *Industry Segment* | | | | |
| | Seedstock | -1.579 | 0.399 | <0.001 | 0.206 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | 1.296 | 0.376 | 0.001 | 3.653 |
| | Stocker/yearling | 0.951 | 0.305 | 0.002 | 2.589 |
| | Feedlot | 0.346 | 0.348 | 0.32 | 1.413 |
| | Dairy | -0.710 | 0.752 | 0.345 | 0.492 |

| | | | | |
|---|---|---|---|---|
| Other | -12.09 | 659.8 | 0.985 | 5.61E-06 |
| Multiple segments | 0.170 | 0.842 | 0.84 | 1.185 |
| *Region* | | | | |
| North | -1.362 | 0.205 | <0.001 | 0.256 |
| West | 0.068 | 0.236 | 0.772 | 1.071 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | -0.366 | 0.072 | <0.001 | 0.693 |
| Gender | -0.597 | 0.252 | 0.017 | 0.550 |
| Yrs in Industry | 0.215 | 0.103 | 0.037 | 1.240 |
| Attended a quality meeting | 0.236 | 0.228 | 0.301 | 1.266 |
| Heard of BQA | -0.445 | 0.259 | 0.085 | 0.641 |
| *Producer Perception* | | | | |
| Profitability is greatest concern | 0.055 | 0.097 | 0.574 | 1.056 |
| Aggressive adopter of new practices | -0.027 | 0.098 | 0.787 | 0.974 |
| Read articles/attend meetings | -0.172 | 0.103 | 0.095 | 0.842 |
| In contact with Extension | -0.107 | 0.185 | 0.564 | 0.899 |
| Constant | 0.709 | 0.721 | 0.326 | 2.031 |
| | | | | |
| Chi-square | 465.7 | | | |
| Probability > Chi-square | 0.000 | | | |
| Log-likelihood | -2296.2 | | | |
| Pseudo R-square | 0.0921 | | | |

| | |
|---|---|
| Sample size | 2842 |

[1]"These are in response to the question: In a typical day of working cattle (processing or loading), on what percentage of your cattle is an electric prod (hot shot) used as a driving tool?"

**Table 4.5.** Factors influencing a producer to have a routine set of diseases for which his/her cattle are vaccinated[1]

| Response | Variables | Coefficient | Std. Err. | P > z | Odds Ratio |
|---|---|---|---|---|---|
| Always | | (base scenario) | | | |
| Usually/ | | | | | |
| Sometimes | *Farm Characteristics* | | | | |
| | Primary Source of Income | -0.230 | 0.100 | 0.022 | 0.795 |
| | No. of Cows | -0.000 | 9.26E-05 | 0.07 | 1.000 |
| | *Industry Segment* | | | | |
| | Seedstock | -0.546 | 0.129 | <0.001 | 0.579 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | 0.042 | 0.270 | 0.878 | 1.042 |
| | Stocker/yearling | -0.100 | 0.200 | 0.619 | 0.905 |
| | Feedlot | 0.148 | 0.183 | 0.417 | 1.160 |
| | Dairy | -0.328 | 0.279 | 0.24 | 0.720 |
| | Other | -0.369 | 1.282 | 0.774 | 0.692 |
| | Multiple segments | -0.313 | 0.544 | 0.565 | 0.731 |
| | *Region* | | | | |
| | North | -0.164 | 0.100 | 0.099 | 0.848 |
| | West | -0.556 | 0.147 | <0.001 | 0.574 |
| | South | (base) | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *Producer Characteristics* | | | | |
| | Age | -0.005 | 0.040 | 0.897 | 0.995 |
| | Gender | -0.424 | 0.131 | 0.001 | 0.655 |
| | Yrs in Industry | 0.053 | 0.053 | 0.318 | 1.054 |
| | Attended a quality meeting | -0.081 | 0.122 | 0.505 | 0.922 |
| | Heard of BQA | -0.257 | 0.151 | 0.088 | 0.774 |
| | *Producer Perception* | | | | |
| | Profitability is greatest concern | -0.119 | 0.051 | 0.019 | 0.888 |
| | Aggressive adopter of new practices | -0.200 | 0.055 | <0.001 | 0.819 |
| | Read articles/attend meetings | -0.103 | 0.058 | 0.079 | 0.902 |
| | In contact with Extension | -0.381 | 0.100 | <0.001 | 0.683 |
| | Constant | 2.083 | 0.408 | <0.001 | 8.026 |
| Never | *Farm Characteristics* | | | | |
| | Primary Source of Income | -0.579 | 0.245 | 0.018 | 0.561 |
| | No. of Cows | -0.001 | 0.001 | 0.152 | 0.999 |
| | *Industry Segment* | | | | |
| | Seedstock | -1.413 | 0.379 | <0.001 | 0.243 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | -1.347 | 1.028 | 0.19 | 0.260 |
| | Stocker/yearling | -0.785 | 0.531 | 0.14 | 0.456 |

| | | | | |
|---|---|---|---|---|
| Feedlot | 0.118 | 0.335 | 0.724 | 1.126 |
| Dairy | -0.878 | 0.635 | 0.167 | 0.415 |
| Other | -12.82 | 1095.25 | 0.991 | 2.71E-06 |
| Multiple segments | -12.48 | 451.35 | 0.978 | 3.78E-06 |
| *Region* | | | | |
| North | 0.560 | 0.213 | 0.009 | 1.751 |
| West | -0.325 | 0.371 | 0.38 | 0.722 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | 0.124 | 0.083 | 0.136 | 1.132 |
| Gender | -0.496 | 0.279 | 0.076 | 0.609 |
| Yrs in Industry | -0.198 | 0.102 | 0.052 | 0.820 |
| Attended a quality meeting | -0.722 | 0.223 | 0.001 | 0.486 |
| Heard of BQA | -0.489 | 0.261 | 0.061 | 0.613 |
| *Producer Perception* | | | | |
| Profitability is greatest concern | -0.059 | 0.104 | 0.574 | 0.943 |
| Aggressive adopter of new practices | -0.338 | 0.111 | 0.002 | 0.713 |
| Read articles/attend meetings | -0.090 | 0.113 | 0.429 | 0.914 |
| In contact with Extension | -0.539 | 0.204 | 0.008 | 0.583 |
| Constant | 1.487 | 0.814 | 0.068 | 4.425 |

| | |
|---|---|
| Chi-square | 282.77 |
| Probability > Chi-square | 0.000 |
| Log-likelihood | -2086.1 |
| Pseudo R-square | 0.0635 |
| Sample size | 2841 |

[1] "In response to the question: Do you have a routine set of diseases that you vaccinate your cattle for, and standardized treatments for routine diseases (e.g. pneumonia, foot rot, pinkeye, calf scours, etc.)?"

**Table 4.6.** Regression results for the logistic analysis showing factors that influence a producer to have health protocols in writing[1]

| Variable | Coefficient | Std. Err. | P > z | Odds Ratio |
|---|---|---|---|---|
| *Farm Characteristics* | | | | |
| Primary Source of Income | 0.161 | 0.098 | 0.101 | 1.175 |
| No. of Cows | 0.000 | 0.000 | 0.002 | 1.000 |
| *Industry Segment* | | | | |
| Seedstock | 0.199 | 0.119 | 0.093 | 1.220 |
| Commercial cow/calf | (base) | | | |
| Backgrounder/preconditioner | 0.371 | 0.256 | 0.147 | 1.450 |
| Stocker/yearling | -0.036 | 0.212 | 0.865 | 0.965 |
| Feedlot | 0.425 | 0.178 | 0.017 | 1.529 |
| Dairy | 0.445 | 0.252 | 0.078 | 1.561 |
| Other | 0.673 | 1.284 | 0.6 | 1.961 |
| Multiple segments | 0.570 | 0.460 | 0.216 | 1.768 |
| *Region* | | | | |
| North | 0.391 | 0.103 | <0.001 | 1.479 |
| West | 0.423 | 0.138 | 0.002 | 1.527 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | 0.057 | 0.041 | 0.169 | 1.058 |
| Gender | 0.288 | 0.120 | 0.016 | 1.333 |

| | | | | |
|---|---|---|---|---|
| Yrs in Industry | -0.136 | 0.055 | 0.013 | 0.873 |
| Attended a quality meeting | 0.287 | 0.139 | 0.039 | 1.332 |
| Heard of BQA | 0.167 | 0.184 | 0.365 | 1.181 |
| *Producer Perception* | | | | |
| Profitability is greatest concern | 0.095 | 0.054 | 0.077 | 1.100 |
| Aggressive adopter of new practices | 0.313 | 0.060 | <0.001 | 1.367 |
| Read articles/attend meetings | -0.005 | 0.065 | 0.934 | 0.995 |
| In contact with Extension | 0.391 | 0.108 | <0.001 | 1.478 |
| Constant | -3.741 | 0.437 | <0.001 | 0.024 |
| | | | | |
| Chi-square | 178.70 | | | |
| Probability > Chi-square | 0.000 | | | |
| Log-likelihood | -1541.3 | | | |
| Pseudo R-square | 0.0548 | | | |
| Sample size | 2696 | | | |

[1] "In response to the question: Is your plan for administering health treatments and protocols in writing?"

**Table 4.7.** Results for the multinomial logistic analysis showing factors that influence the frequency a respondent verifies withdrawal times before cattle are marketed[1]

| Response | Variables | Coefficient | Std. Err. | P > z | Odds Ratio |
|---|---|---|---|---|---|
| Always | | (base scenario) | | | |
| Usually/ | *Farm Characteristics* | | | | |
| Sometimes | Primary Source of Income | -0.116 | 0.147 | 0.429 | 0.890 |
| | No. of Cows | 0.000 | 0.000 | 0.245 | 1.000 |
| | *Industry Segment* | | | | |
| | Seedstock | -0.223 | 0.187 | 0.234 | 0.800 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | -0.156 | 0.442 | 0.724 | 0.855 |
| | Stocker/yearling | 0.080 | 0.275 | 0.771 | 1.083 |
| | Feedlot | -0.409 | 0.334 | 0.221 | 0.664 |
| | Dairy | 0.080 | 0.384 | 0.834 | 1.084 |
| | Other | -13.312 | 984.914 | 0.989 | 1.7E-06 |
| | Multiple segments | 0.415 | 0.644 | 0.519 | 1.514 |
| | *Region* | | | | |
| | North | -0.592 | 0.150 | <0.001 | 0.553 |
| | West | -0.064 | 0.190 | 0.735 | 0.938 |
| | South | (base) | | | |
| | *Producer Characteristics* | | | | |
| | Age | -0.098 | 0.056 | 0.078 | 0.907 |

| | | | | | |
|---|---|---|---|---|---|
| | Gender | -0.230 | 0.186 | 0.217 | 0.795 |
| | Yrs in Industry | 0.025 | 0.074 | 0.738 | 1.025 |
| | Attended a quality meeting | -0.276 | 0.161 | 0.087 | 0.759 |
| | Heard of BQA | -0.324 | 0.189 | 0.087 | 0.723 |
| | *Producer Perception* | | | | |
| | Profitability is greatest concern | -0.039 | 0.072 | 0.586 | 0.961 |
| | Aggressive adopter of new practices | -0.106 | 0.076 | 0.163 | 0.900 |
| | Read articles/attend meetings | -0.140 | 0.079 | 0.076 | 0.870 |
| | In contact with Extension | -0.224 | 0.141 | 0.111 | 0.799 |
| | Constant | 0.687 | 0.553 | 0.214 | 1.987 |
| | | | | | |
| Never | *Farm Characteristics* | | | | |
| | Primary Source of Income | -0.062 | 0.355 | 0.862 | 0.940 |
| | No. of Cows | 1.9E-05 | 3.8E-05 | 0.609 | 1.000 |
| | *Industry Segment* | | | | |
| | Seedstock | -0.659 | 0.539 | 0.221 | 0.517 |
| | Commercial cow/calf | (base) | | | |
| | Backgrounder/preconditioner | 0.495 | 0.758 | 0.514 | 1.640 |
| | Stocker/yearling | -0.339 | 0.739 | 0.647 | 0.713 |
| | Feedlot | -0.089 | 0.652 | 0.891 | 0.915 |
| | Dairy | -12.635 | 425.373 | 0.976 | 3.3E-06 |
| | Other | -12.766 | 1816.508 | 0.994 | 2.9E-06 |

| | | | | |
|---|---|---|---|---|
| Multiple segments | -12.414 | 907.670 | 0.989 | 4.1E-06 |
| *Region* | | | | |
| North | -0.236 | 0.352 | 0.503 | 0.790 |
| West | -0.185 | 0.484 | 0.702 | 0.831 |
| South | (base) | | | |
| *Producer Characteristics* | | | | |
| Age | 0.194 | 0.143 | 0.175 | 1.215 |
| Gender | 0.329 | 0.386 | 0.394 | 1.390 |
| Yrs in Industry | -0.142 | 0.163 | 0.384 | 0.868 |
| Attended a quality meeting | -0.810 | 0.354 | 0.022 | 0.445 |
| Heard of BQA | -0.170 | 0.415 | 0.681 | 0.843 |
| *Producer Perception* | | | | |
| Profitability is greatest concern | -0.168 | 0.162 | 0.3 | 0.845 |
| Aggressive adopter of new practices | -0.222 | 0.178 | 0.212 | 0.801 |
| Read articles/attend meetings | 0.087 | 0.190 | 0.647 | 1.091 |
| In contact with Extension | -0.647 | 0.329 | 0.049 | 0.523 |
| Constant | -2.327 | 1.318 | 0.078 | 0.098 |
| | | | | |
| Chi-square | 111.9 | | | |
| Probability > Chi-square | 0.000 | | | |
| Log-likelihood | -1151.6 | | | |
| Pseudo R-square | 0.0463 | | | |

| | |
|---|---|
| Sample size | 2832 |

[1]"In response to the question: Does your operation verify that withdrawal times for animal health products (such as antibiotics, vaccines, or dewormers) have been met before cattle are marketed?"

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