

CATTLE PRODUCER MOTIVATIONS AND WILLINGNESS TO PARTICIPATE IN INDUSTRY ANIMAL
WELFARE PROGRAM VERIFICATION

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ABSTRACT

Cattle Producer Motivations and Willingness to Participate in Industry Animal Welfare Program Verification

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As consumers have become increasingly interested in where their food comes from and how it is grown, the cattle and beef industry is without exception. Many consumers are beginning to question traditional animal husbandry practices and on-farm animal welfare protocol. It is essential that the food system meets new demands and understands consumer views. In order to address these concerns, the industry has rallied around the Beef Quality Assurance (BQA) program to set the standard for cattle welfare and beef quality, with the explicit goal of improving consumer confidence. The goal of this research is to determine if cattle producers would be willing to participate in animal welfare verification programs based on BQA to ensure that cattle are being raised in accordance with industry standards. Data were collected through an online survey sent to a national sample of cattle producers. The survey was designed to determine specific producer demographics that would be inclined to participate, their opinions of the BQA program, and using fractional factorial design to assess what components of a program would most likely encourage producer participation.

Keywords: Beef, Animal welfare, Certification, Audit, Verification, Meat, Consumers, Fractional factorial design, Willingness to participate, Willingness to supply

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Chapter 1

INTRODUCTION

1.1 Background

There are several animal welfare programs and schemes that exist within the beef industry. However, this thesis will focus on the industry supported Beef Quality Assurance (BQA) program because of its broad adoption and awareness within the industry. Additionally, the cattle and beef industry, through the 2021-2025 Beef Industry Long Range Plan (LRP) has identified BQA as the program to use to improve consumer perception of animal welfare.

The cattle industry currently sets standards through the BQA program which is funded by the Beef Checkoff, an industry self-help entity that focuses on research and promotion of beef (Cattlemen's Beef Board, 2020). By investing in itself, the cattle and beef industry has shown it is willing to take necessary action to improve consumer perceptions of the industry that can improve beef demand. BQA is one example of the educational and outreach programs that the industry has developed on a national scale to provide resources and information to cattle producers on best practices that can improve animal welfare and beef quality. BQA covers a variety of topic areas pertinent to cattle production including the following: cattle care and handling, biosecurity, herd health, transportation, record keeping, nutrition, environmental stewardship, worker safety, and emergency action planning (Beef Quality Assurance, 2019).

There are also proactive steps taken by BQA done with the goal of improving consumer confidence in beef (Beef Quality Assurance, n.d.). On a national level, the program does not have an on-product label, but some state programs do have a BQA label for locally produced meat that meets specific program standards (Pennsylvania BQA, 2020). The industry also

promotes the program to consumer through the “Beef. It’s What’s for Dinner” brand (Southeast Ag Net, 2019). According to the National BQA Program, there are currently over 207,000 certified individuals with an additional 280,000 enrolled in equivalent programs (BQA Learning Management System, 2020). Strong industry enrollment indicates that the program has a strong opportunity to serve as the industry animal welfare standard.

Quality assurance programs and certifications provide consumers with information about a product and can increase consumer confidence by addressing specific concerns, whether about topics like animal welfare or sustainability. But quality claims can lead to increased confusion for consumers who do not understand what the programs include or concerns that they address (Christensen, et al., 2003). McCluskey (2000) discovered that not all label claims are true or accurate because producers have an economic incentive to make false claims regarding their products. In the United States, there are no government sponsored animal welfare certifications, but there are several third-party certifiers including “American Humane,” “Certified Humane,” “Animal Welfare Approved,” and “Global Animal Partnership (GAP)”. Each has its own standards and private governance, although what the programs have in common is a verification step in which they audit the on-farm practices of their producers to ensure adherence with their various standards and levels of welfare that they claim their producers adhere to (Humaneitarian, 2014). Third-party certification offers retailers and consumers the ability to differentiate products by attributes that are of concern to them and ensures consistent implementation of product standards (Hatanaka, Bain & Busch, 2005). A gap in the BQA program is that it does not currently include a verification step to ensure that practices taught through BQA education initiatives are implemented.

1.2 Problem Statement

With the increased importance the cattle and beef industry is placing on the Beef Quality Assurance program to address animal welfare concerns, and initiatives to further consumer messaging around animal welfare it will be vital that cattle producers comply with industry standards. In order to develop how the industry can best address the gap in education, implementation and verification this study will examine two questions. First, are cattle producers willing to accept verification of compliance with Beef Quality Assurance practices? And, if so, what incentives or motivations would create a willingness to accept?

1.3 Hypothesis

It is expected that cattle producers consider Beef Quality Assurance (BQA) as an industry standard that should be recognized throughout the beef supply chain. Cattle producers are aware of increased consumer and regulatory interest in animal welfare standards and as such will be willing to accept verification of adherence to program standards.

1. The majority of cattle producers will indicate willingness to accept BQA verification steps if a premium greater than \$10 per hundred weight (cwt) is awarded.
2. The majority of cattle producers will indicate a willingness to accept BQA verification steps without a premium if reduced regulatory action was guaranteed.
3. A majority (>50 percent) of cattle producers will not be willing to undergo verification steps to confirm compliance with BQA practices without a price premium or guarantee of reduced regulatory/government burden.

1.4 Objectives

1. To determine industry willingness to accept verification of compliance with industry animal welfare standards.
2. To determine the level of incentive necessary for cattle producers to undergo verification of animal welfare practices.

Chapter 2

REVIEW OF THE LITERATURE

The objective of this thesis is to understand cattle producer participation in the industry standard animal welfare program, Beef Quality Assurance (BQA), and willingness to accept verification of adherence to BQA practices. The literature review is designed to provide insight into previous research and literature that provides knowledge and background to the topic of animal welfare as is it used within the cattle and beef industry and is organized into the following key subject areas: animal welfare from an industry and consumer perspective, current and previous animal welfare regulatory policies and impacts, and farmer participation in commodity value-add programs. Reviewing research that understands current animal welfare standards and participation will shed light on how producers already adhere to industry programs and will also provide insight into their opinions and beliefs in the BQA program. Research that examines consumer perceptions of beef and meat production will give background on how consumers currently view animal welfare and their knowledge level of current industry standards. An overview of pertinent regulation at the state and national level, as well as proposed legislation, will provide current requirements and future expectations for cattle producers. Additionally, farmer participation in value-added programs will be explored to assess the current interest and reveal potential premium models that may be used to verify animal welfare practices.

2.1 Animal Welfare

2.1.1 Consumer Perspective

In order to understand the entire landscape of animal welfare as it relates to food choices it is important to gain an understanding of consumer perceptions, behaviors, and willingness to pay for their preferences. Without understanding consumer perceptions of animal welfare and how they respond to those perceptions it will be difficult for the cattle and beef industry to adequately satisfy consumer demands. This literature review looks at how labeling can influence consumer perceptions of food products, the impacts of labeling and marketing on consumer knowledge, and how consumers prioritize various product attributes when making food purchases.

Consumer trends are pointing towards a desire for increased information about their food sources and the methods used to grow and raise their food (Pirog, 2004; Conner et al., 2010; Van Loo, Caputo & Lusk, 2020; Eden, Bear & Walker, 2008). Wording of a label may have a marked impact on the consumer perception (Grunert, Bredahl & Brunso, 2004). Van Loo et al. (2014) found in their study of European consumers that the largest segment of consumers showed a positive preference for each of the sustainability labels they tested; of those labels, free range and animal welfare claims were the most popular labels. But access to such label schemes is largely controlled by the private sector, especially in the United States where there is no labeling standard for animal welfare or other sustainability claims. Binnekamp and Ingenbleek (2006) show that supermarkets control access to shelf space and are able to set standards for the products they sell. Thus, supermarkets have an outsized influence on the production practices and consumer purchasing behavior.

Individual consumers have varying degrees of knowledge and perception of labels and wording of a label can skew consumer knowledge and acceptance of a product. Studies have

shown that while intensive livestock production systems do have better animal welfare outcomes in some circumstances, the associated negative impacts of such systems are especially vivid to consumers thereby causing decreased trust (Napolitano, Girolami & Braghieri, 2010; Vanhonacker et al. 2008; Pieniak, Vanhonacker & Verbeke, 2013).

Other studies show consumer's lack of knowledge related to the production of their food and the certifications associated with animal production methods (Harper & Makatouni, 2002; Schroder & McEachern, 2004; Frewer et al., 2005). Yiridoe, Bonti-Ankomah, and Martin (2005) found that an increase in consumer demand for products grown and raised according to organic and natural production methods actually increased demand for better health and well-being of animals. Consumers in the same study also admitted to being largely uncertain about actual attributes of organic foods and labeling practices. Lusk, Roosen, and Fox (2003) determined that European consumers were more concerned than Americans about the use of biotechnology in animal production and the use of genetically modified corn in cattle feed. While European consumers showed increased concern regarding biotechnology, they also indicated that they were less educated than their American counterparts. Lusk, Roosen, and Fox's (2003) research indicates that consumer knowledge is variable, and perception is ultimately what guides consumers in making purchase decisions.

While production methods provide choice to consumers, dietary knowledge can shape demand. Davis, Lin and Yen (2007) looked at how consumer knowledge of nutritional information relates to meat consumption in the United States. Using USDA consumption data and a Maximum-likelihood model, the researchers found that dietary knowledge decreases consumer demand for red meat products but not for poultry or fish. Guenther et al. (2005), found that consumers who had high consumption of beef and pork were likely to believe that their diets were too high in fat, but also less likely to believe it is important to have a low-fat

diet. Consumers like this demonstrate that even when nutritional information is provided and understood, consumers still use the information differently depending on their perception of the information. This can be used to guide how animal welfare and sustainability labeling might not lead to increased awareness of production practices.

There are required and optional labeling systems for meat products in the US; each is utilized to convey information to the consumer about the product. These labels influence consumers' purchase habits and behavior depending on the information and how it is presented. Grebitus, Menapace, and Bruhn (2011) studied German pork consumer behavior, which provided insight to actual consumer use of meat labels and grading systems. Customers were asked questions based on the label on the pork they had just purchased, and responses were compared to actual label information on the product. This design was useful in determining if consumers used the product labels to choose their products and the perceptions that they gained from those labels. The researchers found that 16% of consumers surveyed used labels to determine which pork products to buy and 30% responded that they knew the origin of their pork from the label. However, less than half of those that indicated they used labels were able to identify the seal on the product they had purchased. Based on these conclusions, consumers in this study may be making conclusions by piecing together facts from a variety of sources and intuitions that may skew what they believe they know about their purchased meat products.

In determining the factors consumers consider most important in their beef purchase, Mennecke et al. (2007) used a conjoint analysis study and found region of origin to be most important to consumers. Respondents were asked to prioritize a list of factors and then asked to compare factors randomly using conjoint analysis which is a methodology that determines the value that respondents place on different attributes of a product. Based on this, consumer's

priorities were determined to be the following: cattle breed, feed type (i.e. grass- or grain-fed), and beef quality. Some of the least important factors included cost of cut, hormone use, and guaranteed tenderness. Additionally, Mennecke et al. (2007) explored beef product perceptions based on education and knowledge; animal science undergraduates selected product attributes that leaned towards beef quality, while business students tended to select based on cost and traceability. Student responses were compiled and compared to a national sample of consumers to decide what most Americans would consider as an “ideal” beef product. This was determined to be a product that is locally grown, mixed-fed (grass and grain), and choice-graded. Comparing the responses of animal science and business students allowed for insight into the role that specific industry knowledge and expertise plays in determining the perception and preferences that are indicated by consumers. Students that were more knowledgeable of beef production and products chose differently than their business counterparts.

Consumer’s food experience may not always match their expectations regarding the methods associated with the development or production methods employed to grow or raise the products. In a study on genetically modified organism (GMO) labeling and consumer perceptions, Grunert and Bech-Larsen (2004) tested consumer opinions by encouraging a positive sensory experience with GMO foods and determining if this could change their feelings. Consumers were asked to indicate their preferences for various cheeses that were chosen with the intention that GMO cheese would have a palatable superiority to traditional cheese. This was designed to determine if the subjects had the potential to enjoy the GMO cheese more than the traditional cheese. When participants had a positive experience with GMO cheese, they developed a less negative opinion of GMO food production. Control groups that had not tasted the GMO cheese indicated a taste preference for non-GMO food production and viewed the technology in a negative light (Grunert & Bech-Larsen, 2004).

2.1.2 Producer Perspective

While consumer interest and concern about livestock animal welfare is well documented it is important to also look at the work done by the livestock industries to continuously improve animal welfare. While cattle producer attempts to improve animal welfare and inform consumers of the steps taken to ensure cattle are responsibly raised is a growing area of research, this review will look at what is already being done by agriculture producers to address consumer concerns, how well industry standards are already being implemented, and areas that the industry might be able to improve for both the animals and consumers.

Some research indicates that agriculture producers may already be addressing consumer concerns but just need to improve communication to consumers about how their animals are raised. Wolf and Tonsor (2017) looked at consumer WTP and dairy producer willingness-to-supply (WTS) for various on farm production practices and found that consumers showed a positive WTP for the practices they included and that most dairy farms already implemented the practices that consumers were WTP for. A key exception that the dairy farms were missing were employee training and third-party certification. This is further justification for this thesis to explore what kind of verification programs cattle producers would be willing to participate in. In fact, Wolf and Tonsor (2017) found in some cases, such as tail docking, consumers were WTP much higher amounts per gallon of milk than dairy producers indicated they needed in order to change their practices. Consumers were WTP \$0.49 / gal while dairy producers indicated they needed \$0.04 / gal. This could be indicative of value-added opportunities for practices that are either already in place or readily achievable.

In looking at how well cattle producers in Kansas implement the BQA program, Barnhardt et al. (2014) found that 78.6% of feedyards met the criteria outlined in the BQA Self-

Assessment tool at an acceptable level. Fifty-six Kansas feedyards volunteered to be evaluated in the study to determine their level of implementation of the BQA program and potential success in completing an assessment program based on BQA. It is important to note that this study was conducted on feedyards that volunteered to participate in the study, meaning they may have already been aware of criteria in the assessment or confident that their implementation of BQA practices was already at an acceptable level. Additionally, while practices were considered to be acceptable at a large percentage of the evaluated facilities, documentation was unacceptable on 33.9% of participating feedyards. Only 19.6 percent of yards were acceptable in all of the categories evaluated: documentation, cattle handling, and pen observations. This study provides evidence that while the BQA program provides a framework and sets industry standards through education industrywide verification programs could dramatically improve implementation of BQA practices.

Grandin (2018) explored why welfare problems continue to persist, even though in many cases there are already well-established practices that can improve welfare. Poor practices persist according to Grandin because of three reasons: a marketing chain that does not hold producers accountable for losses when poor welfare affects others in the supply chain, or the final meat product; a systemic failure to measure and assess chronic welfare problems; and repetition of old mistakes that make bad become normal.

This thesis will look at producer willingness to measure and assess implementation of animal welfare practices which directly addresses the identified failure to measure and assess problems. In some cases, these failures may be a result in poor education to producers about solutions to improve welfare. Grandin (2003) found four areas that create an environment that leads to a successful transfer of knowledge leading to improved behavior. First, results of research need to be communicated outside of the academic community; if livestock producers

are unaware of new practices that can improve welfare, then it won't be effectively implemented across the industry. Second, new practices should be implemented by operations that believe in the research. This will help to ensure there is industry support for the practices. Third, early adopters should be closely monitored to be sure they are implementing new strategies correctly to avoid adverse implementation that might decrease welfare. And finally, Grandin advises that new technology should not get tied up in patent disputes.

When looking at implementation of animal welfare strategies from an industry perspective there is improvement that can be made. While in some cases where farm areas are already implementing practices that directly address consumer concern, there are clear areas of improvement around verifying animal welfare practices. Additionally, to address consumer concerns more proactively there needs to be more robust communication about new and improved animal welfare practices towards producers; otherwise, consumers may take other approaches to ensure their concerns are being addressed. Consumer interest in animal welfare not only comes from their choices at the grocery store or restaurant, but it also comes to light through regulation. In some cases, consumers or the public vote on various regulations addressing their concerns. In other cases, their representatives use legislation to address animal welfare concerns of their constituents.

2.2 Animal Welfare Regulatory Policies and Impacts

Animal welfare perceptions extend beyond what happens on the farm or at the grocery store. In some cases, it has been addressed at the ballot box, leading to government regulation. As animal welfare concerns become mainstream, various groups have looked for ways beyond the supply chain to influence and dictate how animals are raised. In particular, two California ballot initiatives have led the way to how this may take place in other areas in the United States

moving forward. These ballot initiatives not only dictate how farmers raise their animals but have widespread impacts on consumer choice and economic impacts to farmers and consumers.

California has been the epicenter of animal welfare regulation in the United States as a result of two significant ballot measures: Proposition 2 and Proposition 12. Proposition 2 was passed in 2008 by California voters and requires the confinement of animals in a manner that allows them to turn around freely, lie down, stand up, and fully extend their limbs (*California Proposition 2, Farm Animal Confinement Initiative, 2008*). This law took effect in 2015 and included a provision that egg products could not be sold in California that were raised in settings that did not comply with the law, even if raised outside of California (*California Proposition 12, Farm Animal Confinement Initiative, 2018*). This has led to the modification of housing systems across the United States, proving to some the effectiveness of animal welfare policy initiatives even though there were published studies about the negative economic impacts the regulation would cause for agriculture (*Proposition 2, n.d.*). Sumner et al. (2010) found that this regulatory change increased cost to produce a dozen eggs by \$0.31 per dozen. Additionally, they found that implementation of Prop 2 was likely to curtail conventional egg production in California and increase the importation of eggs to the state. These impacts demonstrate just how impactful animal welfare regulations can be. Even though studies showed the consumer would end up paying up to twenty percent more for eggs to cover the costs associated with these new production regulations, the ballot measure still passed with over 63 percent of the vote (*California Proposition 2, Farm Animal Confinement Initiative, 2008*). This wide-spread support indicates consumers were willing to pass regulation that would cost them more at the grocery store.

Proposition 12 was passed in 2018 and built upon Proposition 2. Under the law, veal calves are required to have 43 square feet of useable floor space per calf, and sows will need to

have a minimum of 24 square feet of useable floor space and laying hens will need to be cage-free by 2022 (California Department of Food and Agriculture, 2019). Animal agriculture groups have challenged the law, indicating that the law does not actually further animal welfare but so far have failed in court (*Court Blocks Injunction Request over Calif. Animal Housing Law*, 2020). These landmark pieces of animal welfare policy show that consumers, at least those who vote, are willing to support regulatory efforts that are perceived to improve animal welfare, even if they are not economically beneficial to the consumer. This could serve as an example of regulatory efforts that could impact the beef cattle industry.

In response to increased animal welfare regulation in certain states, and the rise of animal activism, some states have passed “ag-gag” laws. These laws are intended to prevent animal activists and others from withholding animal abuse information from authorities but release video footage to the public to impact perception of production methods. While the goal of these laws is to reduce the chance of negative opinions forming around on-farm production practices, Robbins et al. (2016) have shown that the laws might only be making consumers and the public more skeptical of on-farm animal welfare. In fact, the research shows that the passage of “ag-gag” laws increased support, among the general public, for animal welfare regulations.

The research conducted in this thesis will attempt to understand if cattle producers are more inclined to participate in animal welfare verification programs if it prevents future government regulation or legislation. To understand how future regulation might impact the cattle industry in the future it is important to cover animal welfare regulation that is already occurring; the beef cattle industry has largely remained untouched from such efforts.

2.3 Farmer Participation in Value-Added Programs

Shifting consumer demands and perceptions are not a new, or novel, concept; this happens in all industries and adaptation is necessary for sustainable business models. In order to remain fiscally viable, businesses need to assess what products offer enough value to increase, or at least maintain, consumer willingness-to-pay (WTP). This assessment of current research will demonstrate how specific product attributes can serve as cues that enhance WTP. Additionally, producers need to determine how the costs associated with participation in value-added programs may fit into their business. This review will show how participation might look different for some in order to access new markets while improving the financial sustainability of their business. Finally, government plays a unique role in agricultural markets and it is important to understand how that role may impact the ways in which producers participate. We will see how in some cases cattle producers are even willing to take a discount to keep government out of their business.

Value-added products are only effective and potentially profitable if consumers show a WTP increased prices that offset higher input and production costs. A consumer's WTP an increased price for products is a function of multiple factors. Choice experiments, like the one used by Gao and Schroeder (2009), can determine the changes in WTP that occur between product attributes and their interactions with one another. In a choice experiment, respondents were asked to select beef steak products that they would purchase based on price and a changing number of attributes. For example, some of the products includes three attribute claims while others had up to five. The methodology of Gao and Shroeder (2009) also used the presence of "cue" attributes (attributes that have been proven to be of interest to consumers), like *U.S. Product*, to determine effects on WTP. By developing a series of choice experiment questions with three, four, and five attributes, it was determined that adding additional product

attributes to “cue labels” affected consumer WTP more than multiple independent attributes. The study also found that consumer WTP did not change consistently with the number of attributes applied to each beef steak; however, it was also determined that the variance in WTP decreased when more information or attributes were added. This indicates that additional attributes may not overwhelm consumers but provide a more informed decision that leads to a reliable premium. Understanding how consumers use labels in determining WTP provides insight to consumer’s ability to process information and make a decision. Gao and Schroeder (2009) were unable to determine which product attribute was most powerful in affecting consumer opinions of a beef steak product, especially as more attributes were added.

These studies that look to understand consumer habits are important because they impact farmer participation in value-added marketing schemes. A study out of Alabama, conducted in 2011, looked at produce growers and their participation in maximizing the profitability of their produce. The study found that a majority of the farmers in the study were selling produce directly to consumers in some fashion either whole or as a value-added product. Of those farmers, only 33 percent were developing value-added products (e.g., jellies, dried fruit mixes, etc.) and 23 percent were interested in creating value-added products to sell their otherwise unsellable produce (Alonso & O’Neill, 2011).

In Belgium, Verhaegen and Van Huylenbroeck (2001) looked at the costs and benefits of farmers participating in six different innovative marketing channels. Their findings found that on an individual producer basis the benefits did not tend to outweigh the costs, but through cooperatives the producers were able to create marketing and labeling schemes that could provide positive benefit to participating producers. This is a model of finding value-added schemes that cattle producers may develop that include verification steps to participate in creative marketing schemes.

In 2001, Hudson and Jones study entitled *Willingness to plant identity preserved crops: the case of Mississippi soybeans* used a factorial designed survey on soybean farmers in Mississippi. This study served as an initial survey model for our study on cattle producers' willingness to participate in BQA verification programs. Using a probit model to evaluate the responses to their survey, Hudson and Jones (2001) found that the use of premiums can be used to entice producers to grow non-traditional crops, which allows us to theorize that cattle producers could likely be interested in participating in verification programs if there is enough of a premium incentive. We explore if other factors could also entice cattle producers to participate, like a guarantee of reduced government regulation.

A 2018 survey of cattle producers looked to determine willingness to supply and willingness to pay for cattle traceability (Tonsor, Mitchell & Schulz, 2019). Similar to research conducted by Hudson and Jones (2001), this study found that cattle producers reacted to premiums and discounts for participating in traceability programs, particularly in the feedlot segment of the industry (Tonsor, Mitchell & Schulz, 2019). This study also provides key information about the role government might play—including that cow-calf producers would be willing to accept a discount of \$9.74/head, and feedlot producers up to \$22.52/head to avoid participating in a government managed traceability system. These results further reinforce our hypothesis that cattle producers are likely to positively respond to premiums for participating in value-added programs and would be willing to accept lower premiums if it meant a lack of government regulation or intervention.

In the cattle industry, premiums are constantly changing with the demand for products and production methods as well as the age and growth stage of the cattle. Dennis (2020) found that non-hormone treated cattle (NHTC) fetched a premium of \$20 per cwt and all-natural premiums could be greater than \$25 per hundred weight (cwt). These prices however fluctuate

due to beef supply and demand as well as slaughter capacity and other market factors including seasonality, weather, and national herd size. Certified Angus Beef (CAB) labeling was the most consistent over the last ten years with premiums between \$3 and \$5 per cwt. Some of this consistency can be attributed to program management and the steady increase in both supply and demand for this specific label. These various levels of premiums served as a baseline in our survey to establish premium levels.

While it has been established that consumers are not always willing to pay for additional product attributes, it would be to the disadvantage for industries to disregard consumer interest in product attributes because there are niche markets and consumers that are looking for products with various value-added attributes (Umberger et al., 2009; Thilmany, Umberger & Ziehl, 2006; Loureiro & McCluskey, 2000; Carlsson, Frykblom & Lagerkvist, 2007). Without understanding what consumers' desire, meeting customer demand is challenging but premiums and discounts can incentivize or dissuade cattle producers from adhering to various production methods and standards.

Chapter 3

METHODOLOGY

3.1 Procedures for Data Collection

Data were collected using a nationwide online survey of cattle producers. The survey was conducted using the online survey tool developed by SurveyMonkey. The survey, which is provided in Appendix A, was delivered via email to 7,051 cattle producers through a list provided by the National Cattlemen’s Beef Association; the list included both members and non-members of the association. The email asking producers to participate is provided in Appendix B. The survey was opened on April 15th, 2021 and closed April 30th, 2021 with 424 qualified respondents. The same email invitation was sent twice, once when the survey opened on April 15th and again on April 26th to generate additional responses. Prior to dissemination, five cattle producers were asked to review the survey for accuracy in terminology and clear understanding. These producers provided no significant changes to the survey. Respondents were screened to determine if they could make operational decisions or had influence in operational and business decisions. Qualified respondents were those that identified as owners or managers of cattle operations.

The survey was structured into the following four main categories: demographics, current BQA status and sentiment, current participation in value-added verification programs, and interest in participation in a theoretical animal welfare verification program based on Beef Quality Assurance.

Demographic questions and response selections were based on the 2017 Census of Agriculture. Respondents were asked their age, sex, state, industry segment(s), and herd size. Because some operations take place in multiple states, respondents were asked to select the state that they consider to be their primary state of operation. Multiple industry segments were eligible to be selected as some operations involve more than one industry segment. The options included the following: Seedstock, Cow-Calf, Stocker/Backgrounder, Feedyard, or other. These segments are generally recognized as the major segments of the cattle industry and are known as the “Beef Lifecycle” (University of Arkansas, Division of Agriculture Research & Extension, 2016). Options for herd size were the following in total head of cattle: 0-9; 10-19; 20-49; 50 – 99; 100 – 199; 200 – 499; 500 – 999; 1,000 – 2,499; 2,500 – 4,999; and 5,000+. These specific ranges were selected to match the ranges that were reported on in the 2017 Ag Census (USDA NASS, 2019).

The survey was designed to also determine if respondents were currently BQA certified or if they had been in the past. Respondents were asked to rate their opinion of the BQA program on a Likert Scale of 1-5. Respondents indicating an opinion of “1” had a “strongly negative” opinion, “2” was “negative”, “3” corresponded with a “neutral” opinion, “4” was “positive, and 5 indicated a “highly positive” opinion of the BQA program. The Likert Scale is a commonly used scale in survey research to indicate how strongly a respondent feels about a topic or how strongly they agree or disagree with a statement. The scale has a distinct neutral position, in this case 3, and two extremes, 1 and 5 for the purposes of our survey (Joshi et al., 2015). Respondents were also asked about their level of understanding of BQA program principles and if they had implemented the program self-assessments on their operation. Gauging the current BQA certification status, sentiment, and engagement in the BQA program

was important to include to see if this influenced their decision to participate in a theoretical animal welfare verification program based on the BQA program.

To discover what levels of current participation respondents had in value-added verification programs, they were asked if they participated in any third-party verification programs. Those who responded “yes” were guided through a series of questions asking which programs and what level of premiums they received for participating. See appendix A for more details.

The final section of the survey asked respondents to indicate their interest in participating in a theoretical animal welfare verification program based on BQA. Each situational question included four components. First, the question presented what level of cost share the buyer of cattle would contribute to participation in the program. Options included 0 percent, 50 percent, and 100 percent. These levels were selected to provide potential scenarios with no cost share, partial, or full funding for participation. Second, the scenario included what level of premium the producer could expect by participating in the program. Different scenarios were set in \$5 increments per hundredweight (cwt) from \$0 - \$5 per cwt up to “greater than \$25” per cwt. These increments were determined from the premiums that were reported by Dennis (2020) and set to even increments for ease of interpretation by respondents. Next, the mode of the audit that would verify adherence to BQA standards. This component included three different possibilities: self-audit, 2nd party audit, and 3rd party audit. These modes were selected based on current systems of auditing and assessment within the beef cattle industry including self-assessments or self-audits, 2nd party evaluations where the operations works with an outside entity with a direct relationship to the farm (i.e. herd veterinarian), and 3rd party audits that have no relationship with the operation. Finally, each situation indicated if participation would or would not prevent future government intervention on animal welfare practices. This

category was included to determine the impact of animal welfare regulation as a motivator for producer participation.

These components created unique situations for respondents to respond yes or no on their willingness to participate. An example of how this question was asked is provided:

Please respond if you would participate in a verification program as outlined below:

- The verification program will be funded by the buyer of your cattle at 100 percent of the cost of the service.
- If you participate in this program your cattle will be eligible for a premium of between \$20 and \$25 per cwt.
- Verification of adherence to BQA standards will be accomplished through a 3rd party audit.
- Participation in this verification program will not prevent future government intervention on animal welfare practices.

This question included multiple levels of variables for each of the four components. Because of the large scale of various scenarios given, the number of categories and levels, it was determined that a fractional factorial design would be utilized for this study rather than a full factorial design. A full factorial design, like Hudson and Jones (2001) used, would have generated 108 unique scenarios. Given the expected response rate for this survey it was determined that each scenario may not have collected enough data to provide sufficient results. Using a fractional factorial design allows for a more reliable result by increasing the number of reactions to each specific scenario.

JMP software was used to determine different combinations of factors and levels that created the scenarios to generate reliable results and determine the effects of each factor level on respondent's willingness to participate. Because the factors had various levels, JMP's Design

Of Experiments (DOE) Custom Design feature was used. Each factor (cost share, premium, mode of audit, and government intervention) was input with the corresponding number of categorical levels per factor. A single response factor was used, “Y” which would indicate the response to each generated scenario. Each factor was selected as Covariate Factors, which then generated all of the possible scenarios. The minimum was selected for number of runs, this generated 12 unique scenarios that were presented to respondents in the survey (JMP, 2019). The minimum number of runs would provide enough data for JMP to determine the effects of each variable level on the willingness of a respondent to participate in a given scenario.

Table 1 shows the scenarios that were presented to survey respondents. Each factor is listed in the columns, with the level of that factor that was included in each scenario. Each scenario can be read by going across the row to see what levels of each factor were included in the scenario.

Table 1: Theoretical Verification Program Treatments

Scenario	Cost Share (0%, 50%, 100%)	Premium (\$/cwt)	Mode of Audit (Self, 2 nd party, 3 rd party)	Government Intervention (will prevent, will not prevent)
1	100%	\$20 - \$25 / cwt	3 rd party	Will not prevent
2	50%	\$5 - \$10 / cwt	2 nd party	Will not prevent
3	0%	\$20 - \$25 / cwt	Self	Will prevent
4	100%	Greater than \$25 / cwt	Self	Will prevent
5	100%	\$5 - \$10 / cwt	3 rd party	Will prevent
6	50%	\$10 - \$15 / cwt	Self	Will not prevent
7	100%	\$15 - \$20 / cwt	2 nd party	Will not prevent
8	50%	\$0 - \$5 / cwt	2 nd party	Will prevent
9	50%	\$15 - \$20 / cwt	3 rd party	Will prevent
10	0%	Greater than \$25 / cwt	3 rd party	Will not prevent
11	0%	\$0 - \$5 / cwt	Self	Will not prevent
12	0%	\$10 - \$15 / cwt	2 nd party	Will prevent

3.2 Procedures for Data Analysis

Demographic and BQA status and sentiment data were nominal, ordinal, rational, and categorical in nature. Responses were analyzed using various descriptive statistics to provide insight into the nature of the survey respondents. Frequencies were performed on relevant data to determine if there were any distinctive relationships between specific groups of respondents and their BQA status or sentiment, as well as their tendencies to participate in value-added verification programs.

Frequency distribution, simply stated as the number of respondents that fit in each category, were used to assess the profile of survey respondents and if they reflected known industry demographics as established in the 2017 Census of Agriculture (USDA NASS, 2019).

To test the hypotheses that cattle producers would need a premium of greater than \$10 / cwt or a guarantee that future regulation would be prevented, the results were computed using JMP. Each of the 424 respondents answered yes or no indicating their willingness to participate in the twelve scenarios generating a total of 5,088 responses. To analyze the fractional factorial model designed for the survey all responses were input as the Y factor, otherwise known as the response. To determine the effects of each factor level a Standard Least Squares model for Effect Screening was run. The standard least squares model generates a linear regression by which the intercept indicates if a given scenario includes enough positive effect that the respondent is willing to participate, scenarios that combined factors with a sum total of their effects greater than the intercepts were likely to be accepted by respondents.

By analyzing the individual effects of each factor level, we can determine which factors are necessary to include in a successful program that cattle producers would be willing to participate for animal welfare verification. This method, using JMP to design and analyze a fractional factorial design survey, has been employed in a number of studies—in agriculture and beyond (Ye et al., 2000; Kenett and Zacks, 2021; Chen et al., 2020).

Chapter 4

RESULTS

4.1 Demographics

The survey was sent out through email to 7,051 potential cattle producers and generated 424 qualified responses, resulting in a response rate of 6.01 percent. To be considered a qualified response, respondents had to agree to the terms of the survey and indicate that they were an owner and/or manager of a cattle operation. Responses were received from every state except Alaska, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, Rhode Island, and Vermont. This was not unexpected given the lower levels of cattle production in the states that were not included (USDA NASS 2019). A breakdown of the states by their total number of responses and percentage of total response is provided in Appendix C. It is important to evaluate the responses based on states to verify that the sample adequately captured important regions and states in the cattle industry, without completely neglecting other areas. Texas, Nebraska, Kansas, and Kentucky had that largest number of responses. This reflects the current state of the industry as Texas, Nebraska, and Kansas have the highest cattle numbers and Kentucky is the largest cattle producing state east of the Mississippi River based on USDA NASS (2019) data.

Results from the survey show that the most common herd size response was between 50 and 99 head, with 19.1 percent of respondents indicating this was the size of their herd. This was followed by 100 to 199 and 200-499 both at 16.27 percent, 20 to 49 at 15.33 percent, and 500-999 at 12.03 percent. Further breakdown of the herd sizes represented by respondents is provided in Figure 1. The higher response numbers from smaller herds were not unexpected as

the 2017 Ag Census indicated the average cattle herd size at 43.5 head (USDA NASS, 2017). The results of our survey were marginally higher than the national average but expected given operators of larger herds are more likely to be involved in industry activities and those that participate in the cattle industry as a primary income are more likely to respond to industry surveys.

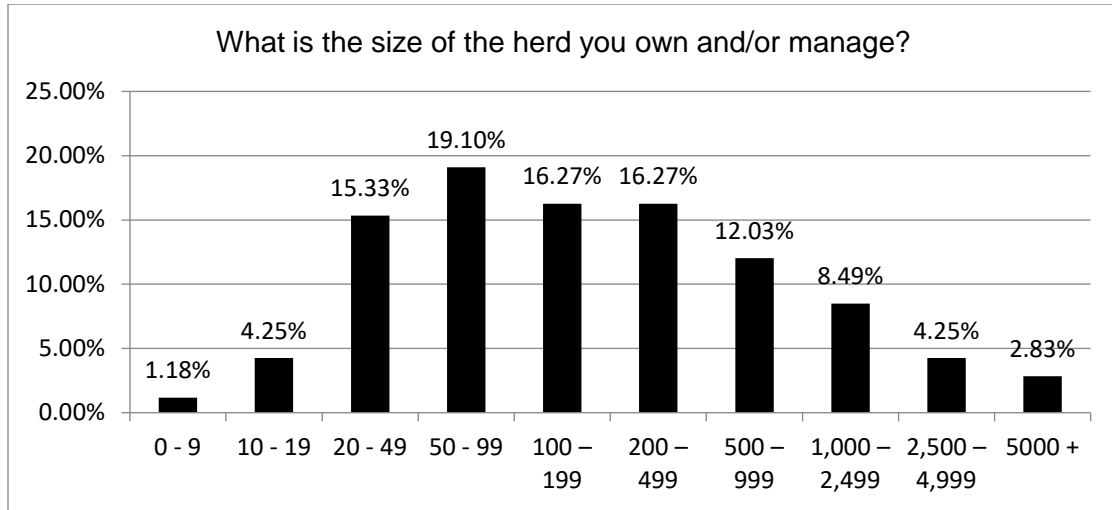


Figure 1: Herd Size of Respondents

Figure 2 shows that the most common segment of the cattle industry represented by respondents in the survey was the Commercial Cow-Calf segment with 70.21 percent of responses. This was followed by Feedyard at 21.04 percent, Stocker / Backgrounder at 20.33 percent, and Seedstock at 4.96 percent. One respondent indicated “other” and provided a response that they were a dairy producer. Respondents were able to select all segments that applied to their operation. Some cattle producers are involved in multiple industry segments, causing the total percentage of responses to be greater than 100 percent. This led to a variety of combinations, with the most common combination being Commercial Cow-Calf and Stocker / Backgrounders (9.6 percent). Operations that identified as Commercial Cow-Calf made up the majority of all responses at 54.95%. Appendix D provides a full breakdown of all the types of operations, combinations thereof, and response levels for each.

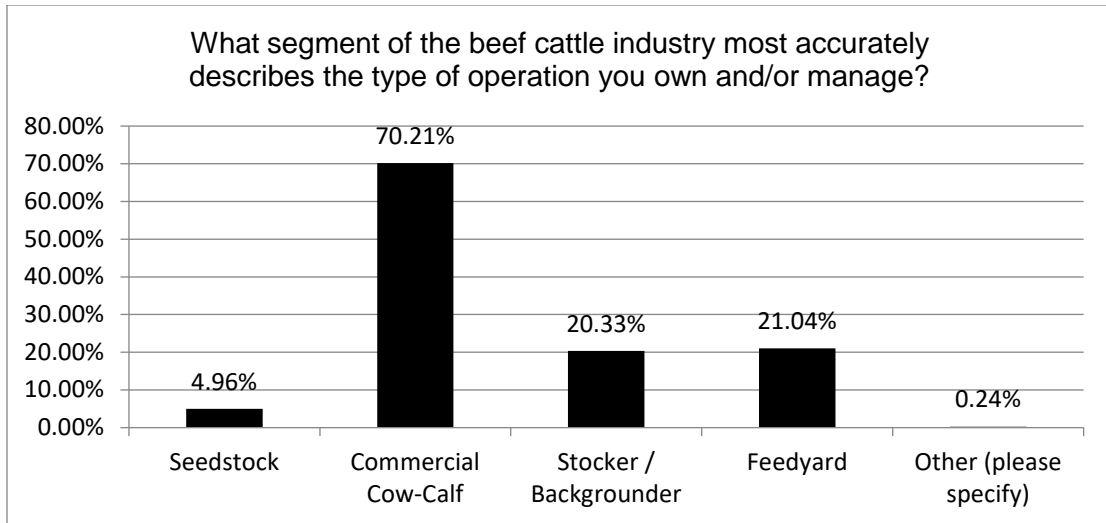


Figure 2: Industry Segment Representation of Respondents

Respondents skewed heavily male, at 85.38 percent of all surveys. This was expected given the dominance of men being the primary owners and managers of beef operations in the United States. In the 2017 Ag Census, women were 29.13 percent of all farm principal operators. Women reporting specifically regarding their involvement in cattle farms made up 28.9 percent of all women reported (USDA NASS 2019). According to data from the National Cattlemen’s Beef Association (NCBA) (n.d.), 9 percent of cattle operations are operated by women. Given the percentage of responses from women falls between the NCBA data and the 2017 Ag Census we believe that women were representatively captured in the data set.

Figure 3 shows that most of the respondents, 26.4 percent, were over 65 years old, 66.74 percent were between 35 and 64, 12.26 percent were 35 to 44, and 6.84 were under 34 years old. Similarly, in the 2017 Ag Census 34 percent of farm producers were over 65, 58 percent were between 35 and 64, and 8 percent were younger than 35. We expect that our response rate of producers over 65 would be lower than the overall population of farm producers because of the online survey format. If the survey had been mailed, we would expect the responses to capture an older audience.

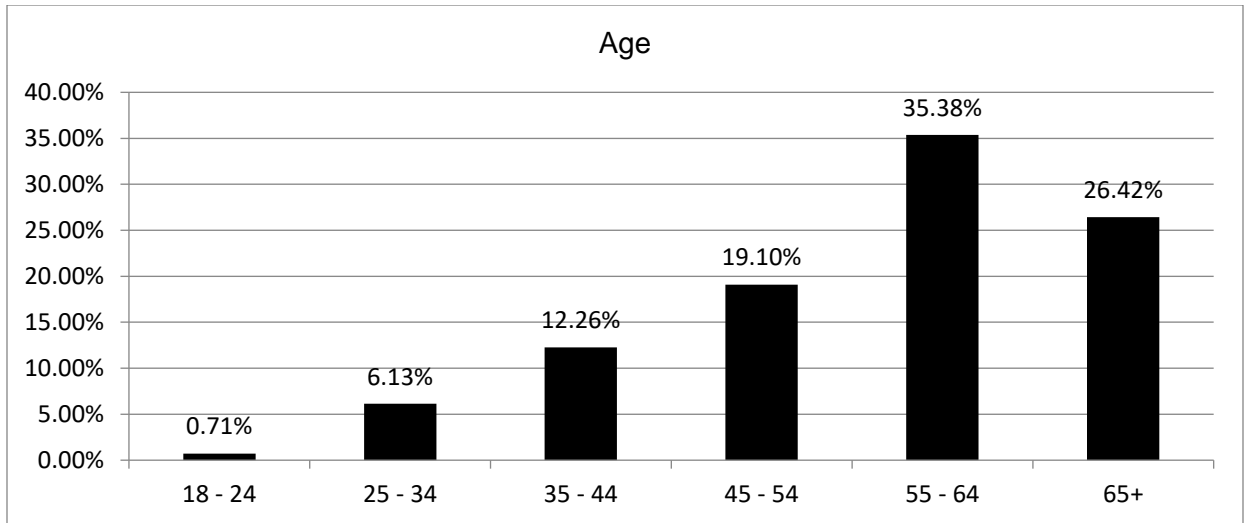


Figure 3: Age Breakdown of Respondents

4.2 BQA Participation and Sentiment

With respect to their current BQA certification status (Figure 4), 78.54 percent of respondents indicated that they were currently BQA certified. Because the respondents to this survey are likely more involved in industry activities than those who did not receive the survey due to their involvement in a trade association, we expect this percentage was higher than what would be seen in a survey of the entire cattle industry. The 21.46 percent of respondents who indicated they were not certified were asked if they had been certified previously. To this follow-up question, 81.32 percent indicated they had been previously BQA certified. This speaks to the prevalence of the BQA program within the industry as a whole. This was also reflected in the question that asked, “Are you aware of the BQA program principles and standards” to which 95.75 percent of respondents said “yes”. Interestingly, female respondents were more likely to be BQA certified, with 87.1 percent of females who responded claiming to be currently BQA certified compared to 77.07 percent of males.

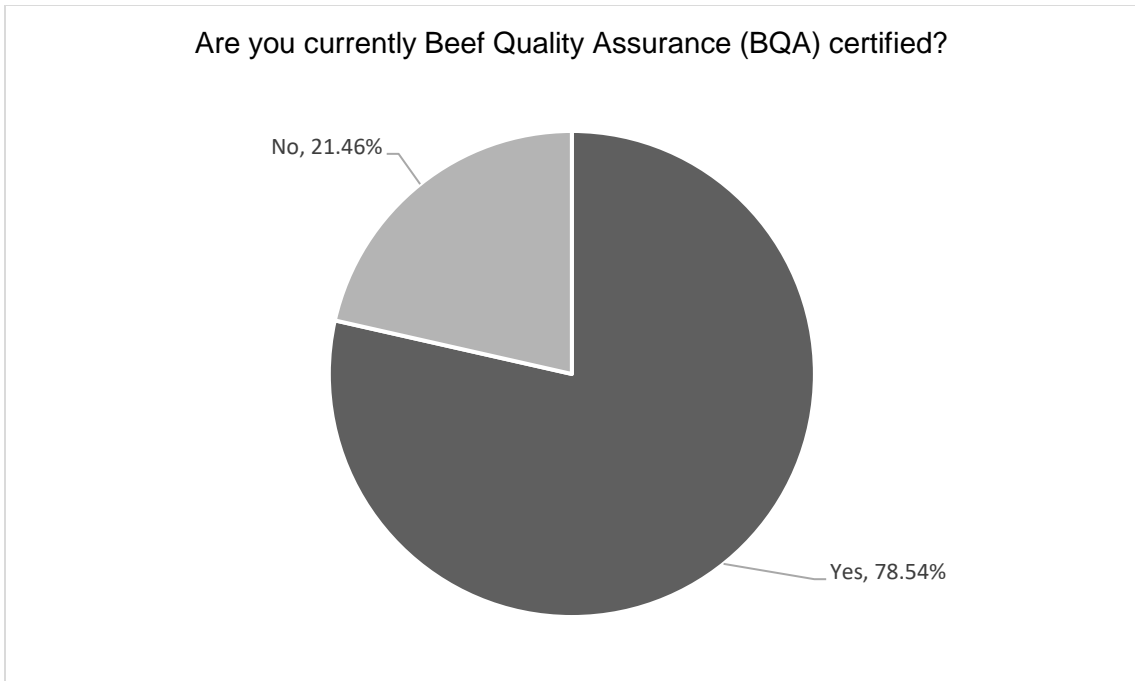


Figure 4: Current BQA Status

The larger the herd size the more likely the respondent was to be BQA certified, as shown in Figure 5. In fact, respondents that owned or managed herds larger than 2,500 head were all BQA certified. This was likely because larger herds are more likely to be represented by the feedyard segment of the industry which has seen BQA certification become mandatory to sell cattle to specific meat packers. Also, larger herd size is likely to indicate that the operation could devote additional resources to training programs for their employees in the form of BQA training. This could be a positive outcome for the cattle and beef industry. Although a lower percentage of total producers might be BQA certified, a higher percentage of cattle are likely being raised by BQA-certified producers.

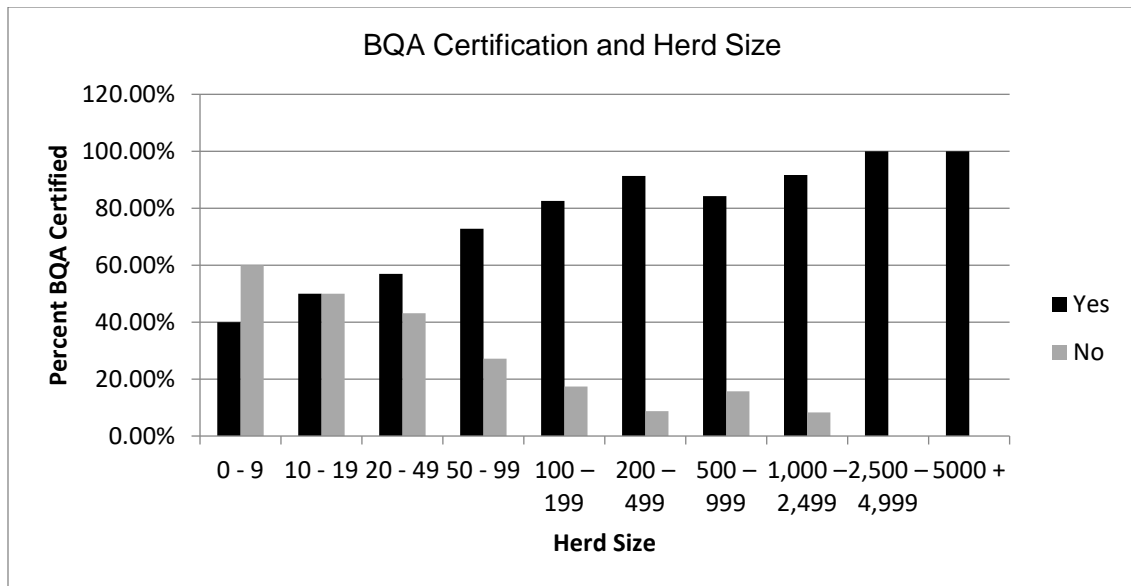


Figure 5: BQA Certification Rate by Herd Size

To determine how positively or negatively the population felt about the BQA program, respondents were asked to rate their opinion of the BQA program on a 5-point Likert scale with 1 indicating a strongly negative opinion and 5 representing a highly positive opinion. The average response of all respondents was 3.5. While this alone would indicate that the population did not have very strong positive or negative opinions of the BQA program, it should be mentioned that 92.42 percent of all respondents rate the program as a 3 or higher. Thus, indicating that overall opinion was either positive or neutral. Figure 6 shows the distribution of responses related to producer opinion of the BQA program.

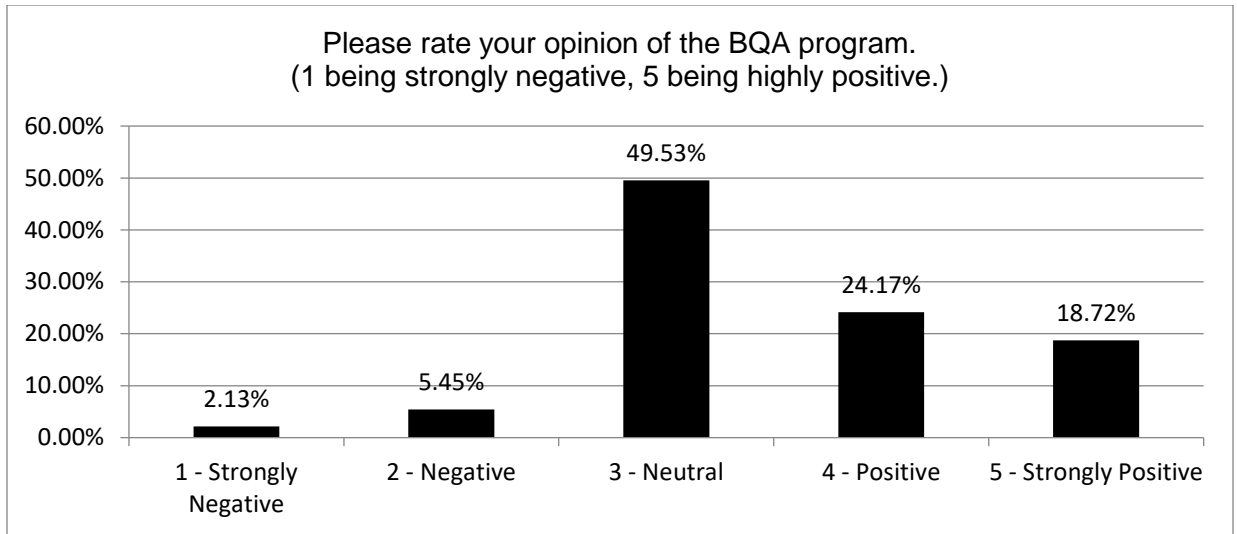


Figure 6: Opinion of the BQA Program

The survey also asked respondents to indicate if they had completed a BQA Self-Assessment of their operation. Ultimately, the goal was to determine if BQA certified producers or those that had completed a BQA Self-Assessment were any more likely to be willing to participate in a theoretical BQA animal welfare verification program. Of all the respondents, 20.85 percent indicated that they had completed a BQA Self-Assessment. When asked if they already participated in a third-party verification program, 18.4 percent of respondents indicated “yes”. However, respondents that indicated they were BQA certified were much more likely to participate in third-party verification programs as illustrated in Figure 7. BQA certified respondents participated in a third-party verification at a rate of 22.52 percent, compared to just 3.3 percent of non-BQA certified respondents.

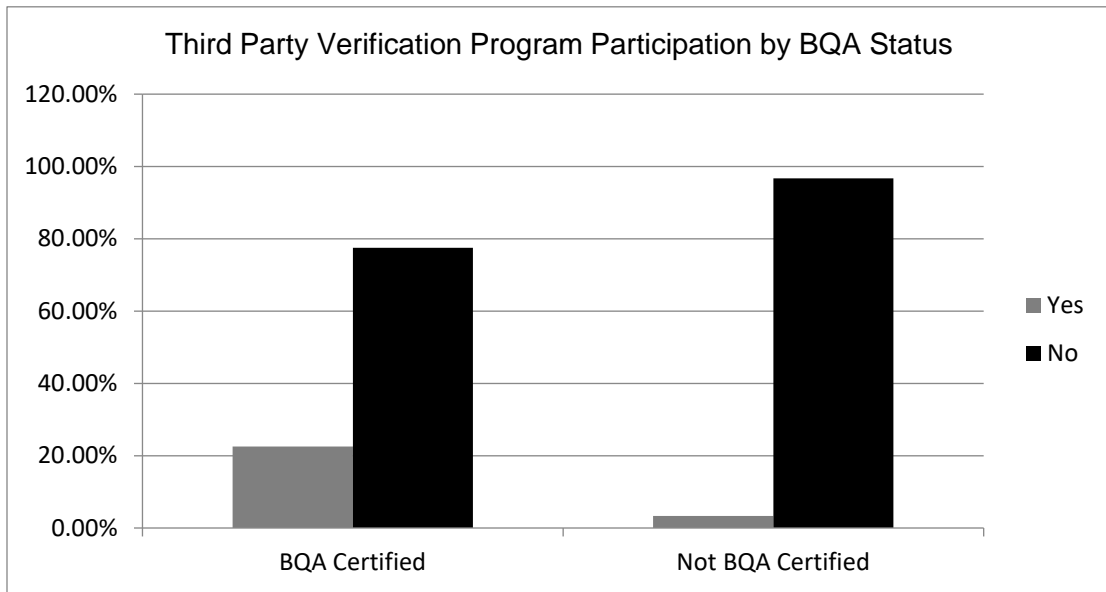


Figure 7: Third Party Verification Participation Rates Based on BQA Certification Status

The most common verification programs were the Verified Natural Program and Non-Hormone Treated Cattle (NHTC), followed by a number of programs with lower amounts of participation. Verified Natural made-up 44.87 percent of those respondents who are currently participating in a program. NHTC participation was the second most common program with 35.9 percent of respondents currently participating in verification programs indicating as such. Other programs including Global Animal Partnership (GAP), BeefCARE, and American Grassfed Association, made up smaller percentages of participation. A full breakdown of response frequencies is provided in Figure 8. Of those that indicated they participate in a third-party verification program, 96.15 percent of respondents were currently BQA certified. These data indicate that cattle producers that are BQA certified are much more likely to participate in third-party verification programs.

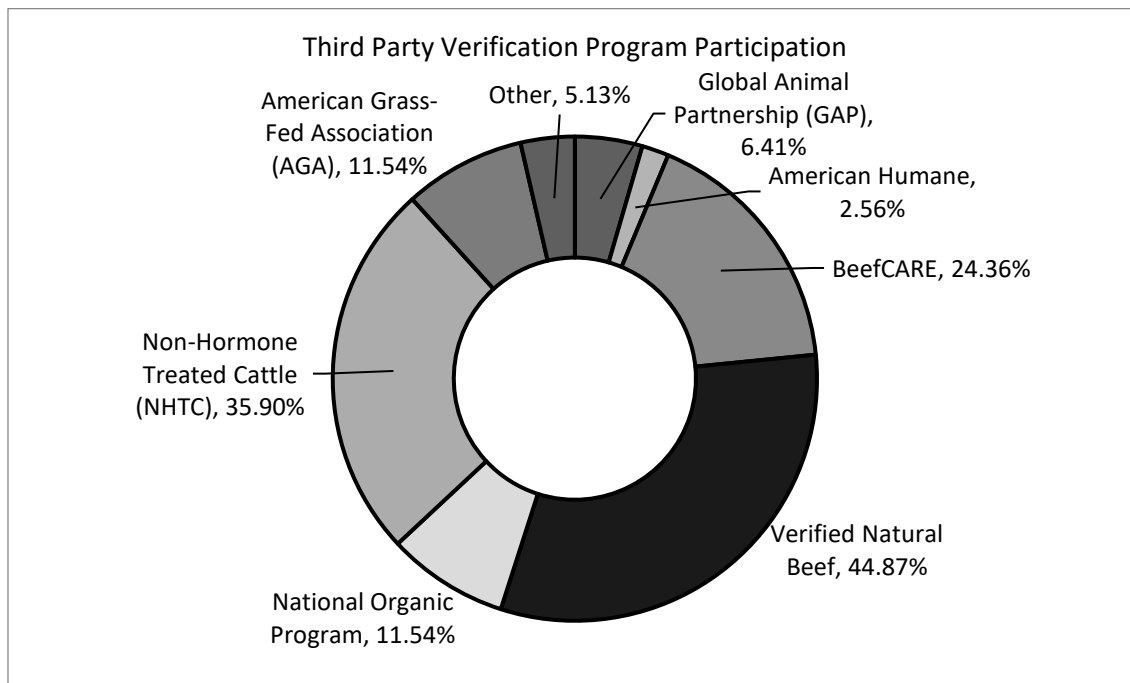


Figure 8: Participation Rates for Select Third Party Verification Programs

4.3 Willingness to Participate in an Animal Welfare Verification Program

To determine the most feasible model of a theoretical animal welfare verification program, based on BQA, respondents were asked if they would participate in various structured programs, as outlined in Chapter 3. Based on their responses it was determined that Cost Share and the Mode of Audit had the most outsized effects on their responses with Premium being a secondary effect and Government Involvement having the smallest effect on their choice.

Each program attribute included various levels: cost share, which indicated how much of the cost associated with participation the producer could expect to be paid for by the cattle buyer; premium, indicating the increased amount the producer could expect to receive over non-verified cattle; the mode of audit, telling how the audit would be conducted and by whom; and, government intervention, providing either a guarantee or no guarantee that participation would eliminate the possibility of future animal welfare regulation.

Based on these attributes and levels, it was expected that proposed programs with a higher level of cost share and premium, lower level of audit (i.e., self-audit), and a guarantee of prevention of future regulation would prove to be more favorable. To that end, a breakdown of the twelve variations of programs indicated that proposed programs with all or some of these attributes did in fact generate more positive responses. Table 2 shows the variations of scenarios and is sorted by the percentage of respondents that indicated their willingness to participate in said scenario. The levels of each factor included were also included to show more clearly which factor levels surfaced as being most important to respondents. All scenarios that included 100 percent cost share fell in the top half of the scenarios most appealing to respondents, indicating that full cost coverage was a key motivator for program participation. The two scenarios that included a premium of \$0 to \$5 per cwt were acceptable to the lowest number of respondents. This shows that if an animal welfare verification program was to be considered acceptable by producers, a higher premium was expected. Additionally, of the four scenarios that included self-auditing as the mode of audit, three were in the top four scenarios for willingness to participate. This was also an indication that cattle producers find self-auditing as the most acceptable means of verification. Finally, there was no clear pattern among respondents' willingness to participate and a guarantee of reduced regulation.

Table 2: Positive Responses for Each Proposed Scenario Ordered by Respondents Willingness to Participate

Scenario	Cost Share (0%, 50%, 100%)	Premium (\$/cwt)	Mode of Audit (Self, 2 nd party, 3 rd party)	Government Intervention (will prevent, will not prevent)	Number of Respondents Willing to Participate	Percent of Respondents Willing to Participate
4	100%	Greater than \$25 / cwt	Self	Will prevent	363	85.61%
7	100%	\$15 - \$20 / cwt	2 nd party	Will not prevent	315	74.29%
6	50%	\$10 - \$15 / cwt	Self	Will not prevent	240	56.6%
3	0%	\$20 - \$25 / cwt	Self	Will prevent	238	56.13%
1	100%	\$20 - \$25 / cwt	3 rd party	Will not prevent	223	52.59%
5	100%	\$5 - \$10 / cwt	3 rd party	Will prevent	180	42.45%
12	0%	\$10 - \$15 / cwt	2 nd party	Will prevent	94	22.17%
9	50%	\$15 - \$20 / cwt	3 rd party	Will prevent	69	16.27%
10	0%	Greater than \$25 / cwt	3 rd party	Will not prevent	52	12.26%
2	50%	\$5 - \$10 / cwt	2 nd party	Will not prevent	42	9.91%
11	0%	\$0 - \$5 / cwt	Self	Will not prevent	40	9.43%
8	50%	\$0 - \$5 / cwt	2 nd party	Will prevent	24	5.66%

To find the actual effects of each factor level, all responses were analyzed using a standard least squares model for effect screening, as outlined in Chapter 3. This model made clear that programs that had a 100 percent cost share, meaning the buyer of the cattle would pay for the entire verification program, was viewed very positively by respondents. In fact, this was the only level of cost share that generated a positive effect on their ultimate decision.

Similarly, the only mode of audit that had a positive overall effect was a self-audit. Third-party audits had a strong negative effect on the overall likelihood to participate. This was not an unexpected result as third-party audits are the most intrusive mode of auditing and producers would assume this type of audit would incur the highest investment in time and cost to complete. With regard to how much of a premium producer would be looking for to participate, every premium above \$10 / cwt generated a positive effect. Finally, if the program guaranteed that it would prevent future government intervention it was slightly more likely to elicit a positive response; no guarantee only caused a small negative effect. Table 3 shows the effects of each of the categories and levels on the likelihood to participate in program.

Table 3: Effects of each program category level on likelihood to be willing to participate.

Term	Scaled Estimate		Std Error	t Ratio	Prob> t
Intercept	0.3694969		0.005681	65.04	<.0001*
Cost Share[0]	-0.167453		0.009277	-18.05	<.0001*
Cost Share[50]	-0.099843		0.009277	-10.76	<.0001*
Cost Share[100]	0.2672956		0.009277	28.81	<.0001*
Premium[0 - 5]	-0.245676		0.014297	-17.18	<.0001*
Premium[5 - 10]	-0.095519		0.014297	-6.68	<.0001*
Premium[10 - 15]	0.0727201		0.014297	5.09	<.0001*
Premium[15 - 20]	0.0955189		0.014297	6.68	<.0001*
Premium[20 - 25]	0.1136006		0.014297	7.95	<.0001*
Premium[25+]	0.0593553		0.014297	4.15	<.0001*
Mode of Audit[Self]	0.1918239		0.009277	20.68	<.0001*
Mode of Audit[2nd Party]	-0.021226		0.009277	-2.29	0.0222*
Mode of Audit[3rd Party]	-0.170597		0.009277	-18.39	<.0001*
Government Intervention[Yes]	0.0110063		0.005681	1.94	0.0527
Government Intervention[No]	-0.011006		0.005681	-1.94	0.0527

The Lack of Fit test was used to determine if the overall results of our model were statistically significant and to determine if we could be confident in the model. The least squares model used in this study generated an p-value of less than 0.0001 for the Lack of Fit test indicating that our results were statistically significant. Additional effect tests were conducted on each factor, which determines whether the effects of the parameter are zero. Cost share, premium, and mode of audit all generated p-values of less than 0.0001 for this test indicating

their results were significant and their effects were not zero. However, government intervention generated a p-value of 0.0527 meaning that it was just above the 0.05 necessary to be considered significant at 95% confidence. This was consistent with what was seen in the significance of our scaled estimates.

Each scaled estimate shows to what degree that specific program attribute or category and the various levels had on the respondent's willingness to participate in a proposed program. Positive numbers indicate that including that attribute was likely to make a respondent more willing to participate, while negative numbers indicate that attribute is likely to cause respondents to be unwilling to participate. The higher the estimate value, the greater likelihood that a specific attribute would generate a positive response. For example, the category and level that had the highest overall effect on respondents indicating whether they would participate in the program was a cost share of 100 percent; conversely, a proposed Premium of \$0 - \$5 / cwt was the most likely attribute to generate a negative response.

The intercept indicates the sum of the scaled estimates of the factors that make up each scenario that would be necessary to obtain a positive yes response that respondents would be willing to participate in said scenario. For example, scenario 4 as outlined in Table 2, included a 100 percent cost share, a premium greater than \$25 / cwt, would be conducted as a self-audit, and guaranteed that future government animal welfare regulation could be avoided. The scaled estimate of the 100 percent cost share was 0.267, for the premium greater than \$25 / cwt it is 0.059, for a self-audit it was 0.192, and a guarantee that future regulation could be avoided was 0.011. The sum of these effects was 0.529, which was greater than the effect intercept of 0.369, meaning this scenario was likely to generate a positive response by respondents. Conversely, the factors that were included in scenario 5 would not generate a sum of their generated effects greater than the intercept, indicating that respondents would not likely accept such a scenario.

The factors in scenario 5, cost share of 100 percent, a premium of \$5 - \$10 / cwt, a 3rd party audit, and a guarantee that future regulation could be avoided, had scaled estimated effects of 0.267, -0.096, -0.171, and 0.011 respectively for a sum of 0.011.

When analyzing the impact of cost share on respondents' willingness to participate, the only level of cost share that generated a positive effect on willingness to participate for respondents was when the cattle buyer covered the entire cost associated with participation in the verification program. The less the buyer was willing to contribute, the less likely the respondent was willing to participate. This was illustrated by the lower scaled estimates for a cost share of 50 percent and the lowest scaled estimate for no cost share. Each of the effects associated with the cost share factor levels was statistically significant as shown by the Prob>|t| column in Table 3. In this study, the p-value for all of the cost share effects were less than 0.0001.

Scaled estimates of the effects for the various premium levels were not as strong as they were for cost share. This was likely due to the fact that there were additional levels of premiums, meaning that fewer scenarios were included at each level. Thus, the model was not able to generate such strong effects. Despite this, low premiums, classified as below \$10 / cwt, generated negative effects on respondents' willingness to participate. Therefore, respondents were more likely to respond "no" to any scenario that included a premium of \$0 – 5 / cwt or \$5 – 10 / cwt. All of the premium levels above \$10 / cwt generated a positive effect on willingness to participate. These results support the hypothesis that cattle producers would be willing to participate in an animal welfare verification program if it provided a premium above \$10 / cwt when compared with non-verified cattle. It was interesting to note that the scaled estimate for a premium level greater than \$25 / cwt, the highest level offered, was not the strongest positive effect of all premium levels. However, when we explore the scenarios presented in the survey it

becomes clear why this may be the case. This level of premium was only offered to respondents in two scenarios, 4 and 10. In scenario 4, it was paired with a cost share of 100 percent and a self-audit, but in scenario 10 it was paired with no cost share and a third-party audit. The other factor levels in scenario 10 generated the most negative scaled estimates of their respective factors. This likely caused the premium of greater than \$25 / cwt to be unable to overcome those negative effects. All of the effects of the various premium levels proved to be statistically significant with p-values less than 0.0001. This statistical significance is important because factors that had more levels, like Premium which had six possible levels, had a higher standard error. This can be explained because each level was included in fewer samples leading for more room for error in the model, however the p-values indicate the effects were still significant.

The only mode of auditing that generated a positive effect on respondents' willingness to participate was a self-audit. In fact, the scaled estimates indicated that this factor had the second strongest positive effect on overall willingness to participate. Both second- and third-party auditing generated negative effects on respondents' acceptance of a program, though third-party had a much stronger negative effect than second-party audits. Scaled estimates for all three factor levels associated with the mode of audit were considered statistically significant ($P < 0.05$).

We see that the role of government provided very little overall effect on willingness to participate. A guarantee that future government regulation would be avoided generated a small positive effect, but this effect was not considered statistically significant ($P < 0.05$). No guarantee of future regulation showed a minor negative effect on willingness to participate but was similarly not statistically significant ($P < 0.05$). It is possible that because the role of government was the last category outlined in the scenarios, respondents had already determined their willingness or unwillingness to participate in a proposed program regardless of

the potential role or lack thereof by the government. Also, a possibility is that the effects of the other factors were great enough in their significance to respondents that their combined effects outweighed any effect that this factor might have had on their willingness to participate in the program.

Chapter 5

CONCLUSION

5.1 Discussion

A thorough analysis of the current literature on animal welfare, from both a consumer and cattle producer perspective, shows that there is opportunity for development within the cattle and beef industry around animal welfare assurance schemes. The BQA program has broad based industry support, through Beef Checkoff funding and initiatives like the 2021 – 2025 Beef Industry Long Range Plan. The program can be leveraged as the industry standard for animal welfare to help provide consumers with the confidence that beef is raised responsibly. However, as Grandin (2018) noted there are still issues that persist. Barnhardt et al. (2014) showed that implementation of BQA practices could be improved. In order for the industry to continue utilizing BQA as the standard and to address consumer concerns verification steps should be taken to evaluate adherence to the BQA guidelines.

By employing a fractional factorial designed survey this study was able to evaluate and determine the effects of various animal welfare verification program components on cattle producer willingness to participate. The literature and past research do not show that this concept has been widely explored as it related to animal welfare in the cattle industry, although Tonsor, Mitchell, and Schulz (2019) did explore this concept in regards to traceability programs. It is important that this type of research continue as consumer demands and WTP for specific product attributes change to determine the cattle industry's willingness to supply to meet new demands.

The cattle industry is beginning to respond to consumer concerns about animal welfare, and at the core of that industrywide response will be the BQA program. To provide ample substance to the BQA program verification of implementation is the natural next step for the education and training program. Based on respondents' preferences we can generate an "ideal" verification program. The verification program would be conducted using a self-audit with 100 percent cost share, and a premium of \$10 / cwt or more. Because the role of government had such a small and not statistically significant effect on the willingness to participate, it may not be necessary to provide any guarantee that government intervention must be avoided. Further research to evaluate the producer understanding of government involvement in animal welfare should be conducted. This result was particularly interesting given that previous studies showed that producers would take a discount on their cattle to ensure government was not involved in traceability programs (Tonsor, Mitchell, & Schulz, 2019).

Respondents to this survey were largely BQA-certified, but a minority of respondents indicated awareness of BQA Self-Assessment resources. It would be beneficial for the industry to more effectively communicate with producers the need to start evaluating how well they implement BQA on their operations. While it was clear that producers prefer self-audits, as indicated by its outsized effect on their likelihood to participate in an animal welfare verification program, that mechanism is unlikely to satisfy consumers long term based on the literature that has been published. There is a need to assess how the industry might adapt and reward cattle producers for participating in auditing schemes where the mode of audit is more stringent than a self-audit.

5.2 Summary

This study evaluated current cattle producer willingness to participate in animal welfare verification programs based on the BQA program. A total of 424 qualified respondents

participated in an online survey that was disseminated to 7,051 cattle producers via email. Responses generated important information on current BQA certification levels, participation in third-party verification programs, and willingness to participate in theoretical animal welfare verification schemes.

5.3 Conclusions

The first hypothesis of this study was a majority of cattle producers will indicate willingness to accept BQA verification steps if a premium greater than \$10 per hundred weight (cwt) is awarded. Based on the results of the survey and the model used to analyze the responses to twelve scenarios generated by the fractional factorial design, this hypothesis proves to be true. All premium levels above \$10 / cwt demonstrated a statistically significant positive effect on respondents' willingness to participate in an animal welfare verification program.

The second hypothesis, the majority of cattle producers will indicate a willingness to accept BQA verification steps without a premium if reduced regulatory action was guaranteed, was rejected because effects of guaranteeing or not guaranteeing reduced government regulation were not statistically significant.

Finally, the third hypothesis: a majority (> 50 percent) of cattle producers will not be willing to undergo verification steps to confirm compliance with BQA practices without a price premium or guarantee of reduced regulatory/government burden, was accepted because all premiums above \$10 / cwt showed a positive effect on respondents' willingness to participate in a animal welfare verification program. However, although a guarantee that future government regulation also had a positive effect on willingness to participate, it was not statistically significant. The positive effect by premiums is enough to accept this hypothesis as written.

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APPENDICES

Appendix A: Survey

BQA Animal Welfare Verification Survey

Please answer the following questions to help us understand more about you.

1. Are you the owner and/or manager of a beef cattle operation?
 - a. Yes
 - b. No

If no, terminate survey

2. What segment of the beef cattle industry most accurately describes the type of operation you own and/or manage? (select all that apply)
 - a. Seedstock
 - b. Commercial Cow-Calf
 - c. Stocker/Backgrounder
 - d. Feedyard
 - e. Other
 - i. Fill in
3. What is the size of the herd you own and/or manage?
 - a. 0 - 9
 - b. 10 - 19
 - c. 20 - 49
 - d. 50 - 99
 - e. 100 – 199
 - f. 200 – 499
 - g. 500 – 999
 - h. 1,000 – 2,499
 - i. 2,500 – 4,999
 - j. 5000 +
4. How many states do you operate in?
 - a. Number selector 1 – 50
5. What is the primary State that the cattle operation you own or manage located in?
 - a. State selection
6. Age
 - a. 18 – 25
 - b. 26 – 34
 - c. 35 – 44
 - d. 45 – 54
 - e. 55 – 64
 - f. 65 +

7. Sex
 - a. Male
 - b. Female

The next set of questions will be about the Beef Quality Assurance Program and your level of participation in the program.

8. Are you currently Beef Quality Assurance (BQA) certified?
 - a. Yes
 - b. No

If yes, skip to question 10

9. If you are NOT currently BQA certified have you been in the past?
 - a. Yes
 - b. No
10. Are you aware of the BQA program principles and standards?
 - a. Yes
 - b. No

If no, skip question 15

11. If yes, please rate your level of understanding of the BQA program principles and standards on a scale of 1 to 4 with 1 being no understanding and 5 being complete understanding.
 - a. 1 – No understanding (ex. “I have never been trained in BQA but have heard of it.”)
 - b. 2 – Little understanding (ex. “I learned about BQA back in the 90s but can’t remember much.”)
 - c. 3 – Some understanding (ex. “I am BQA trained and know some of the practices I need to follow.”)
 - d. 4 – Complete understanding (ex. “I am currently BQA certified and have implemented the BQA practices on my operation.”)
12. Please rate your opinion of the BQA program. 1 being strongly negative 5 being highly positive.
 - a. 1 – Strongly negative (ex. “
 - b. 2 - Negative
 - c. 3 - Indifferent
 - d. 4 - Positive
 - e. 5 – Highly positive
13. Are you aware that BQA has self-assessment tools to determine how well you implement BQA on your operation?
 - a. Yes
 - b. No

If no, skip to question 15.

14. Have you completed a BQA Self-Assessment of your operation?
- a. Yes
 - b. No

Please answer the following questions about third-party verification program and your participation

15. Do you participate in any third-party verification programs?
- a. Yes
 - b. No

If no, skip to question 18.

16. If yes, which ones (select all that apply)
- a. Global Animal Partnership (GAP)
 - b. American Humane
 - c. BeefCARE
 - d. Verified Natural Beef
 - e. National Organic Program
 - f. Non-Hormone Treated Cattle (NHTC)
 - g. American Grass-Fed Association (AGA)
 - h. Other, please specify
 - i. Fill in
 - ii. Fill in (select NA button)
 - iii. Fill in (select NA button)
 - iv. Fill in (select NA button)
 - v. Fill in (select NA button)
17. If yes, what is the primary reason you participate in a third-party verification program?
- a. To capture added value
 - b. To improve consumer perceptions of the of the beef cattle industry
 - c. To ensure you are raising cattle according to specific guidelines.
 - d. To access specific markets for your cattle
 - e. Other, please specify
 - i. Fill in

18. Do you see a premium for participating in a third-party verification program?
- a. No
 - b. Yes, between \$1 and \$3 per cwt compared to non-verified cattle
 - c. Yes, between \$3 and \$5 per cwt compared to non-verified cattle
 - d. Yes, between \$5 and \$10 per cwt compared to non-verified cattle
 - e. Yes, between \$10 and \$15 per cwt compared to non-verified cattle
 - f. Yes, between \$15 and \$20 per cwt compared to non-verified cattle
 - g. Yes, between \$20 and \$25 per cwt compared to non-verified cattle
 - h. Yes, greater than \$25 per cwt compared to non-verified cattle

The next set of questions address your willingness to participate in a hypothetical verification program for the BQA Program.

Please respond if you would participate in a verification program as outlined below. (Respondents will be provided with twelve scenarios)

Cost Share: The verification program will be funded by the buyer of your cattle at ___ percent of the cost of the service. (options include 0, 50, 100)

Premium: If you participate in this program your cattle will be eligible for a premium of ___ per cwt. (options include: between \$0 and \$5, between \$5 and \$10, between \$10 and \$15, between \$15 and \$20, between \$20 and \$25, and greater than \$25)

Mode of Audit: Verification of adherence to BQA standards will be accomplished through a ___ audit. (options include: self, 2nd party, 3rd party)

Government intervention:

Participation in this verification program _____ prevent future government intervention on animal welfare practices. (options: will, will not)

Thank you for taking our survey.

Appendix B: Recruitment Email

Dear Cattle Producer,
Researchers at California Polytechnic State University, San Luis Obispo (Cal Poly) are currently looking for cattle producers to complete the attached survey regarding participation in animal welfare verification programs. Please consider participating by completing the survey linked below.

The study being conducted is hoping to learn more about cattle producer's willingness to participate in and interest in animal welfare verification schemes based on the Beef Quality Assurance (BQA) program. It is intended that results from this study will be used by industry to inform future decisions on animal welfare programs for the beef industry. Your participation and input is valued as a member of the beef cattle industry.

The survey should take between 10 and 15 minutes to complete and all information is anonymous. Please submit your responses by April 15th.

[SURVEY LINK](#)

Thank you!

Appendix C: State Response Rate Breakdown

State	Percentage of Total Responses	Number of Responses
Alabama	1.42%	6
Arizona	1.89%	8
Arkansas	2.36%	10
California	3.54%	15
Colorado	4.25%	18
Florida	1.65%	7
Georgia	3.77%	16
Hawaii	0.47%	2
Idaho	1.18%	5
Illinois	1.65%	7
Indiana	1.42%	6
Iowa	4.48%	19
Kansas	8.73%	37
Kentucky	7.08%	30
Louisiana	1.89%	8
Maryland	0.47%	2
Michigan	2.36%	10
Minnesota	2.36%	10
Mississippi	2.12%	9
Missouri	2.83%	12
Montana	0.94%	4
Nebraska	10.14%	43
Nevada	0.24%	1
New Mexico	0.71%	3
New York	1.18%	5
North Carolina	1.65%	7
North Dakota	1.18%	5
Ohio	1.65%	7
Oklahoma	2.59%	11
Oregon	0.94%	4
Pennsylvania	1.42%	6
South Carolina	0.71%	3
South Dakota	3.07%	13
Tennessee	2.83%	12
Texas	9.43%	40
Utah	0.24%	1
Virginia	1.89%	8
Washington	0.71%	3
West Virginia	0.94%	4
Wisconsin	1.18%	5
Wyoming	0.47%	2

Appendix D: Breakdown of Responses by Operation Type and Combinations

Type of Operation(s)	Number of Responses	Percent age
Commercial Cow-Calf	233	54.95%
Feedyard	74	17.45%
Commercial Cow-Calf; Stocker / Backgrounder	41	9.67%
Stocker / Backgrounder	38	8.96%
Seedstock	10	2.36%
Seedstock; Commercial Cow-Calf	10	2.36%
Commercial Cow-Calf; Feedyard	9	2.12%
Commercial Cow-Calf; Stocker / Backgrounder; Feedyard	3	0.71%
Stocker / Backgrounder; Feedyard	3	0.71%
Seedstock; Commercial Cow-Calf; Stocker / Backgrounder; Feedyard; Other	1	0.24%
Seedstock; Commercial Cow-Calf; Stocker / Backgrounder	1	0.24%
Dairy	1	0.24%