Beef Communication within the Digital Pasture: Tools that Impact Consumer Perceptions

by

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Abstract

Increasingly, people obtain information from social media (SM) instead of peer-reviewed scientific and factual sources. As a result, a knowledge gap has been created between average citizens, consumers, and the animal agricultural community, particularly the beef industry. A majority of consumers rely on SM to gain information about the agricultural industry, and due to directed misinformation there is confusion and a lack of trust between consumers and farmers. Consumers' most notable concerns about the beef industry are welfare, diet/health, and environment. Through the use of videos and SM as communication platforms, perhaps the perceptions of consumers can be shifted. To test this hypothesis, invitations to complete IRB-approved surveys were sent to a diverse cross-section of Auburn University students. Surveys were completed prior to and after viewing videos or simulated social media posts uniquely designed to have either emotional or cognitive messaging characteristics. Paired t-test analysis (SPSS) results revealed that videos as well as emotional SM posts were effective ($p < .05$) in influencing opinions of study participants for each of the three arenas of concern. Compared to cognitive messaging, emotional video and social media posts used as communication modalities may serve to diminish the knowledge gap relationship between the general public and the beef industry.

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Chapter I

Introduction

Meat consumers today care about where their meat comes from and that it is healthy and safe. Consumers want to know how livestock are being raised. They also want assurance that the beef industry is sustainable and environmentally neutral. Consumers not involved within the agricultural industry are questioning the welfare practices of beef cattle production, whether or not that beef has negative impacts on dietary health, and the environmental impact of cattle. Fewer citizens watch news networks or receive information from scientific journals; rather, information about beef is received from other sources such as a tribal member connected through social media which can and does lead to an uninformed consumer (Morris and James, 2017).

Literature Review Overview

Not everyone is familiar or involved with the livestock industry. With an ever-growing population, the world has become more distant from the field of agriculture. With less than one percent of the U.S. population engaged in modern agriculture, a general disconnect of understanding about animal-derived food production has emerged which has led to a knowledge gap (Rice et al., 2020). A lack of understanding and appreciation for the beef community seems to be a factor in the knowledge gap. According to a study done by Rice and others, “The fate of the livestock industry can be determined by the public’s insight” (Rice et al., 2020). This lack of understanding between consumers and producer segments has shifted focus from efficiency to more sustainable yet expensive systems (Spain et al., 2018). The public wants to avoid support of a perceived factory farming framework. In the past, humane slaughter procedures had the most impact on purchaser decisions. However, the public has shifted interest towards making sure livestock are treated more humanely (Edwards-Callaway and Calvo-Lorenz, 2020). With an

increasing informational and knowledge gap about the conditions surrounding the origins of animal derived food, consumers are basing purchasing decisions on perceptions about humane management practices, nutritional content and safety as well as perceived contributions of livestock to greenhouse gas output. Increased levels of negativity fosters erosion of social licensure for animal food products. The widening gap around a lack of understanding and science based knowledge between the general public and the livestock industry appears to be caused by ineffectual communication messaging. Consequently, communicating complicated topics which involve animal agriculture should likely consider underlying principles of how ideas spread through social media and factors which contribute to influence opinion. The ubiquity of citizen journalism and social media tribalism simplifies the upload and sharing of digital media, images and videos. Ideas can rapidly spread by relaying information about unfamiliar topics to people within and external to SM tribes contributing to the formation of changed opinions. A particularly effective communication modality is the usage of videos on social media which can introduce and reinforce aspects of animal derived food production including the beef industry.

In the era of social media usage, participants tend to affiliate around familiarity and ultimately gravitate to connect with other people who have similar views or values. In social media interactions, people decide whether someone is similar to themselves and therefore, might be more likely to agree with opined perspectives and share them with others (Kerpen, 2015). The use of alternate social media channels to connect to different tribes or members could be important to understanding how to more effectively communicate to disconnected groups such as the contrast between agricultural and non-agricultural audiences. Social media could very well play a role in bridging this educational gap. There is a justified need for harnessing social media

(Morris and James, 2017). Media outlets are readily available to help showcase the livestock industry (Morris and James, 2017). Media outlets can help diffuse some of the misinformation that is spreading about the industry by activist organizations. Rogers (2003) describes diffusion as a sequential process where something is communicated via specific channels by individuals of a group and then becomes widely accepted as truth or fact.

Previous research has reported that scientists often lack the communication skills necessary to transmit findings and data to the general public (Simis et al., 2016). Consequently, due to a lack of communication, a lack of trust is also established. People don't necessarily trust what they do not understand. Perhaps with a more transparent view and easier methods of utilizing communication about evidence-based information, a sense of trust, if lost, can be restored. However, there are Ag-gag laws set into place that may be perceived to prevent a transparent view of the livestock sector. Ag-gag laws are designed to protect inappropriate actions by anti-animal agriculture activists and may limit the amount of information shared about farms, livestock facilities and production practices. The more people are aware of agriculture laws such as Ag-gag, the less likely they are to trust farmers (Robbins et al., 2016). Some consumers consider protection groups as a more credible source to gain information and knowledge from than those involved within agriculture (Robbins et al., 2016), and this reinforces the need for producers to become involved in sharing images and stories about their unrelenting efforts to provide care and well-being for food animals.

Social media allows the diverse consumer segments access to a transparent beef industry. In the quest for transparency, use of videos to capture aspects of everyday actions of producers during the lifecycle of cattle may improve perceptions among consumers. By investing in an

open world of communication, the lack of knowledge amongst consumers about the beef industry can be diminished.

Mixed views and concerns about the livestock industry exist. Some of those views can be negatively generated through social media. Through recent survey responses, the top three concerns among consumers are animal welfare, diet/health, and environmental impact. A survey conducted at the 2019 North American Meat Institute Animal Care and Handling Conference sampled 1,000 participants involved in meat production. The survey's top responses identified issues surrounding animal welfare were aligned to a lack of communication between the agricultural and non-agricultural community especially animal handling among plant workers (Edwards-Callaway and Calvo-Lorenz, 2020).

Diet and Health Perceptions

When it comes to the benefits of consuming red meat, some people tend to view beef in a negative way (Specht et al., 2020). They are concerned of the effects it could have on their diet and health. Some consumers also tend to view in vitro meat as a healthier alternative (Specht et al., 2020). The authors discussed what cultured meat is and the procedures it requires in order to end up on grocery shelves as food products. It's presently an expensive procedure and a non-competitive alternative to meat (Specht et al., 2020). Researchers analyzed social media to ask participants about their views of fake meat. Mixed responses were obtained through the surveys. While some respondents preferred the newer options, a majority favored the animal derived protein (Specht et al., 2020).

Beef provides a substantial amount of nutritional benefits. Rousell and others (2012) verified that lean beef was associated with decreases in LDL cholesterol within a healthy diet. According to Van Elswyk and McNeill (2014), "Beef contains several essential nutrients such as iron,

magnesium, niacin, pantothenate, phosphorus, potassium, protein, riboflavin, selenium, vitamin B6, vitamin B12, and zinc" (Van Elswyk and McNeill, 2014). However, claims by the World Health Organization (WHO) state that colon cancer can be linked to the consumption of red meat, the data offer weak suggestions and are not supported by other research (Klurfield, 2018). Van Elswyk and McNeill also provided insight on the fat content of grain fed vs. grass fed beef. Both grass and grain fed beef still have nutrients needed for a heathy diet despite the fact that grass fed contains less fat (Van Elswyk and MacNeill, 2014).

Consumer Perceptions on Welfare

Animal welfare is a key factor in determining a consumer's purchasing decisions as well as their perceptions of the livestock industry. The general public is concerned with how animals are treated, the conditions in which they live, and how the beef community is able to reassure people that their animals are being treated humanely throughout all stages of production. Consumers are also highly concerned that beef animals experience pain during harvest (Edwards-Callaway and Calvo-Lorenz, 2020).

Anti-food animal activist organizations are increasing in number and proactivity. In a recent edition of the Business Benchmark on Farm Animal Welfare (BBFAW), a product of Compassion in World Farming (CIWF) and Four Paws, animal rights extremist entities, it was posited the documents were "a tool that enables investors to understand how companies are managing farm animal welfare within their operations and supply chains." Accordingly, their assessment ranked restaurant, retail and foodservice brands based on animal welfare policies. In their report, CIWF and Four Paws state they want to "end factory farming and change the food system in a sustainable way" through approaches to cause "a significant reduction in the number

of animals raised for food", ensuring that all animals raised for food emerge from "positive animal welfare states" or are "replaced by plant-based alternatives" (Amos et al., 2021).

Curious to see what consumers as well as the general public want to see regarding livestock management facilities, they were asked, "What do you consider to be an ideal dairy farm and why are these characteristics important to you?" (Cardoso et al., 2016). Five hundred people were surveyed on their opinions of the dairy industry through qualitative and quantitative methods. Qualitative research was conducted by using open-ended survey questions online. They used coded words such as "well-being," "cow," or "environment" to categorize the data (Cardoso, et al., 2016). The most frequent concern was the well-being/welfare of the cattle followed by environmental impact (Cardoso et al., 2016).

A study by Morris and James (2017) focused on how social media has become a part of everyday life and could be used to benefit the livestock industry. Hostile publicity from a few farms that have had poor management practices and health concerns can lead to a poor reputation for all farmers in the agriculture community (Morris and James, 2017). However, improved communication skills are essential if farmers want to be able to defend their decisions on how they practice agriculture (Morris and James, 2017). The study found that a majority of farmers do not use social media, which has led to a deeper gap with the public's interest and knowledge (Morris and James, 2017).

Trust among consumers and all non-ag constituents is a concern. Surveys focused on consumer trust can help determine their meat purchasing decisions or why they decline to purchase meat while at the grocery store" (Edwards-Callaway and Calvo-Lorenz, 2020). A 2018 study by the Center for Food Integrity (CFI) consumer reported that only 25% of respondents believed that meat is derived from humanely treated animals inside of the United States while

75% people that livestock are treated inhumanely (Edwards-Callaway and Calvo-Lorenz, 2020). Their finding used a survey conducted during the NAMI Animal Care and Handling Conference of 2013 to determine on how animal welfare could be improved for animals used in meat production. The 2013 NAMI survey indicated it was a requirement that workers must have training before being allowed to handle animals regarding every beef plant they surveyed (Edwards-Callaway and Calvo-Lorenz, 2020). There is no nationwide law requiring training videos at all plants which may lead to a sense of doubt in reference by consumers regarding animal welfare integrity within the animal agriculture industry.

Meyer (2015) explored whether animals experienced pain during harvesting. The state of unconsciousness in the animal must be delivered in a humane method (Meyer, 2015). In US harvest facilities, physical disruption of brain activity causes immediate unconsciousness by causing permanent brain damage all of which is consistent with the Humane Slaughter Act. A quick death must follow immediately after and is humanely accomplished via exsanguination (Meyer, 2015).

Rice and others (2020) used a random telephone survey of the Australian public to examine their opinions on the live export of sheep and how it might affect the public's perceptions. The survey was conducted after an episode of 60 Minutes aired that illustrated sheep were transported by boat. The researchers found that the general population of Australia had barely changed their views. Rice and others found that there were no differences between those respondents that completed the survey before or after the episode aired (Rice et al., 2016. The respondents regard for the welfare of livestock used for red meat or their ability to trust farmers to take care of their livestock did not change (Rice et al., 2020). Viewers who watched 60 Minutes tended to be older adults. Typically, those older in age tend to have a better understanding of agriculture due to the

fact that they are less removed from the understanding of farming than younger generations (Rice et al., 2020). Those who answered a telephone survey also tended to be a part an older generation. With that being the case, social media and videos could be the way to reach younger generations due to the fact that they prefer to get their information from social media.

To assess the impact of a more transparent view of the livestock industry, researchers conducted a study that involved 500 participants who took part in a self-guided walking tour of an actual dairy farm in order to assess the participants views on the dairy industry in hope of changing their perceptions for the better (Ventura et al., 2016). Participants were able to view housing, feed, and milking operations on their own with no guidance or explanation offered. The researchers' expectations were to improve the public's views of the dairy industry. However, based on qualitative analysis, they found that it decreased when determining responses. The participants were given a pre-test as well as a post-test on their views. Unfortunately, the post-tests became less in favor of the industry after their visit (Ventura et al., 2016). The participants did not like the living conditions of the cattle nor did they seem to understand them. The participants especially hated the fact that newborn calves are taken away from their mothers immediately (Ventura et al., 2016).

In Europe, the welfare of livestock is left up to public agencies and police. In contrast, the United States leaves the care of livestock to farmers and owners unless there is evidence of abuse. Most stockyards and harvest plants are certified or inspected by third party auditors such as Professional Animal Auditor Certification Organization (PAACO). In a study by Coulter and Campbell (2020), qualitative interviews and data were provided by the Canadian Chief Veterinary Office (CVO) and the Ministry of Agriculture. To reassure the general public of the laws and goals to help livestock, the CVO was created with four specific goals in order to help

reassure the public. The goals are: “1. Protect the health of the public from diseases of animals that can pass directly or indirectly to people. 2. Protect the safety of food to guard against contamination with pathogens, toxins, or hazardous materials. 3. Protect the health and welfare of animals for economic or intrinsic benefit. 4. Protect trade in agriculture through health certification or food safety assurance programs” (Coulter and Campbell, 2020 p.3). The general public’s opinions seemed to improve on aspects of the livestock industry after seeing a third party in charge of animal welfare laws instead of the farmers and ranchers according to Coulter and Campbell 2020. According to a study done by Spain and others, the majority of respondents wanted to see animal welfare assessments done by a third party or by the federal government (Spain et al., 2018). The takeaway is that some people want to see that a third party is involved.

Even biosecurity can help factor into the welfare perceptions of livestock, which is an important factor in consumers’ purchasing decisions. Fusi and others (2021) dealt not only with welfare concerns but also biosecurity practices of beef cattle in both Italy and Ireland. Ireland seems to have better facilities and a tendency to treat their cattle better (Fusi et al., 2021). Irish workers also require some sort of training before being allowed to work with cattle. However, the two countries seemed to have similar laws and practices in place regarding care of beef cattle. It seems that the more biosecure and the more an operation caters to an animal’s wellbeing, the greater the trust is established amongst consumers (Fusi et al., 2021).

Consumer Perceptions

Communication is such a large part of the livestock industry and messaging needs to be improved. Many consumers are not familiar with terms used in production such as organic or natural. There needs to be a more effective way to communicate terms and reach target audiences such that consumers are reassured that products are safe.

A study conducted by Powers and others (2020) showed that the USDA wanted to create a way to educate consumers and to influence their purchasing decisions. Producers started using labels on eggs and other products to let people know how animals are treated humanely and whether a product was classified as organic, hormone free, cage free, etc. The study found that consumers are highly concerned about the hens' welfare and how they're being treated (Powers et al., 2020). They also found that majority of consumers are not willing to pay much more for something that is labeled "cage free" even though those consumers were not familiar with some of the labels like "American Humane Certified" (Powers et al., 2020). A key takeaway is that there definitely needs to be improvements in the ways people are informed about labels and what they mean.

Spain and others (2018) administered a survey to 100 consumers to determine their attitudes towards their willingness to purchase products from livestock raised in more humane conditions (Spain et al., 2018). Their finding concluded that majority of consumers wanted reassure that food animal were being raised humanely (Spain et al., 2018). Consumers will typically pay a little extra if they can be assured that animals are treated humanely. When asked about purchasing decisions, their findings reported that majority of consumers wanted to see an independent third party or the federal government perform welfare checks on the livestock (Spain et al., 2018). Their findings concluded that the public is willing to pay extra for products that come from farms where livestock are humanely treated (Spain et al., 2018) and this reinforces the need for improved modes of communication and labeling.

In a study by Ortega and Wolf (2018), researchers wanted to know how much someone is willing to pay for a product with certain labels. The methodology involved setting up a machine in a grocery store and getting willing participants to act like they were bidding on an item

through the use of the machine. This determined whether or not consumers would be willing to pay more money for a more humanely treated meat item. Unlike the study by Spain and others, they came to the conclusion that consumers were not willing to pay as much for those labels (Ortega and Wolf, 2018).

Consumers trust farmers less than they trust influencers (Robbins et al., 2016). For the study produced by Robbins and others (2016), the researchers selected a group of 750 participants not involved with agriculture and informed them via informational articles about what ag-gag laws are and how they worked. After being informed, participants also wanted an increase in welfare management practices for livestock.

Consumer Perceptions on Livestock Effects on Environment

Consumers are also concerned about the effect that livestock can have on the environment (Cezimbra et al., 2021). Renewable resources as well as greenhouse gas production is vastly important to consumers. Not only is there scientific information to support the fact that beef is sustainable, but farmers and ranchers are also taking steps to ensure that beef is a resource that will be around for future generations (Cezimbra et al., 2021).

Beef is a very sustainable industry. The goal of a study conducted by Cezimbra was to limit carbon emissions in cattle through proper grazing methods. The researchers concluded that overgrazing could lead to a rise in methane emissions (Cezimbra et al., 2021). By utilizing crop land for rotational grazing, it can help lower cost as well as emissions (Cezimbra et al., 2021).

When it comes to factoring in sustainability, de Souza and others (2017) are working to make improvements for the beef industry. As for their strategies to improve sustainability, they want to develop frameworks and indicators capable of measuring progress of production, encourage engagement of all stakeholders at regional and global levels, and improve

communication in a way that makes the beef industry more transparent for consumers (de Souza, et al., 2017). The authors suggested that there be a need for more transparent communication between the industry and consumers. Producers also need to respond to questions in a timelier manner when asked by consumers. Breakout sessions and open-ended questions were used in research which concluded that there needs to be more communication from producers to consumers (de Souza et al., 2017).

Based on the literature findings, people need to understand that beef is in fact sustainable. Consumers tend to have negative perspectives of beef cattle's effects on the environment. However, farmers and ranchers are taking important steps to change their operations for the better, which will be a focus of the videos and Instagram posts discussed in this thesis.

Video and Social Media Impacts

Social media seems to be an excellent way to communicate between different groups of people (Randolph et al., 2021). Lochner and others claim that visuals and images can be used in order to present complex and difficult or unknown information in an easy-to-understand manner. (Lochner et al., 2021). By using videos and imaging could be effective tools in order to present educational opportunities for the general public to learn about the livestock industry. A study conducted by Martono and others focused on using Facebook as a platform in order to inform the public about cattle for sale due to the reasoning that more and more people are getting their information from social media (Martono et al., 2016). Randolph and others performed a study that involved using six different videos as a way to communicate the practice of food safety procedures to the public (Randolph et al., 2021). Three of the videos were analytical in short, medium, and long timing while the other three were on an easier level to understand (Randolph et al., 2021). Their finding concluded that people prefer to view videos based on shorter times in

an easier way to understand including everyday language (Randolph et al., 2021). Olausson (2017) created two articles through Facebook about environmental impacts of beef cattle. One post was negative, focusing on the negative impacts of beef, while one was positive, focusing on the small environmental impact in comparison to airplane travel (Olausson, 2017). The positive post was shared more than the negative posts (Olausson, 2017).

Summary

The studies surveyed in this review suggest that a more transparent view of animal agriculture could lessen a knowledge gap between the public and the livestock industry and perhaps improve relationships. A majority of people are generally concerned about the welfare of livestock used in meat production. The purpose of multiple studies was to help bridge the gap between the public and the agriculture industry. Common recurring themes in the literature focused on bridging the knowledge gap on behalf of the public over issues related to welfare, diet/health, and the environment/sustainability. Sampling more of the population who are not involved in agriculture is another area to focus on to identify where improvements can be made. "Social license to farm, or the freedom within which society allows farmers to operate, is largely built on trust within the community" (Rice et al., 2020 p.2). Without that trust, one cannot expect to improve the relationship between the producer and the consumer.

In order to help the general public, come to a better understanding of the beef industry, our research was geared towards using videos involving emotional as well as cognitive methods as a platform. Social media posts including real life beef operations were also used. By using a transparent approach on how an everyday beef cattle operation works by glimpsing into the welfare, health, and environmental aspects of the beef community, the relationship between the public and livestock producers may be improved.

When participants viewed the emotional video in this study, they saw farmers actually caring for their cattle and interacting with them. The cognitive video focused on a veterinarian who routinely inspects cattle and can explain that any mistreatment of the cattle will negatively affect a farmer's financial gain. The emotional posts relied on creating an emotional connection between the beef industry and the public, while the cognitive posts focused on presenting factual information and sources to change perceptions.

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Chapter II

Title: Measuring the Effectiveness of Both Cognitive and Emotional Forms of Instructional Videos Related to the Beef Industry

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Abstract

People are becoming detached from the animal agricultural industry, so what is the best way to bridge the knowledge gap? Results of studies have shown that video messaging could be a key factor in lessoning this gap. This study focused on assessing the perceptions of young adults about animal agriculture as well as the effectiveness of emotional and cognitive videos featuring local farmers and experts in the industry to alter perception as well as develop and create trust for the beef industry. An invitation to participate was distributed to 10,000 students at Auburn University. Responses were stopped after receiving 500 complete responses. Participants were directed to a survey in Qualtrics. Participants were given a survey with 5 point likert scale and open-ended questions over aspects of their opinions about animal welfare, diet/health of consumers of red meat and environment/sustainability of the beef industry. After viewing two videos participants re-took the survey. Data were subjected to paired t-test statistical analysis using SPSS. Results showed participant's views about the beef industry improved by 82% after watching the videos. ATLAS was used to code negative and positive key words within open response questions. The emotional video had a greater impact ($p < .05$) on participants perceptions with 190 people choosing that video. In contrast only 99 participants preferred the cognitively designed video.

Keywords: Animal Welfare, Beef, Diet, Health, Environment, Sustainability, Social Media, Video Communication

Introduction

Consumers purchasing decisions control the market in any industry. According to a market research study, 50 percent of millennials would buy more beef if they knew more about the cuts they were buying (Beef Board, 2014 as cited in Osterreicher et al., 2018) and millennials will continue to impact the products in demand (Osterreicher et al., 2018). Knowing purchasers control the demand for products, it is of increasing value that consumers are knowledgeable of where their food comes from and specifically how beef is raised. Millennials lacking knowledge of the beef industry (Osterreicher et al., 2018) reinforces how important readily available and accurate information is.

Presently, consumers source a wealth of information from social media instead of scientific and factual sources. This knowledge gap has been created between the average consumer and the animal agricultural industry, specifically the beef industry, because of where purchasers gain knowledge and the type of media where it is accessed from (Osterreicher et al., 2018).

Trust can be established using videos as a communication modality to get a point across. A study by Wickman and others (2021) noted that video has the capability to significantly improve learners' ability to retain, understand, and transfer new knowledge. This information led to the present study of using cognitive or emotional videos in order to determine if the lack of knowledge between the beef industry and the general public can be improved. Randolph and others performed a study that concluded that people prefer to view videos based on shorter times in an easier way to understand including everyday language (Randolph et al., 2021). Across literature findings, the top three concerns of consumers focus on animal welfare, diet/health of red meat, and environmental impact of beef cattle.

As a framework, social judgement theory was considered. Social judgement theory is described as key to understanding communication and attitude change, while defining the ways possible in which people can alter, judge, and respond to influences on the basis of prior viewpoints (Littlejohn and Foss, 2017). Epistemologically speaking, social judgement theory is determined that there is only one viewpoint of those being influenced (Littlejohn and Foss, 2017). Ontologically speaking, this theory can be used to determine whether or not someone's behavior can be predicted (Littlejohn and Foss, 2017). Axiologically speaking, social judgement theory is value-neutral in that the theories are objective based on the individual's beliefs and not biased opinions (Littlejohn and Foss, 2017). Overall, people will simply choose to believe what they want because they can or have prior feelings about a subject before being properly informed. It was hypothesized that if people were to view the information from the contrasting videos, they will pull from their already formed previous opinions about the beef industry and will adapt new and more positive opinions.

Research Questions

There was a key research question within this study. Will there be a change in the survey participants pretest opinions after watching videos which convey information about the beef community?

The hypothesis for each survey question is as follows; participants' posttest should improve (become more favorable) after viewing the videos.

Similarly, the null hypothesis states that participants' posttest will not improve (become more favorable) after viewing the videos.

Methodology

The purpose of this research was to measure the effectiveness of cognitively based and emotionally based educational videos related to the beef industry in altering pre-viewing perceptions. The two four-minute videos discussed animal welfare, consumer health, and environmental impact of beef consumption and production. Videos were produced with the help of local beef ranchers including for the emotional appeal. Interviews were conducted for the three farmers as well as recordings of their cattle operations were used. For a cognitive appeal, the second video was produced by interviewing Dr. Soren Rodning, a State Extension Veterinarian and coordinator of the Beef Quality Assurance certification program.

Participant Population

The target population was 10,000 students (undergraduate and graduate), all above the age of 19, which at the time of the study, were currently enrolled in classes at Auburn University or who teach at Auburn University or are affiliated with Auburn University. The target population was not an at-risk population and did not endure any negative consequences due to completing a survey. Participation was voluntary, and respondents may have exited the survey at any time and their responses were both anonymous and unidentifiable. Any incomplete surveys (included those surveys that are not completed by respondents that exited the survey before completing all questions) were deleted during the data cleaning phase and not used. No face-to-face interactions occurred, the consent process and all study procedures are completed online. The survey was approved as IRB 21-141.

Surveys were administered to all participants online through Qualtrics. Upon completion of demographics and the pre-test questions, participants viewed two videos. Both videos contained scripted content related to the agriculture/beef industry. One video was centered

around appealing to viewer's emotions and contained minimal facts or figures. The other video focused on appealing to cognitive responses and included statements on referenced facts, figures and statistics related to agricultural science as well as the beef industry. A post-survey was then administered to evaluate the overall impact of both videos to reveal any potential differences in effectiveness regarding the emotional vs. cognitive based videos as well as to see if the consumer's perceptions changed whether it be more positive or more negatively geared towards the beef industry.

Recruitment Process

Recruitment occurred across the 12 colleges on Campus at Auburn University for all students. The office of Institutional Research at Auburn University forwarded the motivational email across campus inviting AU students for voluntary participation.

Upon receiving invitation, students voluntarily completed a survey that polled demographic information such as: gender, age, diet, knowledge of agriculture, political affiliation as well as if they are involved with agriculture. The survey followed up with questions about if they purchase beef or beef animal derived products, what affects their decision making and fact-based questions about the agriculture/ beef industry. It is important to note that students who do not purchase beef or beef animal derived products could still participate if interested. The only exclusions to the data collection were those, who did not fully complete the survey.

Statistical Analysis and Instrumentation

In addition to soliciting demographic information, a pre-viewing survey and a post-viewing survey were administered in Qualtrics. SPSS was used for frequency and analysis of quantitative data derived from a Likert scale. A combination of paired-samples t-tests and descriptive statistics were used to determine results from the pretest and the postest was used.

The post-survey results evaluate the overall impact of both videos to reveal any potential differences in effectiveness regarding the emotional vs. cognitive based video as well as to see if the consumer's perceptions changed whether it be more positive or more negatively geared towards the beef industry. ATLAS, a qualitative data collection software used for qualitative data analysis was utilized for thematic coding of responses to open-ended questions. Five questions related to each of 3 main topics: animal welfare, diet/health of red meat, and environment/sustainability were asked. A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5). In addition to the fifteen questions, participants were asked which video they preferred, in what ways could the videos watched be improved, which aspects of the videos really influenced their opinions about the beef industry, had they ever viewed anything similar to what you were viewed in the videos, and after viewing the videos, did they have more of a positive or negative view on beef cattle production.

In comparing the responses from the pretest, and those collected during the posttest, equal variances were not assumed. Statistical significance of calculated scores were measured using a statistical significance of $p \leq 0.05$. Paired t-tests were used to determine changes in item means from the pre and the post survey responses. Qualitative responses for the questions, "In what ways could the videos you viewed be improved?" and the question, "After viewing the videos, do you have more of a positive or negative view on beef cattle production?" were analyzed for themes.

Results

The pre-survey and post-viewing surveys yielded varying perception results. Due to the nature of the questions framed in a positive or negative tone, each statement is discussed in relation to its significance level calculated. More specifically, the participants recorded strong perception changes after viewing the videos.

Viewing the videos elicited a positive attitude alteration regarding the animal welfare practice statements. Animal welfare statements yielded significant ($p < 0.001$) positive change in perception therefore participants responded more positively to statements related to animal welfare after watching the videos. This suggests that after viewing the videos, the participants had a more favorable perception of farmers treating their beef animals humanely, respectfully, and in a way that meets current welfare standards (Table 1). Also, after viewing the videos, it is suggested that participants understand that animals should be treated in sickness, through means of rest, antibiotics, or medicine (Table 1). Four of the 5 statement responses were more positive on the post. The fourth statement "I believe beef cattle deserve to have access to clean water, fresh grass, and healthy feed" had a higher mean on the post so people were more likely to disagree. All 5 items reached significance toward a more positive view. That is, after viewing the videos, participants were more likely to express positive beliefs related to the welfare of cattle.

Table 1.

Paired sample t-test statistics for participants' responses regarding animal welfare

Pair of pre and post	Mean Pre	Mean Post	*T*	*p*
I believe beef cattle are treated humanely.	2.78	1.61	19.556	<.001
I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.	1.40	1.22	5.228	<.001
I think farmers treat their beef cattle with respect.	2.33	1.56	13.977	<.001
I believe beef cattle deserve to have access to clean water, fresh grass, and healthy feed.	1.29	1.44	-3.381	<.001
I believe farmers treat animals in a way that meets current animal welfare standards.	2.37	1.53	15.499	<.001

[1]Survey of young adult college students about their opinion of welfare of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.
[2]Mean after viewing the videos.
[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

In regard to diet and health of beef, participants demonstrated a split in decisions through their responses. Four of the 5 changes were statistically significant ($p \leq .05$). Three of the 4 shifted in a more positive direction in favor of the beef industry. The data suggests that after watching the emotional and cognitive video, participants will continue purchasing beef products ($p < .001$), perceive beef is safe to consume ($p = 0.035$), and believe red meat is healthier than plant-based proteins ($p < .001$) (Table 2). While the results suggest that the videos did not shift participants' perception of support in the sale of beef products and that their opinions remained

stable after watching the videos, both pre- and post-viewing values averaged 1.5 which is indicative of high supportive of sale or purchasing of beef.

Table 2.

Paired sample statistics for diet/health.

Pair of pre and post	Mean Pre	Mean Post	*T*	*P*
I purchase beef products weekly.	2.54	1.46	16.251	<.001
I believe that beef cattle should not be consumed.	4.42	4.29	2.473	.014
I support the sale of beef products.	1.56	1.58	-4.09	.683
I believe that red meat is healthier than plant-based proteins.	3.40	2.32	9.377	<.001
I believe that beef is safe to consume.	3.40	2.32	2.120	.035

[1]Survey of young adult college students about their opinion of diet/health of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.
[2]Mean after viewing the videos.
[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

Respondents had mixed changes ($p < 0.05$) in perception regarding the environmental area of our research or the sustainability of producing beef. All 5 questions shifted significantly. However, 3 out of 5 shifted positively. After viewing the videos, participants were significantly more likely to agree that farmers should communicate with the public and less likely to agree that farmers don't care about the environment and that the beef cattle industry be phased out. On the other hand, participants were more likely to agree that farmers are the main contributors to pollution and believe that the beef cattle industry is not sustainable. (Table 3).

Table 3.

Paired sample statistics for environment/sustainability.

Pair of pre and post	Mean Pre	Mean Post[2]	*T*	*P*
I believe farmers do not care about the environment.	4.21	4.43	-3.949	<.001
I believe farmers are the main contributors to pollution.	4.30	2.24	19.823	<.001
I believe the beef cattle industry is not sustainable.	3.55	1.95	13.744	<.001
I believe animal agriculture is a large contributor to pollution and should be phased out.	4.06	4.24	-3.782	<.001
I believe that farmers should communicate with the general public about their farming practices.	2.01	1.68	6.165	<.001

[1]Survey of young adult college students about their opinion of welfare of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.
[2]Mean after viewing the videos.
[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

The results from the paired samples t-test provided us with insights on perception shifts from participants after watching the videos. Since the results showed the videos producing both positive and negative shifts in perception, these data provided us with understanding of what is best communicated through videos and perhaps where the industry can improve in communicating topics about the beef industry. Specifically, animal welfare practices are communicated effectively, while some aspects of diet and health of beef products and especially the environmental aspects of the beef industry could be improved in order to influence positive shifts in opinion.

Considering if video communication could be affective or not, we looked at how effective the video messaging could be through a couple free response questions. For example, we wanted to see if anyone had seen how effective the messaging could be (Table 4). Due to such a positive response, video would be an excellent tool in order to teach and engage future audiences.

Table 4.

Frequency response to the question, "Have you viewed anything similar to what you were shown today?"

Response	Frequency	Percent
Yes	132	42.2
No	181	57.8
Total	313	100

[1]Survey of young adult college students on perceptions about beef animal topics after viewing a cognitive and an emotionally based video.
[2]Results creating using a frequency from SPSS.

Overall, we wanted to examine how effective the videos were in changing people's perceptions of the beef industry. Out of the 313 respondents, 74.4% had a more positive response (Table 5). The initial hypothesis was proven correct in the fact that a majority of responders were left with a positive view after completing the surveys. Respondents also preferred the emotional video over the cognitive video. (Table 6).

Table 5.

Frequency response to the question, “After viewing these videos, do you have more of a positive or negative view on the beef industry?”

Response	Frequency	Percent
Positive	233	74.4
Negative	6	1.9
Neutral	74	23.6
Total	313	100

[1]Survey of young adult college students on perceptions about beef animals topics after viewing a cognitive and an emotionally based video.
[2]Results creating using a frequency from SPSS.

Table 6.

Response to the question, “What video did you prefer? Video 1 or Video 2?”

Video	Frequency
Video 1: Emotional	190
Video 2: Cognitive	101
Both	14
NA	10
Total	326

[1]Survey of young adult college students on perceptions about beef animals topics after viewing a cognitive and an emotionally based video.
[2]Results creating using a frequency from SPSS.

Emerging themes in response to the question, “In what ways could the videos you viewed be improved?”. Responses were coded as either positive or negative or neutral for themes. As far as positive themes, the top three common codes were that “Farmers take good care of their animals” (1) “Beef is healthy and an essential part of our diet” (2) and “I gained knowledge and a new perspective of the beef industry” (3). When asked about negative factors, the top three common responses were, “Beef is environmentally unsustainable” (1), “Beef is inhumanely harvested” (2) and “All beef is factory farmed” (3).

Emerging themes in response to the question, question, “Which aspects of the videos really influenced your opinions about the beef industry?”, 82% were positive, 11% were neutral, and 7% were negative. As far as the top three positive themes, the themes were “The videos provided a transparent view about the beef industry” (1), “food animals are raised wholesomely, respectfully, and humanely” (2) and “the videos influenced me to have a more positive outlook on beef” (3). The top three negative themes were “my opinions did not change” (1) “the information provided was staged and biased” (2), and “more facts and statistics would help explain beef production” (3).

Discussion

With increasing popularity of virtual messaging, there is a need for a more transparent view of the beef industry. Videos are proposed as an effective tool to communicate about specific topics, and there is great opportunity for animal agriculture to implement to increase transparency, communicate to a broader audience, and bridge the knowledge gap between consumers and producers. In this study, participants were shown two separate videos pertaining to emotional and cognitive aspects related to the beef industry. The main focal points are on the aspect of animal welfare, diet/health of red meat, an environment/sustainability, which was explored through several studies. This study is similar to the studies done by Rice and others (2020) and Ventura and others (2016) by providing a visual experience. This present study focused on providing emotional and cognitive videos as tools in order to engage participants. Crafted by a panel of animal science experts, each video created two different narratives for the participants to connect with. The emotionally charged video had a combination and overlap of stories from actual Alabama beef cattle producers. The producers, all from the same family, shared their experiences, hardships, as well as their motivations to farm beef cattle to create an

atmosphere of family values and realism tied to the industry. It was anticipated that these emotionally charged characteristics would be more influential on participant's perceptions toward beef production. The cognitively charged video portrayed facts and statistics about the beef industry and the quality of beef products vectored through an actual practicing extension veterinarian. Dr. Soren Rodning presented the same information as the emotional video in an academic or educational perspective. Both videos had expert-created scripts drafted for use, however, the genuity off-script was used instead because they were seen as most appealing to the projected participants.

It was hypothesized that the intervention of videos will shift opinions optimistically in a positive outlook, especially the emotionally charged video, regarding the beef industry, and the data resulted suggests this is true. In each question subset, animal welfare, diet and health of beef, and environment and sustainability of beef production, significant differences in opinion were recorded post-video intervention. Overall, animal welfare topics demonstrated the highest potential to shift opinion. Results from the diet and health of beef and sustainability of beef production sections were less conclusive than the animal welfare portion, but the results still suggest that video messaging can be an effective tool to explore use of in the future. This study found that people genuinely liked seeing farmers interact with their cattle and gained knowledge. In contrast Ventura and others (2016) focused on bringing people to an actual dairy, this study shows the participants real life farms.

Video messaging, growing in popularity, has immense potential to alter attitudes toward agricultural topics out of non-agricultural audiences as shown in this study. Both the descriptive statistics and paired samples t-tests results demonstrate this phenomenon. This study found that perceptions regarding animal welfare differed significantly after viewing the videos. Participants

perceived the beef industry as a humane, ethical, safe industry with specific understanding that beef cattle are kept to current animal welfare standards. Regarding diet, health, and consumption of beef, participants showed significant shifts in understanding the health benefits of beef. Specifically, participants demonstrated a shift in perception in their confidence that red meat products are healthier than plant-based alternatives. Sustainability of beef, however, demonstrated the least clarity in shifting perceptions of participants. After watching the videos, there were statistically significant perception changes in a negative manner, such as farmers are responsible for current pollution outputs. Considering all of the quantitative measures, qualitative analysis provided greater insight to participant perceptions across the three research areas. Particularly, thematic coding revealed percentages of positive and negative comments addressing the beef industry after viewing the videos. For example, the videos provided a generally liked transparency of the beef industry, but also scrutinized because the farms presented were not "representative of factory farms." Though negative statements like these were commented throughout 405 responses, the videos induced positive outlooks for the beef industry. Thus, reinforcing the concept that video messaging can be an effective tool for promotors of the industry.

Animal welfare seems to be the biggest concern among college students in this present study as in several others including Edwards-Callaway and Calvo-Lorenz, (2020) and Cardoso and others (2016). As far as results go, consumer's biggest positive comments were the fact that beef cattle were being treated humanely by their owners. The most frequent concern was the well-being/welfare of the cattle followed by environmental impact (Cardoso, et al. 2016). Unlike Ventura (2017), after seeing the videos, the participant's behaviors improved in their attitudes

towards animal welfare, diet/health of red meat, an environment/sustainability. It seems to be more effective to show videos than to bring consumers to actual locations.

Limitations and Future Research Discussion

If given the chance to redo this study, the formatting of the questions in Qualtrics would be changed to remain neutral and consistent in design for all questions. For future research, the study could be conducted across multiple colleges and universities to compare results. There could be more diversity due to the fact that mostly Caucasian men and women were shown. Demographics could be added alongside the pretest and the posttest when analyzing data. Furthermore, perhaps if the videos were launched on more social media platforms, it would lead to a more realistic and transparent view of the beef industry toward developing a sense of trust between the general public and the beef industry.

Conclusion

With fewer people involved in the world of agriculture, people are not understanding animal husbandry. Consequently, there is a need for a more transparent view of the beef industry. Fewer people can identify where the meat is coming from and have been exposed to social media narratives and messaging about inhumane treatment, diet-health consequences and relationships to environmental sustainability. By using digital media such as video, it creates a climate of openness which can be utilized to bridge the gap of understanding between the general public and the beef industry. The world needs animal agriculture in order to survive but that can't happen without support from the general public.

This study was extremely successful in showing that people's perceptions can be changed for the betterment of the industry. Videos are an excellent form of communication and need to be

explored as a communication modality to lessen the knowledge gap between citizens and the beef industry. Results of this study show that people have an interest in learning more about the beef industry. They also need more facts and more open communication when it comes to the concepts of diet/health and environment/sustainability.

Credit author statement:

Savannah Locke: Conceptualization, Validation, Investigation, Data Curation, Writing - Original Draft, Visualization. **Karen Hiltbrand**: Investigation, Video Production- Review & Editing. **Katie Corbitt**: Data Curation, Writing - Review & Editing. **Darcey Richburg**: Data Curation and Editing. **Jason Sawyer**: Conceptualization, Methodology, Writing - Review & Editing. **Soren Rodning**: Conceptualization, Methodology, Writing - Review & Editing. **David Shannon**: Conceptualization, Methodology, Writing - Review & Editing. **Donald Mulvaney**: Conceptualization, Methodology, Writing - Review & Editing, Supervision, Project administration, Funding acquisition.

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Chapter III

Title: Instagram as a Tool of Diffusion for the Livestock Industry

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Abstract

Studies have shown that more people are getting their information through social media (SM). With so much misinformation presented in global media, it is difficult for consumers to distinguish what is true and what isn't. With negative images and minimal context, consumers have a tendency to believe and trust what they see on SM. After IRB approval, a survey study was launched on Qualtrics and accessed via email. Using Instagram as platform, this study presented 5 cognitively and 5 emotionally oriented posts focused on the aspects of animal welfare, diet/health, and environment/sustainability. Prior to viewing the Instagram posts, study participants were given a 5-scale Likert pre survey assessing their opinions about their views of animal welfare, diet/health of consumers of red meat and environment/sustainability for the beef industry. Participants subsequently viewed the posts and then took a post survey. SPSS was used to analyze responses with t-tests and frequencies. ATLAS was used to code for negative and positive key words in open responses. Results showed that participant's views about the beef industry improved ($p < .05$) after viewing the media posts for welfare and that participants favored the suggestions that beef cattle are treated humanely. Participants were unsure of the effects that beef consumption has on consumers' diet and health as well as the environment. Qualitative results suggest that viewing of the posts had a favorable impact on consumer's opinions.

Key Words: Animal Welfare, Beef, Diet/Health, Environment/Sustainability, Social Media, Video Communication

Introduction

Citizens within developed countries have become removed from agriculture and are no longer agrarian societies. Increasingly, people gain information from and are influenced in their views by social media instead of evidence-based, scientific sources (Raj et al., 2021). Consequently, a knowledge gap has been created between the consumers and the animal agricultural industry.

There is a chance that this knowledge gap could be lessened by using social media as a way to bring in truthful and factual information. (Morris and James, 2017). A study presented by Simis and others has shown that scientists don't necessarily possess the skills to communicate findings and data to the general public in a way that everyone not of the scientific community can understand (Simis et al., 2016).

Consumers are concerned with welfare, diet/health on consumption of red meat, and the impact beef cattle have on the environment/sustainability. With less than 1% directly involved in production agriculture, consumers are relying on what they digest from social media which shapes their perceptions (Rice et al., 2016). Without much regulatory process oversight and citizen journalism, it has become easy and simple to propagate false or misguided information (Mavrodiev et al., 2021). Ultimately, consumers decide for themselves what they choose to trust and believe by relying on "their own internal voice" (Houldsworth et al., 2020).

A key concept to improving relations between the agricultural industry and the general public is the development and maintenance of trust. If consumers can gain understanding about where their meat is coming from in all stages of production, perhaps it can lead to improved trust. As described by Houldsworth (2020), truth and integrity are related to trust in that all are required for an accurate perception of what we call "the truth." Social media follows a structure of a teacher-student relationship where the teacher is the content creator and the student is the

social media user. The teacher-student bond, also described by Houldsworth (2020), inquires that information shared across social media in an educational manner, regardless of positive or negative attitude on a subject, is proven influential enough to craft permanent perceptions. This background led to a study designed to examine the effectiveness of cognitive and emotional social media posts as modalities to offset the knowledge gap between the beef industry and the general public and if this translates to improved perceptions.

Research Questions

There were two research questions to answer from this study. First, which posts, cognitive or emotional, are more influential or effective on changing perceptions of non-ag audiences about humane treatment of livestock? Second, will there be a change in the participants pre- and post-survey self-declared perceptions after having viewed the posts?

The hypotheses for these questions were as follows. First, emotional posts will have a greater impact upon changing the public's perceptions about the beef industry. Second, participants' posttest should greatly improve after viewing the posts.

The null hypotheses are described as the following. First, cognitive posts will have a greater impact upon changing the public's perceptions about the beef industry. Second, participants' posttest will not improve after viewing the posts.

Methods

The purpose of this research was to measure the effectiveness of cognitively based and emotionally based Instagram posts related to the beef industry in altering pre-viewing perceptions. The ten posts contained imagery and content on animal welfare, consumer health, and environmental impact of beef consumption and production. These posts were extracted from

the investigators Instagram account and for the cognitive content, additional information was inserted. Original images created for emotional appeal were taken from local beef ranchers.

Participant Population

10,000 students (undergraduate and graduate), all above the age of 19, which at the time of the study, were currently enrolled in classes at Auburn University were asked for voluntary participation. There were no risks or negative consequences involved in taking this survey. Respondents could have exited the survey at any time. Their responses were both anonymous and unidentifiable. In the data cleansing phase, incomplete surveys were omitted and deleted. The recruitment and survey link were completely online, so no face-to-face interactions occurred. The survey was covered by an approved IRB (21-40).

Recruitment and Survey Process

All study participants were recruited via an invitational email from the Office of Institutional Research at Auburn University. Voluntary participation was asked for students across all 12 colleges of Auburn University.

Upon accepting the invitation to participate, students completed a Qualtrics survey that asked demographic questions. Some of the question asked included: age, race, gender, what college they were enrolled, and if they had any involvement within agriculture. The presurvey asked five questions each about animal welfare, diet/health of red meat for consumers, and environment/sustainability. There were no limitations of who could participate. Upon completion of the presurvey, participants were directed to view 10 social media posts set to an Instagram format all on the aspects of animal welfare, diet/health, and environment/sustainability.

Participants were also asked which posts they preferred, in what ways could the posts be improved, which aspects of the posts really influenced their opinions about the beef industry, have they viewed anything similar to what you were shown today, and after viewing the posts, did they have more of a positive or negative view on beef cattle production.

Statistical Analysis

Materials for this project included ten social media posts, five emotional and five cognitive. All images were taken by the author and were derived from personal Facebook and Instagram profiles. A Qualtrics survey was used to collect the data which included asking for demographics, a presurvey data set, and a posttest survey data set. SPSS was used for data analysis which included the use of a combination of paired-sample t-tests and frequencies. The significance of these calculated scores was measured using of $p = \leq .05$. ATLAS was used for qualitative data collection.

A combination of t-tests and frequencies to compare the data from the pretest and the post-test groups. Likert type scale was used as a five-point scale, with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5). Questions related to three main topics: animal welfare, diet/health of red meat, and environment/sustainability. In addition to the 15 questions, participants were asked to view and read the 10 social media posts formatted to look simulate real Instagram post. Results allowed determination which type of post had the greatest impact on participants and to determine if the study led to an effective mode of communication with the general public.

Results

The images produced a positive ($p < .05$) attitude alteration regarding the animal welfare practice statements. The data showed what the participant's views were before the viewing the posts and what the participant's views were after having seen the posts. Analysis of the response to the pre- and post-viewing survey statements within the animal welfare category showed a significant increase ($p < 0.001$) of opinion or perception which makes all 5 items significant. Four of the five items shifted in a positive direction in favor of the beef industry. This suggests that after viewing the posts, the participants had an altered perception of farmers treating their beef animals humanely, respectfully, and in a way that meets current welfare expectations (Table 1). Also, after viewing the posts, it is suggested that participants understand that animals should be treated in sickness, through means of rest, antibiotics, or medicine (Table 1).

Table 1.

Paired sample statistics for welfare[1,3].

Pair of pre and post	Mean Pre	Mean Post[2]	*t*	*p*
I believe beef cattle are treated humanely.	2.84	1.86	18.669	<.001
I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.	1.38	1.28	3.665	<.001
I think farmers treat their beef cattle with respect.	2.29	1.82	9.756	<.001
I believe beef cattle deserve to have access to clean water, fresh grass, and healthy feed.	1.64	1.77	-2.345	.019
I believe farmers treat animals in a way that meets current animal welfare standards.	2.42	1.83	12.386	<.001

[1]Survey of young adult college students about their opinion of welfare of animals prior to and after the viewing of a cognitive and emotionally based posts. N=438.
[2]Mean after viewing the posts.

[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

In regard to diet and health of beef, participants demonstrated a split in decisions through their responses. Two pairs reached statistical significance while all 5 pairs shifted to positive perceptions in favor of the beef industry. After viewing the images, participants indicated that they would purchase more beef ($p < .001$), but also more strongly agreed that red meat products were healthier ($p < .001$)

When asked "I support the sale of beef products" in the pre-test and then asked, "After viewing these posts, I support the sale of beef products" the alpha significance level was .059 which is greater than $p < .05$. Therefore, the consumers' perceptions did not alter after viewing the videos and remained stable.

When asked, "I believe beef is safe to consume" in the pretest then asked, "After viewing these posts, I believe beef is safe to consume" it was not significant ($p = .901$). Their stances on whether to support the sale of beef products remained stable after viewing the posts. When asked "I support the sale of beef products" in the pretest and then asked, "After viewing these images, I support the sale of beef products" it was not statistically significant ($p = 0.059$) since it is greater than $p \leq 0.05$. Therefore, the views remained stable on whether to support the sale of beef products. The results suggest that the images did not shift participants' perception of support in the sale of beef products and that their opinions remained indifferent after viewing the images because they were already strongly supportive of beef.

Table 2.

Paired sample statistics for diet/health[1,3].

Pair of pre and post	Mean Pre	Mean Post[2]	*t*	*p*
I purchase beef products weekly.	2.54	1.67	15.724	<.001
I believe that beef cattle should not be consumed.	4.33	4.32	.403	.687
I support the sale of beef products.	1.59	1.65	-1.892	.059
I believe that plant-based proteins are healthier than red meat.	3.15	2.46	7.596	<.001
I believe that beef is safe to consume.	1.50	1.50	.125	.901

[1]Survey of young adult college students about their opinion of diet/health of animals prior to and after the viewing of a cognitive and emotionally based posts. N=438.
[2]Mean after viewing the posts.
[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

The respondents had mixed perceptions regarding environment and sustainability. Four of the following were significant. Out of the following, 2 shifted negatively while three shifted positively. The negative shifts ($p \leq .05$) in perception regarding the environmental area of research or the sustainability of producing beef. The data suggests that participants feel that farmers do not care about the environment, the production of beef contributes to pollution, is unsustainable, and the industry should be phased out after viewing the posts (Table 3). The results suggest after viewing the posts, participants want farmers to communicate about their farming practices ($p < 0.321$).

Table 3

Paired sample statistics for environment/sustainability[1,3].

Pair of pre and post	Mean Pre	Mean Post[2]	*T*	*p*
I believe farmers do not care about the environment.	3.46	3.42	.993	.321
I believe farmers are the main contributors to pollution.	4.18	2.93	13.359	<.001
I believe the beef cattle industry is not sustainable.	2.16	3.95	11.477	<.001
I believe animal agriculture is a large contributor to pollution and should be phased out.	3.95	4.20	-5.487	<.001
I believe that farmers should communicate with the general public about their farming practices.	1.95	1.66	7.421	<.001

[1]Survey of young adult college students about their opinion of environment/sustainability of animals prior to and after the viewing of a cognitive and emotionally based posts. N=438.
[2]Mean after viewing the posts.
[3]Results creating using a t-test from SPSS.
[4] A five-point Likert type scale was used with the response categories: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

The results from the paired samples t-test provided us with insights on perception shifts from participants after viewing the posts. Though the results showed the posts producing both positive and negative shifts in perception, this provides us with understanding of what is best communicated through images where we can improve the images produced about the beef industry. Specifically, animal welfare practices are communicated effectively, while some aspects of the environment and especially the diet/health aspects of the beef industry could be improved to produce positive shifts in opinion.

A frequency table was used for the question, “Have you been exposed to posts like these before?” Out of the 438 participants, 50.7% said yes. This shows how easy it can be to upload and share information, whether it’s true or not about the beef industry.

Table 4.

Frequency response to the question, “Have you been exposed to posts like these before?”[1,2]

Response	Frequency	Percent
Yes	222	50.7
No	216	49.3
Total	438	100

[1]Survey of young adult college students on perceptions about beef animals topics after viewing a cognitive and an emotionally based video.
[2]Results creating using a frequency from SPSS.

For the question, “After viewing these images, do you have more of a positive or negative view on the beef industry?”, out of the 438 respondents, 64.4% had a more positive response. The initial hypothesis was proven correct in the fact that majority of responders were left with a positive view after completing the survey.

Table 5.

Frequency response to the question, “After viewing the images, do you have more of a positive or negative view on beef cattle production?”

Response	Frequency	Percent
Positive	282	64.4
Negative	29	6.6
Neutral	127	29.0
Total	438	100

[1]Survey of young adult college students on perceptions about beef animals topics after viewing a cognitive and an emotionally based video.

[2]Results creating using a frequency from SPSS.

For emerging themes in response to the question, “In what ways could the posts you viewed be improved?” Responses were coded as either positive or negative or neutral for themes.

As far as positive themes go, the top three common codes were that "The posts represented real-life beef farms" (1) "The presence of sources reinforced the credibility of the posts" (2) and "Farmers take care of their beef animals" (3). When asked for negative factors, the top three common responses were, "The formatting of the social media posts were not representative of Instagram (1), "The information was fake and staged" (2) and "More sources would have provided more credibility" (3).

Emerging themes in response to the question, "Which aspects of the videos really influenced your opinions about the beef industry?" 82% were positive, 11% were neutral, and 7% were negative. The top 3 positive themes were "The videos provided a transparent view about the beef industry" (1), "food animals are raised wholesomely, respectfully, and humanely" (2) and "the videos influenced me to have a more positive outlook on beef" (3). The top negative 3 were "my opinions did not change" (1) "the information provided was staged and biased" (2), and "more facts and statistics would help explain beef production" (3).

Discussion

With many people removed from agriculture a lack of knowledge and understanding has occurred (Rice, et al., 2020). In this study, Instagram was used as a model to display information about the industry alongside images of functioning cattle operations as it has high popularity among social media users as indicated in this study. Animal activism can promote negative ideas about the livestock industry of animal industries and can change perceptions in a negative manner (Cardoso, et al., 2016). Even in this study, a few images that consumers may perceive as negative images were used such as a calf being tagged, and a calf being vaccinated. Both ear

tagging and vaccinations are necessary procedures but to the non-ag audience can be perceived as inhumane.

Godfrey and others claim that those who are uninformed, or anti-agriculture argue more intensive farming practices can harm the environment (Godfrey, et al., 2010). A social media post can only fit so much information on it. Despite the intentions of the survey to inform consumers of sustainable farming practices, they remain unsure of the actual impact of agriculture on contribution of carbon to the environment. Much like the Olausson (2017) study, environment along with red meat were the biggest concerns for participants of this study. Participants in both studies as well as Olausson's preferred images that had positive elements displayed such as people and cows with their calves, more than the perceived negative images such as those where the calves are restrained.

Diet and health are another area of concern for consumers specifically regarding red meat's nutritional value. Ensuring consumers are informed correctly is extremely important because their beliefs directly impact purchasing decisions (Oesterreicher et al., 2018). Currently, people have many choices as alternatives to red meat especially with the introduction of plant-based proteins (Mann 2018) which is a reason why communication and education is extremely important. This study utilized Instagram to generate posts while other studies have investigated using farmer's preference of Facebook according to Raj and others (2020) as their choice of social media platform. According to Raj and others, "The WhatsApp, YouTube and Facebook were the most commonly used social media tools by majority of the livestock farmers" (Raj, et al., 2020 p.4).

Increasing availability of virtual media and consequently increasing use of social media as a vector for sharing information has allowed propagation of misinformation regarding animal agriculture. As a test of mitigation, this study was created to measure perception shifts after viewing 2 different kinds of social media posts: cognitive Instagram posts and emotional Instagram posts. In this study, participants indicated their affability of statements regarding the beef industry focused in three areas including animal welfare, diet and health of beef, and sustainability of beef production. The project social media posts were created and approved by a team of experts in the field, where five emotionally charged posts and five cognitively charged posts were generated to reflect similar structure to Instagram. Each post had an image and a caption describing the image below it. Emotional post captions reflected the wholesomeness of beef, family values amongst industry producers, and the values of motivations for farmers to provide food for the world. Cognitive post captions introduced factual information and sources to back up the claims. It was anticipated that emotionally charged posts would influence participant perceptions greater than cognitively charged posts because people tend to lean on their emotions when using social media.

It was hypothesized that intervention of cognitive and emotional social media posts will both shift opinions regarding production of beef positively, especially the emotional posts, and the data suggests this is true. As a result of viewing these posts, participants had a more positive outlook on the beef industry. Each question subset produced significant changes in perception after viewing the posts. Overall, concepts of animal welfare were best translated in contrast to diet and health of beef or sustainability of beef. Considering this, the results reinforce the idea that social media can be an effective tool for sharing information about the beef industry and has a massive potential to cultivate appreciation for animal agriculture.

As commonly seen in other non-scientific areas, social media has the power to motivate specific audiences to fit their agenda. Both the descriptive statistics and paired samples t-test conducted demonstrate this concept, where after viewing the posts, participants had altered perceptions regarding animal welfare of beef animals, diet and health of beef products, and the environmental impact or sustainability of beef production. The data suggest that animal welfare topics have the greatest potential for application in real-life situations, such as communicating the safety and wholesomeness of raising beef cattle. Participant understanding of health of beef products and sustainability of beef production are less conclusive, but still very important in understanding their confidence in the beef industry. In compliment to quantitative measures explored, qualitative measures from the results provide details on participants' level of influence through social media. For example, participants thoroughly enjoyed the posts regardless of emotional or cognitive status, but participants were suspicious of the photos being staged. This is interesting because though people tend to trust what they see on social media, true statements about animal agriculture is suspected to be false. Though suspicions and other negative comments were discovered throughout the data analysis, there were a plethora of positive comments as well. The posts influenced participants positively and helped shift their opinion of the beef industry to a more positive and supportive perspective.

Social media is an excellent way to communicate between different groups of people (Randolph et al., 2021). Within this study transparency was another area that participants preferred to see in posts which can lead consumers to have a clearer view of the beef industry. Lochner and others claim that visuals and images can be used to present complex and difficult or unknown information in an easy-to-understand manner (Lochner, et al., 2021). When Lochner and others used social media to distribute posts about the industry, their findings concluded that

posts that contained images or infographics faired far better than just informational materials (Lochner, et al., 2021) which is consistent with the results of the present study.

Limitations and Future Research

Should this study be repeated, it would be important to factor in different forms of social media. Perhaps, participants would have better responses if the posts were used through Facebook or Twitter. Additional studies should include more diversity in the images of the posts. Another limitation is that Instagram posts can only have so many words and a limit of pictures used per post. It would also be encouraged to include sources where the images were taken should this study be repeated.

Conclusion

Social media is a necessary tool in combatting the lack of knowledge consumers face due to being so far removed from the farm. Instagram posts seem to be effective in helping lessen this knowledge gap yet more research is needed around image management and content on the latest data on environment and sustainability topics. More information is needed on most effective communication messaging and modalities in order to strengthen perceptions of the beef industry among non-agricultural audiences.

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Appendices

Appendix A

Invitation Email for the Measuring the Effectiveness of Both Cognitive and Emotional Forms of Instructional Videos Related to the Beef Industry Study

You are invited to participate in a research study to help the general public come to a better understanding of the beef industry, research will be geared towards using videos as a platform. Qualtrics will be used as platforms to conduct a survey on how the relationship between the public and livestock producers may be improved. The study is being conducted by Savannah Locke, Graduate Student, under the direction of Dr. Donald Mulvaney in the Auburn University Department of Animal Science. You were selected as a possible participant because you are a student of Auburn University and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to view a 4.5-minute video and determine whether your opinion changes or not by taking a brief pretest as well as a posttest. Your total time commitment will be approximately 20 minutes or less.

Are there any risks or discomforts? There are no risks or discomforts while participating in this research study.
Are there any benefits to yourself or others? If you participate in this study, you can expect to become more aware and informed of the animal agriculture through the beef industry. We/I cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating? To thank you for your time you will be offered a chance to enter and win a gift card worth $50.

Are there any costs? If you decide to participate, there are no associated costs.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Animal Science.

Your privacy will be protected. Any information obtained in connection with this study will remain anonymous. Information obtained through your participation may be published anonymously in an educational journal.

If you have questions about this study, contact Savannah Locke at sll0030@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Click here to begin the survey: https://bit.ly/3qGsXo8

Appendix B

Invitation Email for the Social Media as Tools of Diffusion for the Livestock Industry Study

You are invited to participate in a research study to help the general public come to a better understanding of the beef industry, research will be geared towards using videos as a platform. Qualtrics will be used as platforms to conduct a survey on how the relationship between the public and livestock producers may be improved. The study is being conducted by Savannah Locke, Graduate Student, under the direction of Dr. Donald Mulvaney in the Auburn University Department of Animal Science. You were selected as a possible participant because you are a student of Auburn University and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to view ten social media posts and determine whether your opinion changes or not by taking a brief pretest as well as a posttest. Your total time commitment will be approximately 20 minutes or less.

Are there any risks or discomforts? There are no risks or discomforts while participating in this research study.

Are there any benefits to yourself or others? If you participate in this study, you can expect to become more aware and informed of the animal agriculture through the beef industry. We/I cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating? To thank you for your time you will be offered a chance to enter and win a gift card worth $50.

Are there any costs? If you decide to participate, there are no associated costs.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Animal Science.

Your privacy will be protected. Any information obtained in connection with this study will remain anonymous. Information obtained through your participation may be published anonymously in an educational journal.

If you have questions about this study, contact Savannah Locke at sll0030@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Click here to begin the survey:

https://auburn.qualtrics.com/jfe/form/SV_aeJIjWLd3MdcnRQ

Appendix C

Qualtrics Survey for Measuring the Effectiveness of Both Cognitive and Emotional Forms of Instructional Videos Related to the Beef Industry

Demographics

Q1 What is your year of birth?

_____

Q2 Choose one or more races that you consider yourself to be:

- o White (1)
- o Black or African American (2)
- o American Indian or Alaska Native (3)
- o Asian (4)
- o Native Hawaiian or Pacific Islander (5)
- o Other (6) _____

Q3 What is your sex?

- o Male (4)
- o Female (5)
- o Nonbinary (6)
- o Other (7)

Q4 Which college are you enrolled in or have obtained a degree from?

- o College of Agriculture (4)
- o College of Architecture, Design, and Construction (5)
- o College of Business (6)
- o College of Education (7)
- o College of Engineering (8)
- o College of Forestry and Wildlife Sciences (9)
- o College of Human Sciences (10)

- o College of Liberal Arts (11)
- o College of Nursing (12)
- o College of Pharmacy (13)
- o College of Sciences and Mathematics (14)
- o College of Veterinary Medicine (15)

Q5 Please specify your major after having selected your college.

_____

Q6 What political party are you registered with, if any?

- o Republican (1)
- o Democratic (2)
- o Independent (3)
- o Other (4) _____
- o None (5)

Q7 Which choice best fits where you are from originally?

- o city (1)
- o rural (2)
- o other (3)

Q8 Do you currently or have you worked in an agricultural field?

- o Yes (1)
- o No (2)

Q10 What do you usually trust more in relation to a new topic to you?

- o Science (1)
- o Social Media (2)

- o The Government (3)
- o An Expert (4)
- o An Influencer (5)
- o A Professor (6)
- o A Trusted Friend or Family Member (7)
- o Other (8)

Q9 Which social media accounts do you use if applicable? Choose all that apply.

- o Facebook (1)
- o Instagram (2)
- o Twitter (3)
- o Snapchat (4)
- o Tumblr (5)
- o TikTok (6)
- o Linkedin (19)
- o Reddit (20)
- o Other (21)
- o None (22)

Q10 Where do you mainly get your news from? Choose all that apply.

- o Newspaper and/or magazines (1)
- o Television (2)
- o Social Media (3)
- o Other. Please list: (4) _____

Q11 Do you trust what you see on social media?

- o Yes (1)
- o No (2)

o It depends (3)

Q12 I seek to know more about things I do not understand.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q13 Everything I choose to trust is based on factual information.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 I trust social media over science.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 I fact check everything I read.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Pre-test. Please answer the following questions to the best of your ability.

Q1 I believe beef cattle are treated humanely.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q2 I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q3 I think farmers treat their beef cattle with respect.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q4 I believe beef cattle deserve to have access to clean water, fresh grass, and healthy feed.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q5 I believe farmers treat animals in a way that meets current animal welfare standards.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q6 I purchase beef products weekly.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q7 I believe that beef cattle should not be consumed.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q8 I support the sale of beef products.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q9 I believe that plant-based proteins are healthier than red meat.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q10 I believe that beef is safe to consume.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q11 I believe farmers do not care about the environment.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q12 I believe farmers are the main contributors to pollution.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q13 I believe the beef cattle industry is not sustainable.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 I believe animal agriculture is a large contributor to pollution and should be phased out.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 I believe that farmers should communicate with the general public about their farming practices.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Videos

Q1 Please watch the following video carefully. After you finish the video, you will be redirected to a post test to complete. The video will automatically advance once you have watched it completely.

Q2 Please watch the following video. Once you finish the video you will be redirected to a post test. Afterwards, the video will automatically advance.

Post-test

Q1 After viewing these videos, I believe that beef cattle are treated humanely.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q2 After viewing these videos, I believe that it is necessary to treat sick animals. Such treatments include rest, antibiotics, or medicine.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q3 After viewing these videos, I believe farmers treat their beef cattle with respect.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q4 After viewing these videos, I believe beef cattle have access to clean water, fresh grass, and healthy feed.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q5 After viewing the videos, I believe farmers treat animals in a way that meets current animal welfare standards.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q6 After viewing these videos, I will continue to purchase beef products.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q7 After viewing these videos, I still believe that beef cattle should no longer be consumed.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q8 After viewing these videos, I will support the sale of beef products such as meat.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q9 After viewing these videos, I believe that red meat is healthier than plant-based proteins.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q10 After viewing these videos, I believe that meat from beef cattle is safe to consume.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q11 After viewing the videos, I believe farmers do not care about the environment.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q12 After viewing these videos, I believe that farmers are not the main contributors to pollution.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q13 After viewing these videos, I believe the beef cattle industry is sustainable.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 After viewing the videos, I believe animal agriculture is a large contributor to pollution and should be phased out.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 After viewing the videos, I believe that farmers should communicate with the general public about their farming practices.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q16 In what ways could the videos you watched be improved?

_____

Q17 Which video do you prefer? Video 1 or Video 2?

_____

Q18 Which aspects of the videos really influenced your opinions about the beef industry?

_____

Q19 Have you viewed anything similar to what you were shown today?

o Yes (1)

o No (2)

Q20 After viewing the videos, do you have more of a positive or negative view on beef cattle production?

o Positive (1)

o Negative (2)

o Neutral (3)

Q1 (Optional) Please enter your email here to enter a chance to win a $50 Amazon gift card.

_____

Appendix D

Qualtrics Survey for Instagram as a Tool of Diffusion for the Livestock Industry

Demographics

Q1 What is your year of birth?

_____

Q2 Choose one or more races that you consider yourself to be:

- o White (1)
- o Black or African American (2)
- o American Indian or Alaska Native (3)
- o Asian (4)
- o Native Hawaiian or Pacific Islander (5)
- o Other (6) _____

Q3 What is your sex?

- o Male (4)
- o Female (5)
- o Nonbinary (6)
- o Other (7)

Q4 Which college are you enrolled in or have obtained a degree from?

- o College of Agriculture (4)
- o College of Architecture, Design, and Construction (5)
- o College of Business (6)
- o College of Education (7)
- o College of Engineering (8)
- o College of Forestry and Wildlife Sciences (9)
- o College of Human Sciences (10)
- o College of Liberal Arts (11)

- o College of Nursing (12)
- o College of Pharmacy (13)
- o College of Sciences and Mathematics (14)
- o College of Veterinary Medicine (15)

Q5 Please specify your major after having selected your college.

_____

Q6 What political party are you registered with, if any?

- o Republican (1)
- o Democratic (2)
- o Independent (3)
- o Other (4) _____
- o None (5)

Q7 Which choice best fits where you are from originally?

- o city (1)
- o rural (2)
- o other (3)

Q8 Do you currently or have you worked in an agricultural field?

- o Yes (1)
- o No (2)

Q10 What do you usually trust more in relation to a new topic to you?

- o Science (1)
- o Social Media (2)
- o The Government (3)

- o An Expert (4)
- o An Influencer (5)
- o A Professor (6)
- o A Trusted Friend or Family Member (7)
- o Other (8)

Q9 Which social media accounts do you use if applicable? Choose all that apply.

- o Facebook (1)
- o Instagram (2)
- o Twitter (3)
- o Snapchat (4)
- o Tumblr (5)
- o TikTok (6)
- o Linkedin (19)
- o Reddit (20)
- o Other (21)
- o None (22)

Q10 Where do you mainly get your news from? Choose all that apply.

- o Newspaper and/or magazines (1)
- o Television (2)
- o Social Media (3)
- o Other. Please list: (4) _____

Q11 Do you trust what you see on social media?

- o Yes (1)
- o No (2)
- o It depends (3)

Q12 I seek to know more about things I do not understand.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q13 Everything I choose to trust is based on factual information.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 I trust social media over science.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 I fact check everything I read.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Pre-test. Please answer the following questions to the best of your ability.

Q1 I believe beef cattle are treated humanely.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q2 I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q3 I think farmers treat their beef cattle with respect.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q4 I believe beef cattle have access to clean water, fresh grass, and healthy feed.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)

o Strongly disagree (5)

Q5 I believe farmers treat animals in a way that meets current animal welfare standards.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q6 I purchase beef products weekly.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q7 I believe that beef cattle should not be consumed.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q8 I support the sale of beef products.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q9 I believe that red meat is healthier than plant-based proteins.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q10 I believe that meat from beef cattle is safe to consume.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q11 I believe farmers care about the environment.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q12 I believe farmers are the main contributors to pollution.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q13 I believe the beef cattle industry is sustainable.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 I believe animal agriculture is a large contributor to pollution and should be phased out.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 I believe that farmers should communicate with the general public about their farming practices.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Posts

Image 1

Image 2

Image 3

Image 4

Image 5

Image 6

Image 7

Image 8

Image 9

Image 10

Post Survey

Q1 After viewing these images, I believe beef cattle are treated humanely.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q2 After viewing these images, I believe that it is necessary to treat sick animals. Such treatments include rest, antibiotics, or medicine.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q3 After viewing these images, I believe farmers treat their beef cattle with respect.

- o Strongly agree (1)
- o Somewhat agree (2)
- o Neither agree nor disagree (3)
- o Somewhat disagree (4)
- o Strongly disagree (5)

Q4 After viewing these images, I believe beef cattle have access to clean water, fresh grass, and healthy feed.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q5 After viewing the images, I believe farmers treat animals in a way that meets current animal welfare standards.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q6 After viewing these images, I will continue to purchase beef products weekly.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q7 After viewing these images, I believe that beef cattle should no longer be consumed.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q8 After viewing these images, I support the sale of beef products such as meat.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q9 After viewing these images, I believe that red meat is healthier than plant-based proteins.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q10 After viewing these images, I believe that meat from beef cattle is safe to consume.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q11 After viewing the images, I believe farmers care about the environment.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q12 After viewing these images, I believe that farmers are the main contributors to pollution.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q13 After viewing these images, I believe the beef cattle industry is sustainable.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q14 After viewing the images, I believe animal agriculture is a large contributor to pollution and should be phased out.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q15 After viewing the images, I believe that farmers should communicate with the general public about their farming practices.

o Strongly agree (1)

o Somewhat agree (2)

o Neither agree nor disagree (3)

o Somewhat disagree (4)

o Strongly disagree (5)

Q16 In what ways could the images you viewed be improved?

_____

Q17 Have you been exposed to posts like these before?

o Yes (1)

o No (2)

Q18 Which aspects of the images really influenced your opinions about the beef industry?

_____

Q19 After viewing the images, do you have more of a positive or negative view on beef cattle production?

o Positive (1)

o Negative (2)

o Neutral (3)

Q20 Which images do you prefer? Rank them in order of 1 to 10 with 1 being your favorite and 10 being your least favorite picture. You can only choose each number (1-10) once. If using your cell phone, turn your phone horizontally to rank your choices.

_____ Image 1: The cow and her calf (4)

_____ Image 2: The Vaccine (5)

_____ Image 3: Eating (6)

_____ Image 4: Ear Tag (7)

_____ Image 5: Steak (8)

_____ Image 6: The bulls (9)

_____ Image 7: Mahlon Richburg (10)

_____ Image 8: The bottle calf (11)

_____ Image 9: The baler (12)

_____ Image 10: The Richburg Farmers

Q1 (Optional) Please enter your email here to enter a chance to win a $50 Amazon gift card.

Appendix E

Additional Tables of Results for the Chapter II– video study

Table 7. Frequency results of the survey questions on welfare[1,2,3].

Question		Information Gathered				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I believe beef cattle are treated humanely.	Pre Post	15.7% 55.8%	26.0% 31.3%	27.9% 10.6%	24.7% 1.6%	5.8% 1%
I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.	Pre Post	67.6% 84%	26.3% 11.9%	4.8% 2.9%	1% 1%	.3% .3%
I think farmers treat their beef cattle with respect.	Pre Post	28.5% 60.6%	29.5% 26.9%	26.0% 9.9%	12.8% 1.9%	3.2% .6%
I believe beef cattle have access to clean water, fresh grass, and healthy feed.	Pre Post	80.1% 67.3%	13.8% 24%	3.5% 7.1%	2.2% 1%	.3% .6%
I believe farmers treat animals in a way that meets current animal welfare standards.	Pre Post	26.0% 60.6%	29.2% 28.5%	29.2% 9.3%	13.1% 1.3%	.3% .3%

[1]Survey of young adult college students about their opinion of welfare of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.

[2]Results creating using a frequency from SPSS.

[3]Likert scale: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

Table 8.

Frequency results of the survey questions on diet/health of red meat[1,2,3].

Question		Information Gathered				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I will continue to purchase beef products.	Pre	30.8%	27.9%	9%	21.2%	11.2%
	Post	75.3%	13.5%	6.7%	0%	4.5%
I believe that beef cattle should not be consumed.	Pre	2.2%	2.6%	9.6%	21.5%	64.1%
	Post	5.1%	3.8%	11.2%	16.3%	63.5%
I support the sale of beef products.	Pre	62.5%	23.7%	9.9%	2.6%	1.3%
	Post	67.9%	16.0%	10.3%	2.6%	3.2%
I believe that red meat is healthier than plant-based proteins.	Pre	6.4%	13.5%	37.8%	18.9%	23.4%
	Post	35.3%	18.6%	31.1%	10.6%	4.5%
I believe that beef is safe to consume.	Pre	64.4%	25.3%	7.7%	1.9%	.6%
	Post	70.2%	22.1%	5.4%	1.9%	.3%

[1]Survey of young adult college students about their opinion of diet/health of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.

[2]Results creating using a frequency from SPSS.

[3]Likert scale: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

Table 9.
Frequency results of the survey questions on environment and sustainability[1,2,3].

Question		Likert Scale				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I believe farmers do not care about the environment.	Pre	1.3%	4.5%	14.1%	32.1%	48.1%
	Post	2.6%	1.6%	9%	23.1%	63.8%
I believe farmers are the main contributors to pollution.	Pre	0%	6.4%	12.5%	25.3%	55.8%
	Post	44.9%	21.2%	11.9%	9.6%	12.5%
I believe the beef cattle industry is not sustainable.	Pre	6.1%	13.1%	27.2%	26.6%	26.9%
	Post	44.9%	30.4%	13.1%	7.4%	4.2%
I believe animal agriculture is a large contributor to pollution and should be phased out.	Pre	1.6%	9.3%	19.2%	22.1%	47.8%
	Post	1.9%	5.4%	14.1%	21.8%	56.7%
I believe that farmers should communicate with the general public about their farming practices.	Pre	37.2%	37.8%	15.7%	5.8%	3.5%
	Post	57.7%	24.4%	12.2%	3.8%	1.9%

[1]Survey of young adult college students about their opinion of environment/sustainability of animals prior to and after the viewing of a cognitive and emotionally based videos. N=326.
[2]Results creating using a frequency from SPSS.
[3]Likert scale: strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5).

Table 10.

Emerging themes in response to the question, “In what ways could the videos you viewed be improved?”

Encoding	Main Theme	N[1]	%[2]
Suggestions for improvement	Positive	111	34%
	Neutral	115	35%
	Negative	99	31%
	Total[3]	325	100

[1]Frequency of references coded within each theme.
[2]Percent of references in relation

Table 11a.

Emerging themes in response to the question, “In what ways could the videos you viewed be improved?

Encoding	Comment	N[1]	%[2]
Additional positive comments	Farmers take good care of their animals. 1	19	34%
	Beef is healthy and an essential part of our diet. 2	13	24%
	I gained knowledge and a new perspective of the beef industry. 3	23	42%
	Totals	55	100
Additional negative comments	Beef is environmentally unsustainable. 4	17	20%
	Beef is inhumanely harvested. 5	30	34%
	All beef is factory farmed. 6	40	46%
	Totals	87	100

[1]Frequency of references coded within each theme.
[2]Percent of comments in relation to the theme.

Table 11b.

Example comments to form major themes reported in table 11:

1. Taking care of cows, family aspect of farming, daily life of farmers, raising calves, considering how tough it is to be a farmer (farmer hardships).
2. Benefits of eating beef/red meat, regulations instilled to ensure safe products, anti-plant based protein, hormones within safe ranges.
3. Informative, educational, enjoyed these videos, wish these videos were more popular, learned something new, gained new perspective.
4. Negatively impacts environment, pollution, inaccurate description of environmental statistics.
5. Murder of beef, killing of beef is inhumane, end destination of beef, inhumane processing of beef.
6. Mass produced beef, large company operations, large corporations, factory farming, generalization to larger operations.

Table 12.

Emerging themes in response to the question, "Which aspects of the videos really influenced your opinions about the beef industry?"

Encoding	Main Theme	N[1]	%[2]
Aspects of images	Positive	292	82%
	Neutral	39	11%
	Negative	25	7%
	Total	356	100%

[1]Frequency of references coded within each theme.
[2]Percent of total respondents.

Table 13a.

Emerging themes in response to the question, “Which aspects of the videos really influenced your opinions about the beef industry?”

Encoding	Comment	N[1]	%[2]
Additional positive comments	The videos provided a transparent view about the beef industry.	251	70%
	Food animals are raised wholesomely, respectfully, and humanely.	77	21%
	The videos influenced me to have a more positive outlook on beef.	36	9%
	Totals[3]	364	100%
Additional negative comments	My opinions did not change.	14	61%
	The information provided was staged and biased.	1	4%
	More facts and statistics would help explain beef production.	8	35%
	Total	23	100%

[1]Frequency of references coded within each theme.
[2]Percent of comments in relation to the theme.

Table 13b.

Example comments to form major themes reported in table 13a:

1. Transparency, clearly describing the beef industry, accurate representation, new perspective, understand farmer motivations to raise beef.
2. Taking care of animals, animal treatment, humane, animal health, vaccinations, happy cows.
3. Video 1 or 2 influenced me, positive reinforcement, changed my opinion, effective, relatable.
4. Did not influence, negatively influenced.
5. Biased.
6. More statistics or facts, more examples help me understand.

Table 14.

Frequency for the demographic, “What is your year of birth?”

Year	Frequency	Percent
1944	1	.3
1948	1	.3
1949	1	.3
1951	1	.3
1956	1	.3
1957	4	1.3
1962	4	1.3
1963	2	.6
1965	1	.3
1966	2	.6
1967	3	1.0
1968	2	.6
1969	3	1.0
1970	1	.3
1972	1	.3
1977	3	1.0
1978	1	.3
1979	1	.3
1980	3	1.0
1981	1	.3
1982	1	.3
1988	2	.6
1992	1	.3
1993	1	.3
1995	1	.3
1996	7	2.2
1997	6	1.9
1998	15	4.8
1999	33	10.5
2000	57	18.2
2001	64	20.4
2002	80	25.5
2003	9	2.9
Total	314	100

[1]Survey of young adult college students about their year of birth.
[2]Results created using a frequency from SPSS.

Table 15.

Frequency for the demographic, “What is your sex?”

Sex	Frequency	Percent
Male	105	33.4
Female	206	65.6
Nonbinary	3	1
Total	314	100

[1]Survey of young adult college students about their sex.
[2]Results created using a frequency from SPSS.

Table 16.

Frequency for the demographic, “Which college are you enrolled in or have obtained a degree from?”

College	Frequency	Percent
College of Agriculture	49	15.6
College of Architecture, Design, and Construction	14	4.5
College of Business	42	13.4
College of Education	28	8.9
College of Engineering	56	17.8
College of Forestry and Wildlife Sciences	11	3.5
College of Human Sciences	15	4.8
College of Liberal Arts	50	15.9
College of Nursing	12	3.8
College of Pharmacy	1	.3
College of Sciences and Mathematics	28	8.9
College of Veterinary Medicine	2	.6
Missing	6	1.9
Total	314	100

[1]Survey of young adult college students about their college.
[2]Results created using a frequency from SPSS.

Table 17.

Frequency for the demographic, “Which political party do you belong to?”

	Frequency	Percent
Republican	166	52.9
Democratic	50	15.9
Independent	35	11.1
Other	2	.6
None	61	19.4
Total	314	100

[1]Survey of young adult college students about their political parties.
[2]Results created using a frequency from SPSS.

Table 18.

Frequency for the demographic question, “Which choice best fits where you are from originally?”

	Frequency	Percent
City	152	48.4
Rural	125	39.8
Other	37	11.8
Total	314	100.0

[1]Survey of young adult college students about their hometown.
[2]Results created using a frequency from SPSS.

Table 19.
Frequency for the demographic question, “Do you currently or have you worked in an agricultural field?”

	Frequency	Percent
Yes	73	23.2
No	241	76.8
Total	314	100

[1]Survey of young adult college students about their relation to agriculture.
[2]Results created using a frequency from SPSS.

Appendix F

Tables pertaining to Chapter III – social media posts study

Table 6.

Results of the questionnaire of the pretest and posttest regarding welfare[1,2,3].

Question		Likert Scale				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I believe beef cattle are treated humanely.	Pre Post	16.7% 42.0%	25.1% 39.0%	25.3% 10.7%	23.1% 7.1%	9.8% 2.5%
I believe that it is necessary to treat sick animals. Such treatments could include rest, antibiotics, or medicine.	Pre Post	66.9% 77.6%	28.3% 18.0%	4.6% 3.7%	0.2% 0.2%	0% 0.5%
I think farmers treat their beef cattle with respect.	Pre Post	29.5% 44.7%	31.1% 36.5%	23.7% 11.9%	12.6% 5.9%	3.2% 0.9%
I believe beef cattle deserve to have access to clean water, fresh grass, and healthy feed.	Pre Post	61.9% 46.8%	21.2% 37.7%	9.4% 8.4%	6.2% 6.2%	1.4% 0.9%
I believe farmers treat animals in a way that meets current animal welfare standards.	Pre Post	23.5% 45.2%	32.4% 34.2%	26.9% 14.4%	12.6% 4.8%	4.6% 1.4%

[1]Survey of Participants and how they initially responded to the pre-test on welfare.
[2]Results creating using a frequency from SPSS
[3]strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5)

Table 7.

Results of the pretest and posttest questions regarding diet/health of red meat[1,2,3].

Question		Likert Scale				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I purchase beef products weekly.	Pre Post	27.4% 65.1%	34.5% 17.4%	6.6% 8.7%	19.9% 3.7%	11.6% 5.3%
I believe that beef cattle should not be consumed.	Pre Post	1.6% 2.7%	5.3% 6.8%	11.9% 9.8%	20.8% 17.1%	60.5% 63.5%
I support the sale of beef products.	Pre Post	61.6% 59.6%	24.4% 24.7%	8.0% 9.4%	4.8% 3.7%	1.1% 2.7%
I believe that plant-based proteins are healthier than red meat.	Pre Post	13.9% 30.6%	13.2% 21.5%	34.7% 26.9%	19.9% 13.7%	18.3% 7.3%
I believe that beef is safe to consume.	Pre Post	61.0% 64.4%	29.7% 25.6%	7.5% 5.9%	1.4% 3.2%	0.5% 0.9%

[1]Survey of Participants responses averaged together for both the pre-test and post-test on diet/health.

[2]Results creating using a frequency from SPSS.

[3]strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5)

Table 8.

Structure of the questionnaire of the pretest questions regarding environment and sustainability.

Question		Information Gathered				
		Strongly agree	Somewhat Agree	Neutral	Somewhat disagree	Strongly disagree
I believe farmers care about the environment.	Pre Post	13.2% 17.8%	14.8% 15.3%	16.7% 10.0%	23.5% 21.0%	31.7% 35.8%
I believe farmers are the main contributors to pollution.	Pre Post	0.7% 31.1%	8.0% 15.1%	13.9% 10.7%	27.9% 15.8%	49.5% 27.4%
I believe the beef cattle industry is not sustainable.	Pre Post	11.9% 33.8%	22.1% 34.5%	21.2% 17.4%	24.7% 10.7%	20.1% 3.7%
I believe animal agriculture is a large contributor to pollution and should be phased out.	Pre Post	2.7% 2.1%	9.4% 8.4%	19.5% 11.4%	26.3% 24%	42.0% 54.1%
I believe that farmers should communicate with the general public about their farming practices.	Pre Post	38.1% 54.8%	41.1% 29.5%	11.4% 11.9%	6.8% 3.2%	2.5% 0.7%

[1]Survey of Participants and how they initially responded to the pre-test on welfare.
[2]Results creating using a frequency from SPSS.
[3]strongly agree (1); somewhat agree (2); neutral (3); somewhat disagree (4); and strongly disagree (5)

Table 9.

Emerging themes in response to the question, “In what way can the images you viewed be improved?”

Encoding	Main Theme	N[1]	%[2]
Suggestions for improvement	Positive	63	22%
	Neutral	90	32%
	Negative	129	46%
	Total	282	100%

[1]Frequency of references coded within each theme.
[2]Percent of references in relation to the category.

Table 10a.
Emerging themes in response to the question, “In what way can the images you viewed be improved?”

Encoding	Comment	N[1]	%[2]
Additional positive comments	The posts represented real-life beef farms.	8	35%
	The presence of sources reinforced the credibility of the posts.	6	26%
	Farmers take care of their beef animals.	9	39%
	Totals[3]	23	100%
Additional negative comments	The formatting of the social media posts were not representative of Instagram.	65	51%
	The information presented was fake and staged.	29	22%
	More sources would have provided more credibility and reinforce my understanding.	34	27%
	Total	128	100%

[1]Frequency of references coded within each theme.
[2]Percent of references in relation to theme.

Table 10b.
Example comments to form major themes reported in table 10a:

1. Representative, examples, aspects of images
2. Presented sources when needed
3. Examples, happy cows, well being
4. Photo quality, post formatting, not like Instagram formatting, formatting was distracting
5. Biased information, staged, inaccurate representation, lying, negative opinions, did not influence me because of faked or false images
6. Needed more sources (emotional posts)

Table 11.
Emerging themes in response to the question, "Which aspects of the images really influenced your opinions about the beef industry?"

Encoding	Main Theme	N[1]	%[2]
Aspects of images	Positive	295	73%
	Neutral	53	13%
	Negative	57	14%
	Total	405	100%

[1]Frequency of references coded within each theme.
[2]Percent of references in relation to theme.

Table 12a.

Emerging themes in response to the question, “Which aspects of the images really influenced your opinions about the beef industry?”

Encoding	Comment	N[1]	%[2]
Additional positive comments	Captions were a good compliment to the post images by expanding the information provided.	65	32%
	Farmers and/or livestock in post images influenced me positively.	83	42%
	Cattle are well taken care of; they are happy, well-fed, and humanely treated.	52	26%
	Totals[3]	200	100%
Additional negative comments	The social media posts did not influence me.	18	41%
	I wish there were more sources for credibility.	12	27%
	The source of posts and information within the posts were staged and/or biased.	14	
	Total	44	100%

[1]Frequency of references coded within each theme.
[2]Percent of references in relation

12b.

Example comments to form major themes reported in table 12a:

1. Concise captions, enjoyed captions, informative, facts, explanation.
2. Evidence of describing posts (farmer presence, animals eating/grazing/getting taken care of).
3. Taken care of, vaccinating for disease prevention, eat well, ability to graze, happy cows, farmer care and concern for animals.
4. Did not influence, did not change my outstanding views.
5. More sources.
6. Staged, biased view, too focused on small operations or too focused on just Auburn operations, inaccuracies, not representative.

Table 13.

Frequency for the question, "What is your gender?"

Male	168	38.4
Female	264	60.3
Nonbinary	3	.7
Other	1	.2
Missing	2	.5
Total	436	99.5

[1]Survey of young adult college students about their gender.
[2]Results created using a frequency from SPSS.

Table 14.

Frequency for the question, "Which choice best fits where you are from originally?"

Location	Frequency	Percent
City	207	47.3
Rural	185	42.2
Other	45	10.5
Total	438	100

[1]Survey of young adult college students about their hometown.
[2]Results created using a frequency from SPSS.

Table 15.

Frequency table for the question, “What year were you born?”

Year Born	Total	Percent
1951	1	.2
1956	1	.2
1957	1	.2
1958	2	.5
1960	1	.2
1962	1	.2
1965	1	.2
1969	2	.5
1972	1	.2
1976	1	.2
1980	1	.2
1981	2	.5
1985	1	.2
1987	2	.5
1989	2	.5
1991	1	.2
1992	1	.2
1993	2	.5
1994	2	.5
1995	6	1.4
1996	3	.7
1997	3	.7
1998	16	3.7
1999	50	11.4
2000	92	21.0
2001	98	22.3
2002	125	28.5
2003	18	4.1
Total	438	100

[1]Survey of young adult college students about their year of birth.
[2]Results created using a frequency from SPSS.

Table 16.

Frequency for the question, “Which college are you in or do you have a degree in?”

College	Frequency	Percent
College of Agriculture	51	11.6
College of Architecture, Design, and Construction	24	5.5
College of Business	72	16.4
College of Education	34	7.8
College of Engineering	86	19.6
College of Forestry and Wildlife Sciences	12	2.7
College of Human Sciences	18	4.1
College of Liberal Arts	65	14.8
College of Nursing	22	5.0
College of Pharmacy	1	.2
College of Sciences and Mathematics	49	11.2
College of Veterinary Medicine	1	.2
Missing	3	.7
Total	438	100

[1]Survey of young adult college students about their college.

[2]Results created using a frequency from SPSS.

Table 17.

Frequency for the question, “Which political party are you affiliated with?”

Party	Frequency	Percent
Republican	205	46.8
Democratic	78	17.8
Independent	50	11.4
Other	7	1.6
None	98	22.1
Total	438	100

[1]Survey of young adult college students about their political party.

[2]Results created using a frequency from SPSS.

Table 18.
Frequency for the question, “Do you currently or have you worked in an agricultural field?”

	Frequency	Percent
Yes	92	21
No	345	78.8
Missing	1	.2
Total	438	100

[1]Survey of young adult college students about their relation to agriculture.
[2]Results created using a frequency from SPSS.

Appendix G
Social Media Posts Used in Social Media as Tools of Diffusion for the Beef Industry

Post 1.

A lot of consumers are concerned with the use of antibiotics in meat. Every animal that is treated with antibiotics must go through a withdrawal period before they can be harvested for food. There is no chance of residue of antibiotics being consumed by humans due to proper management. Antibiotics are only given to sick and unwell animals. Veterinarians must prescribe the treatments. There is also a USDA meat inspector on sight to ensure that meat is safe to consume and antibiotic free. By law, all meat and milk must be antibiotic residue free. Inspectors ensure that all beef is safe for consumers to consume.

Post 2.

We tag calves in order to identify them. We tag them in their first few hours of life due to their pain receptors not being fully developed according to several studies including one performed by Molony and Kent. It's a quick and easy process. The mother of the calf is also close by to help keep her baby calm and reduce stress. During this process we will wrap a measuring tape around the calf in order to determine a weight. We will also check to see if the calf is male or female. The entire process should take no longer than one minute.

Molony, V., & Kent, J. E. (1997). Assessment of acute pain in farm animals using behavioral and physiological measurements. Journal of Animal Science, 75(1), 266.

Post 3

Sometimes it becomes necessary to bottle feed a calf. Many scenarios can occur such as the mother rejected the calf, or she didn't produce enough milk, or she may have died. Usually, bottle feeding is a last resort. Farmers will try to get cows that have lost their calves such as a stillbirth to adopt the orphans. It really just depends on the case. Farmers are very observant with their herds. They frequently check their cattle to make sure nothing goes wrong and that every calf and cow has a chance to thrive. The farmers are dependent upon their herds to make a living and to help feed an ever-growing world.

Post 4

In the beef industry, calves are allowed to stay with their mothers for as long as possible. Mothers are allowed to raise their calves until they need to be weaned. Cattle are herd animals, so we want them to gain valuable social interactions within their herd.

Post 5

Many consumers think that the animal agricultural industry is the one to blame for pollution. However, that isn't the case. According to the Enivronmental Protection Agency, for the agriculture segment as a whole which includes land and crop management, livestock management and manure management you're looking at 9% of all Greenhouse Gas Emissions. But if you're just looking at what animals produce themselves (which all practically eventually contributes to meat production) it's just 3% of all Greenhouse Gas Emissions in the U.S. is the culprit.

"Overview of Greenhouse Gases." EPA, Environmental Protection Agency, 2019, https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

Post 6

Farmers spend countless hours during the summer trying to grow, maintain, and bale hay in order to make sure their cattle stay well fed and cared for during the winter. Farmers genuinely care for their animals and their land. They implement so many sustainability practices to ensure that their herbs and land will last for generations. Majority of beef cattle operations are family operations. There are more small family farms than there are corporate farms. Farmers are trying to feed the world and ensure that the world is livable for generations to come.

Post 7

Cattle normally have access to fresh hay, grass, and water. However, it is sometimes necessary for farmers to implement grain. Grain merely helps the cattle gain weight and creates a more balanced diet. Some consumers are worried that feeding grain can lead to an abundance of greenhouse gasses being produced. However, several studies have concluded that feeding grain does not have a negative impact on the environment.

Dini, Y., Cajarville, C., Gere, J. I., Fernandez, S., Fraga, M., Pravia, M. I., Navajas, E. A., & Ciganda, V. S. (2019). Association between residual feed intake and enteric methane emissions in Hereford steers. Translational Animal Science, 3(1), 239–246.

Post 8

Farmers aren't trying to kill the world. They're trying to save it. They're trying to save it by making more practical and sustainable choices for the environment. They're ensuring a safe product by making sure beef is antibiotic free. They're treating their cattle humanely and respectfully. The beef cattle industry is not to blame for the problems of the world. The next time you have a question, ask a farmer or an expert in their industry.

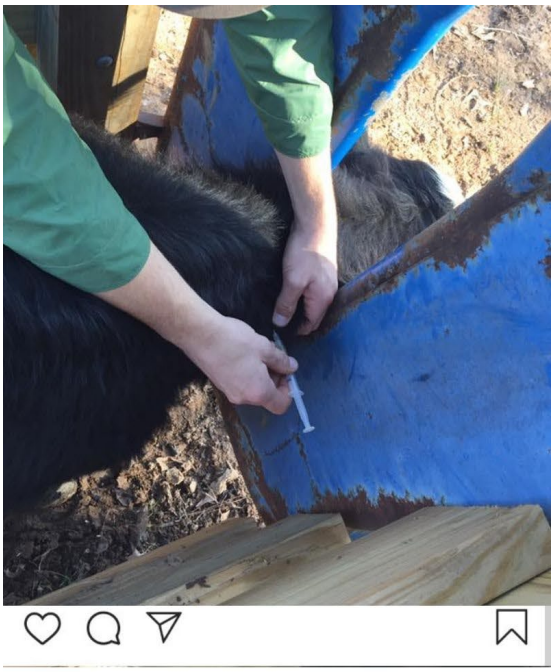
Post 9

Beef is full of flavor and contains several essential nutrients. Beef contains protein, iron, zinc, selenium, riboflavin, niacin, vitamin B, vitamin B12, phosphorus, pantothenate, magnesium and potassium according to the USDA. Iron from beef is “heme” iron, meaning it is bioavailable and more easily absorbed by the body than “non-heme” iron from plant-based sources such as spinach or legumes.

Mann, N. J. (2018). A brief history of meat in the human diet and current health implications. MEAT SCIENCE, 144, 169–179. https://doi.org/10.1016/j.meatsci.2018.06.008

Roseland, Janet M.; Nguyen, Quynh Anh; Williams, Juhi R.; Patterson, Kristine Y.. (2017). USDA Nutrient Data Set for Retail Meat Cuts: Beef, Lamb, Pork and Veal. Nutrient Data Laboratory, Beltsville Human Nutrition Research Center, ARS, USDA. https://doi.org/10.15482/USDA.ADC/1409036. Accessed 2022-02-09.

Post 10



Cattle need vaccinations to help prevent diseases and to help treat them when they are sick. Just as when people get sick, cattle sometimes need rest, antibiotics, and medicine. Farmers don't want their cattle to become ill and die so therefore it is necessary to treat them. According to the USDA, all animals must go through a withdrawal time. Therefore, there is no chance people could consume traces of antibiotics.

Federal Meat Inspection Act | Food Safety and Inspection Service (usda.gov)