frontiers | Frontiers in Communication

TYPE Original Research
PUBLISHED 15 July 2025
DOI 10.3389/fcomm.2025.1557633

OPEN ACCESS

EDITED BY
Ataharul Chowdhury,
University of Guelph, Canada

REVIEWED BY
Domenico Trezza,
University of Naples Federico II, Italy
Stephan-Günther Rudolf Dolle,
University of Giessen, Germany

*CORRESPONDENCE
Anu Karki
✉ akanu@iastate.edu

RECEIVED 08 January 2025
ACCEPTED 05 June 2025
PUBLISHED 15 July 2025

CITATION
Karki A, Qu S, Masambuka-Kanchewa F, Retallick M, Lamm AJ, Lamm K, Sanders CE, Byrd A and Gabler N (2025) Pork production on YouTube: frame and sentiment analysis. *Front. Commun.* 10:1557633. doi: 10.3389/fcomm.2025.1557633

Pork production on YouTube: frame and sentiment analysis

Anu Karki[1]*, Shuyang Qu[1], Fally Masambuka-Kanchewa[1], Michael Retallick[1], Alexa J. Lamm[2], Kevan Lamm[2], Catherine E. Sanders[3], Allison Byrd[2] and Nicholas Gabler[4]

[1]Department of Agricultural Education and Studies, College of Agriculture and Life Sciences, Iowa State University, Ames, IA, United States, [2]Department of Agricultural Leadership, Education and Communication, College of Agricultural and Environmental Sciences, University of Georgia, Athens, GA, United States, [3]Department of Agricultural and Human Sciences, College of Agriculture and Life Sciences, North Carolina State University, Raleigh, NC, United States, [4]Department of Animal Science, College of Agriculture and Life Sciences, Iowa State University, Ames, IA, United States

Introduction: Social media platforms increasingly influence public perceptions of agriculture by shaping narratives around food production. This study explores the portrayal of pork production on YouTube and the corresponding audience reactions, highlighting its role in shaping public discourse.

Methods: Guided by the framing theory, the research examines 147 videos and 735 top comments to analyze media and audience frames alongside sentiments. Video titles, descriptions, and thumbnails represent media frames, while the top comments reflect audience frames. Frames are identified through literature review and sample analysis, with selected videos manually coded for frame presence. Sentiment analysis of textual elements is conducted using MaxQDA, and visual elements are coded manually.

Results: Findings show that information and technology of pork production, and entrepreneurship frames dominate media portrayals, emphasizing information sharing on production practices and business ventures. In contrast, audience responses often highlighted ethical concerns, particularly animal welfare, underscoring moral sensitivity in public discourse. Positive sentiments were prevalent across media and audience responses, though critical views remained significant. The strong alignment between media and audience frames and sentiments underscores the influence of strategic framing in shaping perceptions. Emotional appeals in videos are found to play a critical role in audience reactions.

Discussion: These findings suggest that transparent communication emphasizing ethical practices and technological advancements can effectively engage audiences. By aligning content with audience values and leveraging emotional connections, communicators can counteract misinformation, foster trust, and promote informed discussions about the pork industry. This study provides a framework for utilizing social media, specifically YouTube, to address public concerns while advancing transparency and trust in agricultural practices.

KEYWORDS

pork production, YouTube, framing theory, media frame, audience frame, visual framing, sentiment analysis

1 Introduction

Meat and meat products have historically served as essential protein sources in the human diet (Tonsor and Lusk, 2022). However, in recent decades, there has been a growing concern among consumers about food quality and health benefit information, including meat products (Teixeira and Rodrigues, 2021). Furthermore, many consumers expect farm animal production methods to incorporate factors such as animal welfare and other social and ethical considerations (Grunert et al., 2018). Consumer perceptions frequently involve strong emotions and range from concern and distrust to criticism and overt opposition (Capper, 2020; Spain et al., 2018). Over the past decade, the pork industry has encountered heightened public scrutiny, encompassing concerns such as antibiotic use, confinement in gestation stalls, and animal welfare, as well as consumer apprehensions regarding pork meat quality and environmental impact (Font-i-Furnols et al., 2019; Grunert et al., 2018; Tønnesen and Grunert, 2021).

The gradual shift from rural to urban living over the past century has distanced families from their farming roots, leaving them with little understanding of contemporary agricultural practices (Howard et al., 2017). The study noted that with the growing gap between consumers and producers, consumers are increasingly turning to social media platforms for information on food-related matters such as food production practices and safety. Simultaneously, producers have found it challenging to communicate with consumers about modern farming because of a general lack of first-hand knowledge, the rapid advancement of agricultural technology, and a prevalent "big is bad" sentiment (Rumble and Irani, 2016, p. 2). Animal agriculture has dealt with negative media publicity and communication issues pertaining to antibiotic use, animal welfare, food safety, the environment, and concerns regarding the nutritional content of products derived from animals (Specht et al., 2014). The combination of negatively framed and emotional media coverage and a lack of experience has left consumer opinions toward animal agriculture vague and pliable (Specht and Rutherford, 2013; Kovar and Ball, 2013; Van Boxtel et al., 2022). Moreover, in today's digital world, recommendation algorithms on social media platforms shape content selection and visibility by personalizing feeds based on their interactions and preferences (Haroon et al., 2022; Narayanan, 2023). By promoting content that aligns with existing beliefs, these algorithms often create filter bubbles that limit exposure to diverse viewpoints, reinforcing confirmation bias and fueling polarization (Whittaker et al., 2021). Despite this, social media also proves valuable by enabling the showcase of farming, ranching, and food production, giving agriculturists a platform to share their experiences and challenges (Holt-Day et al., 2020).

YouTube is a widely used social media platform, facilitating user interaction, creation, sharing, and exchange of information and ideas in diverse formats, boasting an extensive audience reach as the second-largest search network behind Google (Farabi et al., 2023). Utilizing auditory and visual communication, along with closed captioning and other inclusive technologies, YouTube is readily accessible to a broad range of viewers with diverse demographic characteristics at no cost (Thomas et al., 2021). According to Van Boxtel et al. (2022), videos are among the most powerful sources of agriculture-related information for consumers. YouTube has provided viewers access to locations typically inaccessible due to geographical constraints or regulations allowing agricultural stakeholders to exhibit diverse farming, ranching, or food production processes (Holt-Day et al., 2020).

Research studies using YouTube content analysis have examined general food and farming technology-related topics (e.g., Basch et al., 2023; Chakma et al., 2022; Mandal et al., 2022; Van Gorp and van der Goot, 2012). However, frames in the context of animal production remain an understudied area. While some studies have analyzed frames in YouTube videos related to wild pig hunting (e.g., McLean et al., 2022; Mörner and Olausson, 2017), studies on framing withing the pork industry have primarily focused on news media coverage (e.g., Chan and Babbitt, 2014; Sitton et al., 2004) and Instagram posts (Bacon, 2022). Hence, a noteworthy gap in the existing literature exists related to YouTube video content associated with pork production, given the platform's popularity and accessibility to a wide audience.

YouTube provides a wide array of features beyond uploading and viewing video clips. Viewers can comment, like, or dislike videos to share their opinions. Features like subscription counts, rankings, and like or dislike counts on YouTube indicate the popularity and receptivity of content. However, an analysis of the posted comments provides an opportunity to obtain additional nuance about audiences' attitudes and feelings toward the video contents (Lee et al., 2017). Understanding media portrayals is crucial as it provides insights for scholars and communication practitioners within the pork industry on how pork production practices are depicted in social media and the impact of this depiction on consumers' perceptions. Such insights can assist pork producers, agricultural communicators, and industry stakeholders to better understand public perceptions and concerns regarding pork production and may be able to more effectively tailor their subsequent communication strategies to enhance transparency and trust.

2 Literature review

Food and agriculture attract social media attention due to their essential role in daily life, making topics like health, safety, food trends, and food availability broadly appealing (Rutsaert et al., 2013; Stevens et al., 2016). Additionally, the agricultural sector's economic impact, the cultural significance of food, technological advancements enhancing sustainability, and global food security issues ensure continuous media interest and coverage (Stevens et al., 2016; Wolfert et al., 2017). Moreover, concerns about safety, transparency, and distrust in the agricultural industry garner significant public and media interest (Stevens et al., 2018).

Concerns surrounding food safety, transparency, distrust in the agro-food industry, and sustainability controversies are particularly active topics on social media within the domain of food and agricultural (Stevens et al., 2018). Social media platforms such as YouTube serve as abundant sources of data, offering insights into the beliefs, attitudes, and behaviors of users across different temporal and spatial scales and contexts (Lopez et al., 2019). Unlike traditional media, social media enables bidirectional communication, allowing the public to engage actively in discussions while also serving as a platform for assessing consumer perceptions during controversies or agricultural crises (Rutsaert et al., 2013). For instance, de Araújo et al. (2022) found mainstream media and social networks have significantly contributed to spreading information about meat and its products.

They further mentioned that in recent years, there has been considerable negative focus on these products, primarily concerning health and sustainability, which has influenced consumer perspectives and behaviors. Similarly, Howard et al. (2017) found information regarding the pink slime incident—where lean finely textured beef (LFTB) was negatively portrayed as unsafe and likened to dog food on social media platforms —had a detrimental effect on university students' views of the beef industry. These findings suggest the significance of studying mainstream social media representation of pork production and the pork industry.

2.1 Framing

This study utilized framing theory to examine the portrayal of pork industry on YouTube. Goffman (1974) described frames as interpretive structures that enable individuals to identify, perceive, understand, and categorize events and situations in their social surroundings, providing them with context for possible actions. Following a similar concept, Gitlin (1980) characterized frames as "persistent selection, emphasis, and exclusion" (p. 7), while Gamson and Modigliani (1987) defined frames as an organizing principle or narrative that assigns significance to a piece of work.

Entman (1991) proposed two distinct layers of news frames: audience frames, representing concepts retained by individuals for information processing, and news frames, characterizing traits inherent in the news itself. According to Entman (1993), framing involves the processes of "selection and salience" (p. 52), wherein specific elements of a perceived reality are chosen and highlighted in communication texts to endorse a particular definition of the problem, causal interpretation, moral assessment, and/or recommended course of action for the subject under discussion. Scheufele (1999) proposed a framing process model, where framing is seen as a continuous cycle where the outcomes of one stage feed into the next. This model outlines four framing processes: frame building, connecting internal and external factors shaping media coverage; frame setting, involving the transmission of frames from media to audiences; individual-level effects of framing, exploring how audience frames influence behavior, attitudes, and cognition; and journalists as audiences, suggesting that the frames they use can also impact them due to cognitive biases. This study is guided by frame setting and individual-level effects of framing where we hypothesize that media frames set by YouTube videos about pork industry are transmitted to the audiences affecting their opinions and responses in the comments.

Given the significant impact media has on audience attitudes, framing analysis has been widely used to assess media influences and audience perceptions. In the contemporary multimodal media environment, framing analysis encompasses textual elements such as headlines and captions, visual components like photographs or videos, and auditory aspects such as voiceovers or background music, all of which work together to shape audience perceptions and interpretations (Geise and Xu, 2024). Media narratives surrounding food production shapes individuals' perceptions of what constitutes palatable, sustainable, healthy, or unhealthy diets (Brüggemann et al., 2022). Therefore, research on how journalists, mass media and social media frame food production practices could provide unique insights into how to effectively communicate. For example, a large body of literature has utilized framing to investigate concerns within agriculture in the United States. The topics that have garnered the greatest focus include genetically modified foods (e.g., Basch et al., 2023; Hunter, 2023; Pjesivac et al., 2020) and organic foods (Cahill et al., 2010; Meyers and Abrams, 2010; Vargas Meza and Yamanaka, 2020). In regard to the livestock industry, some framing studies have focused on red meat (e.g., Sievert et al., 2022), poultry production (e.g., Edgar et al., 2017; Estes et al., 2017; Van Boxtel et al., 2022) and "pink slime" in the beef industry (e.g., Runge et al., 2018). There is a limitation of studies in exploring media framing and representation of pig farming and the pork industry despite growing concern of consumers towards the industry.

According to Scheufele (1999), several factors potentially shape how a specific topic is framed in the media. Therefore, it is crucial to investigate the sources of media content as well as emerging trends in framing about the contents. YouTube videos are primarily represented by two elements: the thumbnail image and the title. A video thumbnail captures the essence of its content in a single image and the title provides a concise, compelling description of what the video is about, often highlighting key topics or emotions to spark curiosity (Lee et al., 2023). These not only convey the video's content but also entice viewers to click, much like advertisements do (Lee et al., 2023; Zhang et al., 2021). Several studies have examined users' pre-viewing behavior, finding that factors like informational content and negative emotions in video titles, the informational quality of descriptions and thumbnails emphasizing expressive faces, clear subject display, and descriptive text can influence views in certain YouTube categories (Shimono et al., 2020; Tafesse, 2020).

2.1.1 Media frame as independent variable

Research exploring media frames has conceptually defined media frames as variables with potential to influence attitudes, opinions, or individual frames (Entman, 1993; Scheufele, 1999). Media often employ emotional appeals in message framing, using references to subject matter that relate with the audience, audio content, and music to evoke emotions in an audience (Brader, 2006; Fischer et al., 2021). These appeals connect the viewers to the subject, making the issue more relatable and impactful, thereby shaping opinions and attitudes (Gross, 2008). The concept that the media significantly shape discourse and thereby influence perceptions and societal understanding of significant issues and events has garnered significant research focus. Goffman (1974), in attempt to furnish evidence of the effects of framing, elucidates that, individuals adopt particular interpretations of reality based on how that reality has been framed among the various interpretations available.

An increasing number of researchers have discovered evidence supporting the idea that media frames influence public perceptions of events and policies. A study conducted by Qu et al. (2017) employed a between-subject, post-test-only experiment with a control group to examine how three different message frames about local food, presented through online videos, influenced U.S. consumers' attitudes. Each 30-s video highlighted one specific benefit of local food: superior quality, support for the local economy, or enhanced social connections. Findings revealed all three videos fostered positive attitudes toward local food, whereas the control group's attitude remained neutral. Similarly, Kouarfaté and Durif (2023) demonstrated posts with one or more media frames had a significant impact on consumer attitudes towards cultured meat compared to posts with no media framing. Pjesivac et al. (2020) experimentally examined how different

frames—highlighting the opportunities and risks of genetically modified organisms (GMOs), both separately and together—influenced attitudes, intentions, and behavior regarding GMOs among university students by controlling for participants' prior knowledge. Findings revealed opportunity framing elicited more positive attitudes towards GMOs than risk framing. Attitudes and intentions aligned with the frame encountered. Similarly, Runge et al. (2018) investigated the impact of framing on perceptions of "lean finely textured beef (LFTB)" versus "pink slime" through a mail survey in Wisconsin. Participants were randomly assigned to versions of the survey mentioning either pink slime or LFTB in ground beef. The findings revealed those exposed to pink slime reported higher perceived risks compared to LFTB.

2.1.2 Visual framing

The same principles of selection, inclusion, and exclusion apply to visual framing as they do to textual framing (Rodriguez and Dimitrova, 2011). Although visualizations inherently involve framing and represent a version of reality, viewers often perceive them as direct windows into reality, which can significantly influence public discourse (SeppÄNen and VÄLiverronen, 2003). Visual framing has been explored in different fields, including political conflict (e.g., Fahmy, 2010), genetic engineering (e.g., Clancy and Clancy, 2016), and climate change (e.g., Wardekker and Lorenz, 2019). Images can serve as evocations, carrying cultural significance while also delivering a strong descriptive impact (Rose, 2008). Simultaneously, they can present something unexpected or unusual to provoke a reaction from the viewer. However, images are rarely neutral: factors like objects, color, season, weather, location, lighting, and camera angle all influence how the subject is perceived and with the use of technology, manipulating images through camera settings and software is easier than ever (Mahon et al., 2023). Busch and Spiller (2018) explain photographs of farm animals taken from different angles—such as a human's perspective, an animal's view, or a bird's eye view—led to varied public evaluations. Space allowance was viewed more favorably in bird's eye images, while animals lying down were often linked to illness. Similarly, it was found that lighting levels in video clips of pig farming impacted public perceptions of the farms shown (Mahon et al., 2023; Wildraut et al., 2015).

Given YouTube's collaborative environment involving both uploaders and commenters alter the dynamics of media-audience relationships (Rutsaert et al., 2013), it is important to explore audience's response to the content and whether YouTube video frames affect the attitude of the audience towards the agricultural industry. Therefore, this study sought to examine the portrayal of the pork industry on YouTube and viewers' feedback on the portrayals from both frames and sentiment perspectives. Specifically, the research questions and hypotheses are:

> RQ1: What are the primary frames and sentiments on YouTube videos about the pork industry?
>
> RQ2: What are the primary frames and sentiments expressed in the comments of YouTube videos about the pork industry?
>
> H1: The frames of YouTube videos about the pork industry are associated with audiences' frames in the comments.
>
> H2: The sentiments of YouTube videos about the pork industry are associated with audiences' sentiments in the comments.

3 Materials and methods

For this study, we first conducted a literature review to identify existing frames relevant to the pork industry, followed by the collection of YouTube video data. We then reviewed a sample of videos to identify any emergent frames, and ultimately coded and analyzed all the data using a quantitative approach.

3.1 Data collection

The COVID-19 pandemic brought media attention to meat production, particularly conditions in meatpacking plants (Taylor et al., 2020). Therefore, we selected March 11, 2020, the day the World Health Organization declared COVID-19 a global health emergency (WHO, 2020), as the start date and March 11, 2024, exactly four years later, as the end date.

We obtained publicly available YouTube videos and comments through YouTube Data Tools[1] for the study (Rieder, 2015). This tool uses the YouTube Data application program interface (API), which allows the users to select six modules of YouTube data: channel info, channel list, channel network, video list, video co-commenting network and video comments. The video list module generates a compilation of video information and statistics sourced from one of four options: videos uploaded to a designated channel, a playlist, videos obtained through a specific search query, or videos specified by a list of identifiers. We used the video list module to generate the list of videos using five search queries: pig farming, pork industry, pork factory, pig industry, and pig factory. We planned to analyze the video contents that provided information about the pork industry for the study; therefore, the five queries were finalized through trial and error of various keywords such as pork, swine, hog, pig farming, etc.

The list contained other significant information such as video title, channel, description, thumbnails, views, likes and comment count, etc. For each search query, we sorted the videos' comment count as a measure of popularity and discussion of the content among viewers. Any videos that did not serve the purpose of our study were removed, such as cartoons, gaming, and recipes. After cleaning the data, we selected the first 100 videos with maximum comments from each list generated by using each search query totaling 500 videos. Duplicated videos from the list of all five search queries were excluded, resulting in a total of 300 included videos. Videos with less than 30 comments and 3,000 views were excluded, signifying the unpopularity of the videos among the mass audience. A previous study by Thomas et al. (2021) excluded videos with fewer than 500 views to analyze YouTube videos for exploring food safety messages during COVID-19, making our study more robust by setting a higher threshold for video popularity. Exclusion thresholds for our study were established as *a posteriori* by the research team. The research

1 https://ytdt.digitalmethods.net

team then reviewed every video and removed videos that were irrelevant or in languages other than English, resulting in a total of 147 videos appropriate for analysis. Lastly, video identifiers from the final list of videos were applied to obtain the top five comments manually using YouTube's Top Comments filter, which resulted in 735 individual comments. The video selection and exclusion process is depicted in Figure 1.

3.1.1 Description of selected YouTube videos

YouTube is the top global social media platforms that reach audiences across the boundaries. The channels of selected videos were based on numerous countries, including the United States, the UK, Asian countries such as Vietnam and China, and African nations such as Uganda and Kenya. The selected YouTube videos were uploaded by different groups including pork producers worldwide, activists and non-profit

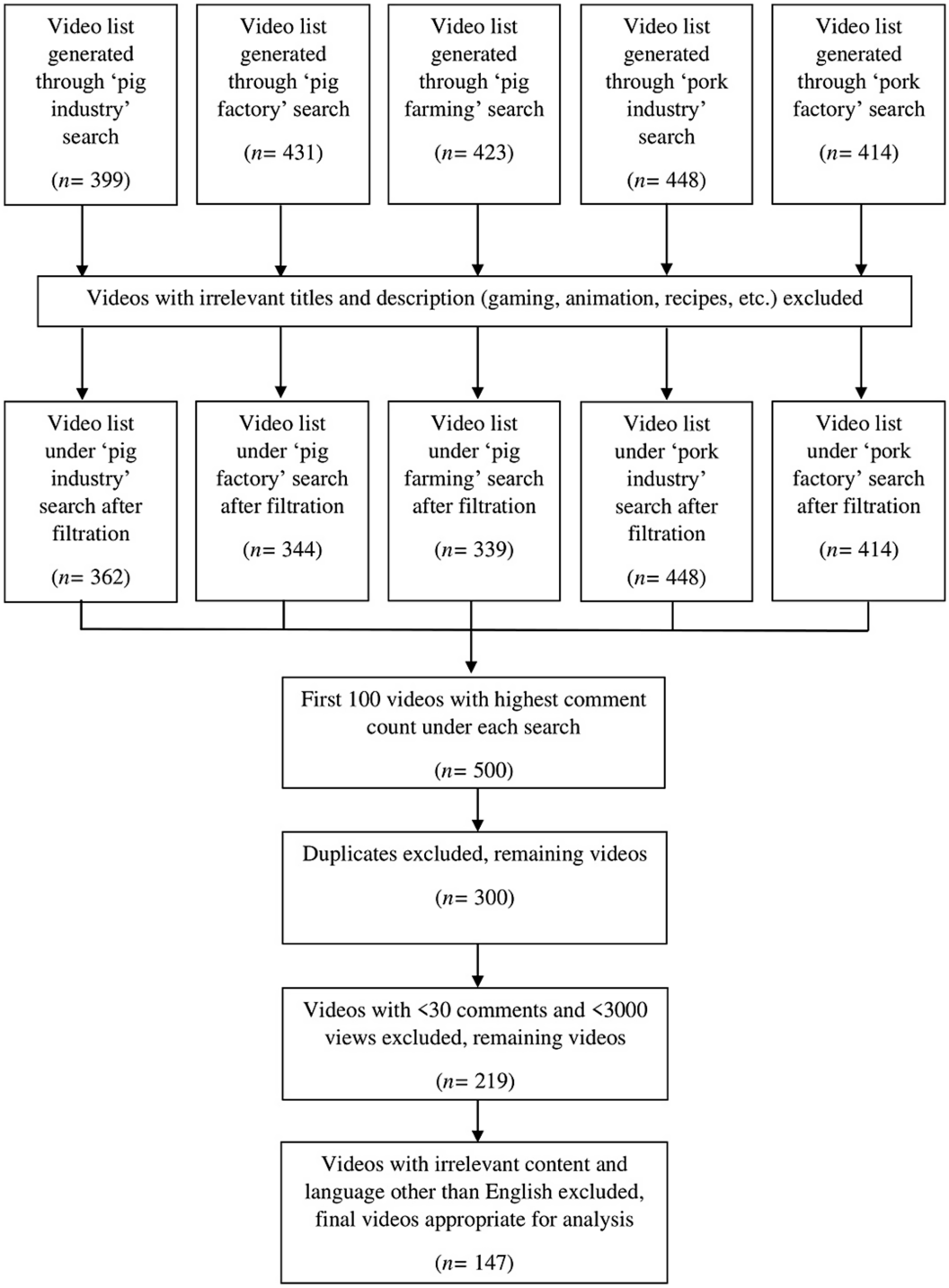

FIGURE 1
YouTube videos selection and exclusion process.

organizations, television and news channels, business companies, other content creators, etc. The distribution of analyzed videos based on default YouTube labeling categories is presented in Table 1. Across all included videos, "People and Blogs" was represented most frequently followed by "Pets and Animals" and "Science and Technology".

3.2 Data analysis

To develop a codebook, we first explored existing literature regarding the framing of animal agriculture and public attitudes and concerns toward pork production such as concerns related to factory farming, animal welfare, human health, and so forth. After establishing these frames, the research team reviewed a sample of videos to identify any emergent frames not previously considered such as challenges faced by pork producers and entrepreneurship. This process ensured our codebook was exhaustive and reflective of the diverse discourse surrounding the pork industry. The final codebook included the frames: *factory farm concerns, animal welfare concerns, human health concerns, environmental concerns, societal concerns, pork production information and technology, challenges faced by pork producers, entrepreneurship,* and *farming lifestyle*. Each frame was coded as either present (1) or not present (0).

To identify the media frames and sentiments of the YouTube videos, we used the video title, video description, and thumbnail to represent the media frame. We manually coded the media frames using the text elements, including the video title, description, and the text overlay on the thumbnail, following the codebook. If a frame was present in either the title, description, or text overlay, the frame was coded as present (1). Sentiments of the text elements were examined using the MAXQDA 24, levels of sentiments ranged from −2 (extremely negative) to 2 (extremely positive) based on the ratio of positive and negative words in the text. To simplify the analysis, we combined all negative sentiments as −1, positives as +1, and neutrals as 0. The visual elements of the thumbnails were coded manually. We took into consideration the color (e.g., bright or dark), facial expression (e.g., sad or joyful), the condition of the facility (e.g., poorly maintained or properly maintained), and the font style of text overlay (e.g., normal or exaggerated). We categorized the sentiments as either negative (−1), neutral (0), or positive (+1).

TABLE 1 Distribution of videos in different categories as labelled by YouTube (N_{videos} = 147).

YouTube categories	*n*	%
People and blogs	48	32.66
Pets and animals	21	14.29
Science and technology	17	11.57
Education	12	8.16
News and politics	11	7.48
How to and style	11	7.48
Nonprofits and activism	10	6.8
Entertainment	10	6.8
Travel and events	6	4.08
Sports	1	0.68

To analyze the audience frames and sentiments of those videos, we used each video's top five comments. We first opened each video manually in a Google Chrome browser in incognito mode (incognito mode prevents the storing of any internet cookies or other tracking software potentially biasing subsequent analysis) and selected the top five comments using the Top Comments filter leading to a total of 735 individual comments. The top five comments from each video were aggregated to identify as one, resulting in 147 comments for the frame and sentiment analysis. All comments were retrieved between June 18 to 20, 2024. All comments were coded using the same codebook, methods, and procedure described previously. Sentiment analysis was conducted using MAXQDA 24 as previously described.

Two coders were involved in the manual coding process. The two coders first discussed the definitions of each frame, followed by coding 10% of the data to determine intercoder reliability. Each variable was deemed substantially reliable, with Cohen's alpha between 0.65 and 0.85 for each variable. Based on this analysis interrater reliability was deemed sufficient given existing guidelines within the literature (Cohen, 1960; McHugh, 2012). Each coder then proceeded to code the rest of the data independently.

SPSS 29.0.2.0 (20) was used for statistical analysis. Descriptive analysis was used to report the frames and the sentiments. Chi-square tests were used to determine the relationship between media and audience frames as well as the media and audience sentiments. When less than five counts were found in a frame, the frame was eliminated from the chi-square test. The effect size was estimated using Phi and Cramer's *V* based on Cohen's (1988) guidelines where, 0.10, 0.30 and 0.50 indicate small, medium and large effect sizes, respectively.

4 Results

4.1 RQ1: primary media frames and sentiments on YouTube videos

We found *pork production information and technology* (*n* = 68, 46.26%) as the most abundantly used frame in the titles, description, and text overlay on thumbnails of YouTube videos about the pork industry. This frame demonstrated technology and production methods such as pasture pork farming, building a pig pen, and modern pork processing lines. The second frequently observed frame was *entrepreneurship* (*n* = 28, 19.05%). This frame emphasized pork production as an economic venture including tips on how to start a pork business and how to conduct the business. Another prominent frame detected in the videos was *animal welfare concerns* (*n* = 27, 18.37%). This frame suggested concerns related to the physical and mental state of pigs in relation to their living conditions and treatment in the farm or industry where languages such as animal "suffering," "horrific" confinement, and descriptions like pig's intelligence and "human cruelty" were used. *Farming lifestyle* (*n* = 25, 17.01%) was employed as another frame. This frame represented a snapshot of life on a pig farm, tours, and farmers' pride and hard work. The fifth frame, *factory farming concerns* (*n* = 15, 10.2%), depicted pork production practices as "alarming," large corporations replacing small pig farms or specifically mentioned factory/industry/standard practice related concerns with languages such as "industrial scale intensive pig farming" and "relentless quest of maximum piglet

TABLE 2 Primary frames on YouTube videos.

Frames	Examples		Description
	Titles	Text overlays on thumbnails with links to their YouTube videos	
Pork production information and technology	"Modern pig farming—pork processing automatic machines that are at another level" "Pig Farming—Pastured Pork VS CAFO"	"Free-range pig farming" https://www.youtube.com/watch?v=pDw4voKHdM0 (Discover Agriculture, 2021) "Make 350 kg pig feed for as low as N65k" https://www.youtube.com/watch?v=py5jXaFRH60 (AniBusiness, 2022)	Titles and text overlays on thumbnails representing different pig farming and feeding practices and use of modern technology in the pork farm industry.
Entrepreneurship	"How to make millions through PIG rearing! | 2023 tips (detailed)" "How to succeed in pig farming business | tips for beginners!"	"$17, 500 a month" https://www.youtube.com/watch?v=eetbgeLDy6M (UpFlip, 2021) "Pig farming Part 1: Tutorial farming from Scratch $24,000 profit on ¾ acre every year! 12 pigs" https://www.youtube.com/watch?v=uTiFOow0UJM (Rowow, 2022)	Titles and text overlays on thumbnails sharing revenues that can be earned through pig farming and tips.
Animal welfare concerns	"This is how the pig meat industry treats mother pigs" "If the pork industry had glass walls, everyone would be vegan"	"Animals under attack" https://www.youtube.com/shorts/982X_IcSb7w (Mercyforanimals, 2022) "Horrific cruelty at Nippon ham in Japan" https://www.youtube.com/watch?v=HTZYx36ZdAE (PETA (People for the Ethical Treatment of Animals), 2021)	Titles and text overlays on thumbnails concerning treatment of pigs in the industry.
Farming lifestyle	"How american farmers raise and process pork | processing factory" "Working on a Iowa pig farm"	No text overlay on thumbnails for any farming lifestyle frames	Titles representing farmers' work and activities in the farm.
Factory farming concerns	"Harrowing farrowing. an eye-opening look at the UK pig breeding industry." "China is building pig skyscrapers"	"Pork skyscraper" https://www.youtube.com/watch?v=w9z_zZs_cPI (China Uncensored, 2023) "4 billion This is pig farm?" https://www.youtube.com/watch?v=3BgrqqV7gXg (Hot Topics Time, 2022)	Titles and text overlays on thumbnails conveying alarming pork production.

Note: The examples of the titles and text overlays on thumbnails for each frame do not represent the same videos.

production" (Table 2). The remaining frames, human health concerns, environmental concerns, and social concerns were observed less than five times among the 147 selected videos.

Among the 147 videos, 61 (41.5%) titles exhibited positive sentiments, 35 (23.8%) exhibited negative sentiments and 51 (34.7%) exhibited neutral sentiments. Similarly, 44 (29.9%) video thumbnails demonstrated positive sentiments, 36 (24.5%) demonstrated negative sentiments and 67 (45.6%) demonstrated neutral sentiments (Table 3).

4.2 RQ2: primary audience frames and sentiments in the comments

The most prominent frame detected in the comments of the videos about the pork industry was *animal welfare concerns* ($n = 52$, 35.37%). Other frames are *pork production information and technology* ($n = 25$, 17.01%), *entrepreneurship* ($n = 19$, 12.93%), *factory farming concerns* ($n = 18$, 12.24%), and *farming lifestyle* ($n = 14$, 9.52%). Although not present in the pre-determined nine frames, we detected many comments sharing appreciation for the videos, mostly for those sharing farm life and technology. Audiences conveyed their gratitude for the information about pork production and technology in the video content.

Of the 147 YouTube video comments, 91 (61.9%) comments expressed positive sentiments, 28 (19.0%) comments expressed negative sentiments, and 28 (19.0%) comments expressed neutral sentiments (Table 4).

4.3 H1: the frames of YouTube videos about the pork industry are associated with audiences' frames in the comments

To test H1, we compared primary frames detected in YouTube videos and comments. Frames that were observed less than five times

TABLE 3 Sentiments of YouTube videos.

Sentiments	Examples		Description
	Titles	Link of YouTube videos for examples of thumbnails	
Positive (+1)	"Amazing high-tech pig farming-modern technology in pig farming-incredible livestock technology today" "How PIG farming is making farmers RICH! | best breeds"	https://www.youtube.com/watch?v=0z1ncBO4au8 (Utmost Precision, 2021) https://www.youtube.com/watch?v=0jWxbiQjyKs (Rhodes, 2022)	Titles representing positive sentiments with use of words like "amazing" and "rich" that have positive connotations complimenting modern technology in pig farming and reflecting benefits of pig farming to farmers. Thumbnails displaying happy human faces, bright light, human caressing pigs to express positive sentiments.
Negative (−1)	"3 reasons for not eating pork" "Labour shortage is 'final straw' for pig farmer"	https://www.youtube.com/watch?v=he1EbN97W9U (60 Minutes Australia, 2023) https://www.youtube.com/watch?v=-leHeUOYAKk (Animals Australia, 2023)	Titles representing negative sentiments by suggesting critical perspective towards pork consumption and sense of crisis of labor and its impact on farmers. Thumbnails displaying the use of dark lights and text overlay colors like red that symbolizes danger and alert with pigs behind bars to express fear and sadness cueing negative sentiments.
Neutral (0)	"AgroLink: pig farming as an economic venture" "Taking the pigs to market"	https://www.youtube.com/watch?v=UODIq__jFDk (This'll Do Farm, 2022) https://www.youtube.com/watch?v=j-1farSx5xg (Syman Says Farms, 2021)	Titles presenting pig farming from business perspective and routine process without implying any positive or negative opinions, suggesting neutral sentiments. Thumbnails demonstrating pork farm/industry and feeds on normal light without any emotional or judgmental undertones to express neutral sentiments.

Note: The examples of the titles and thumbnails for each sentiment do not represent the same videos.

in both videos and comments were omitted from the analysis, resulting in seven primary frames (Table 4).

Our results indicated a significant association between media frames (YouTube video titles and thumbnails) and audience frames (the comments) in the use of five out of seven frames. A significant association was found between YouTube videos and audience comments in employing *animal welfare concerns* ($p < 0.001$), entrepreneurship ($p < 0.001$), *environmental concerns* ($p = 0.007$), *farming lifestyle* ($p = 0.016$), and *factory farming concerns* ($p = 0.022$) frames. However, no statistically significant association was observed between media and audience frames in the use of *pork production information and technology* and *challenges faced by pork producers* frames. Therefore, H1 was partially supported (Table 5).

The computed phi (Φ) indicated a near large effect size for the percentage difference between the media and audience frames of *entrepreneurship* ($\Phi = 0.484$) and *animal welfare concerns* ($\Phi = 0.457$). A medium effect size was found for the *environmental concerns* ($\Phi = 0.315$) frame, whereas small effect sizes were found for the remaining two frames.

4.4 H2: the sentiments of YouTube videos about the pork industry are associated with audiences' sentiments in the comments

To test H2, we compared the sentiments of the media frames (YouTube video titles and thumbnails) with those expressed in audience frames (the comments). Our results indicated a significant association between sentiments of YouTube video titles and comments ($p < 0.001$) (Table 6) as well as between sentiments of YouTube video thumbnails and comments ($p < 0.001$) (Table 7). The computed Cramer's V (Φc) indicated a medium effect size for the percentage difference of the sentiments between YouTube video titles and comments ($\Phi c = 0.368$) as well as between the video thumbnails and comments ($\Phi c = 0.426$). Therefore, H2 was supported.

5 Discussion

YouTube hosts a wide range of perspectives, and our analysis identified frames centered on the pork industry and farmers as the most prominent frames in the videos related to the domain. Specifically, *pork production information and technology, entrepreneurship*, and *farming lifestyle* emerged as the leading media frames on YouTube videos about pork industry. These frames conveyed overall positive sentiments about pork production in the video titles. This was largely due to the presence of a large number of channels dedicated to sharing information about pork production, displaying and sharing pig farms and pork production practices (Holt-Day et al., 2020). However, the sentiments conveyed through thumbnails of these frames ranged significantly between neutral and positive. Correspondingly, *animal welfare* and *factory farming concerns* are still prevalent, reflecting critical perspectives on pork production practices and the industry overall. The visual elements of the thumbnails representing these frames showed sadness, fear, anger, and disgust toward pork production. This aligned with previous literature and media criticism of animal agriculture from media sources (Specht et al., 2014; Stevens et al., 2018).

The frequency distribution of audience frames does not fully align with that of media frames, even though similar frames are prominent in both cases. *Animal welfare concerns* stood out in more than one-third of the video comments, emerging as the top audience frame, indicating the

TABLE 4 Audience frames and sentiments as detected in top five comments of each video.

Frames	Example comments quotations	Sentiments	Description
Animal welfare concerns	"This is really horrible condition these animals are living [.]. People need to go vegan please" "It makes me feel sick and sad how much animal abuse is going on every second [.]"	Negative (−1)	Comments sharing audiences' concerns about the mistreatment of animals and their living conditions expressing negative sentiments with the use of words like "horrible" and "abuse" that have negative connotations.
Pork production information and technology	"I have been raising Yorkshire and Berkshire cross for several years now. With pasturing I have reduced my feed amounts from 700 lbs. to about 380lbs a week" "[…] So, after buying everything, Soybean meal $14.80 per 50#, mineral $14.99 per 50# and corn price is $6.00 per 50# I'm at roughly $7.53 a bag 14% protein[…]"	Neutral (0)	Comments sharing use of different breeds of pigs, pasturing practices, and feed mix by audiences without implying any positive or negative opinions, suggesting neutral sentiments.
Entrepreneurship	"[…] may God bless their business idea more & more as they help share their knowledge with the local beginners like us amen." "It's always inspiring watching all these videos, I've started my farm and will get to this stage with time by God's grace"	Positive (+1)	Comments reflecting audiences' appreciation of video in providing business idea and tips to start pig farm with positive sentiments.
Factory farming concerns	"Factory farming is abusive" "The industry is all about money and profit and care nothing for the welfare of animals. They see them as a commodity which brings this disgusting evil industries profit."	Negative (−1)	Comments reflecting audiences' critical perspective of the pork industry and factory farming, with opinions on how industry is only profit-oriented. The use of words like "abusive" and "evil" with negative undertones express negative sentiment.
Farming lifestyle	"Impressed by the farmers commitment to ethical and sustainable practices in raising millions of pigs outdoors." "It's fascinating to witness the unique approach to pig farming that emphasizes a healthy and natural lifestyle."	Positive (+1)	Comments sharing audiences' appreciation to the farmers' pig farming practices in natural and outdoor spaces expressing positive sentiments with the use of words with positive undertones like "ethical," "natural," and "healthy."

prominence of animal welfare concerns regarding pork production and industry among consumers. This aligns with findings by Specht and Rutherford (2013) regarding the public's sensitivity to ethical issues in animal agriculture, as well as studies by Alonso et al. (2020) and Grunert et al. (2018) that underscored growing consumer concerns over the issues of animal welfare that may be due to intensified production systems. *Pork production information and technology, entrepreneurship, factory farming concerns,* and *farming lifestyle* were other audience frames identified within the comments. Although human health, environmental, and societal concerns are commonly discussed in the literature (e.g., Font-i-Furnols et al., 2019; Grunert et al., 2018), the presence of these frames in media and audience frames in this analysis was negligible.

A significant association was found between the media and audience frames, particularly for frames related to *animal welfare concerns, entrepreneurship, environmental concerns, farming lifestyle,* and *factory farming concerns*. Similarly, sentiments in both YouTube video titles and thumbnails were significantly associated with sentiments in the comments. This implies the media frames and sentiments set by the YouTube video uploaders were effectively transmitted to the audience, influencing their comments and discussions, following Scheufele's (1999) framing process model. The results of this study are also consistent with prior findings that highlighted the influential role of social media in shaping public opinions on agriculture (Howard et al., 2017; Rumble and Irani, 2016).

Previous studies have found that emotional appeals in videos serve an important role related to viewer reactions (Brader, 2006; Fischer et al., 2021). This was consistent with the present study, particularly in the negative sentiments associated with animal welfare and factory farming concerns. It is likely that emotional appeals in the examined videos resonated with viewers' emotions and ethical beliefs, influencing their attitudes. These findings imply the need for strategically framing messages to address public concerns effectively. Transparency and proactive communication about ethical farming practices while highlighting technological advancements and entrepreneurial success in pork production may help to foster an informed public discourse. Creating content that resonates emotionally with the audience while providing factual information can be a powerful strategy. Researching public emotions is an important factor in understanding how individuals process information, particularly in relation to message framing. Emotions significantly impact cognitive processing and receptivity to information, shaping attitudes and behaviors (Kühne and Schemer, 2015; Nabi, 2003). For instance, positive emotions can enhance openness to persuasive messages, while negative emotions, such as fear or anger, often heighten selective attention and memory

TABLE 5 Chi-square comparison of frames in YouTube videos and comments.

Frames	YouTube videos		Comments		X^2	p	Φ
	N_{videos} = 147		$N_{comments}$ = 147				
	n	%	*n*	%			
Animal welfare concerns	27	18.37	52	35.37	30.76	<0.001	0.457
Entrepreneurship	28	19.05	19	12.93	34.50	<0.001	0.484
Environmental concerns	12	8.16	6	4.08	14.60	0.007	0.315
Farming lifestyle	25	17.01	14	9.52	7.33	0.016	0.223
Factory farming concerns	15	10.20	18	12.24	6.91	0.022	0.217
Pork production information and technology	68	46.26	25	17.01	3.81	0.051	0.161
Challenges faced by pork producers	8	5.44	6	4.08	1.53	0.289	0.102

TABLE 6 Chi-square comparison of sentiments in YouTube video titles and comments.

Sentiments	YouTube video titles		Comments		X^2	p	Φ_c
	N_{videos} = 147		$N_{comments}$ = 147				
	n	%	*n*	%			
Positive (+1)	61	41.5	91	61.90	39.73	<0.001	0.368
Negative (−1)	35	23.81	28	19.05			
Neutral (0)	51	34.7	28	19.05			

TABLE 7 Chi-square comparison of sentiments in YouTube video thumbnails and comments.

Sentiments	YouTube video thumbnails		Comments		X^2	p	Φ_c
	N_{videos} = 147		$N_{comments}$ = 147				
	n	%	*n*	%			
Positive (1)	44	29.93	91	61.90	53.365	<0.001	0.426
Negative (−1)	36	24.49	28	19.05			
Neutral (0)	67	45.58	28	19.05			

retention, making emotional framing a powerful tool in communication strategies (Gross, 2008).

6 Recommendation

In this study, we analyzed YouTube video titles, thumbnails, and descriptions for media framing. Future research could expand this by including an examination of full videos to deepen the frame analysis. Future research should also consider cross-platform analyses to offer a more comprehensive understanding of how digital media shapes public discourse around animal agriculture. Social media algorithms are largely based on audience interest, exposing audiences to the content which aligns with their preferences and subsequently creating echo chambers (Güran and Özarslan, 2022). Future studies are recommended to explore whether a randomly selected audience viewing these frames can still result in the same observed interactions and effects. In addition, future studies could also make use of social listening tools to examine audiences and their communities and further explore differences in audiences' opinions from a variety of perspectives (e.g., demographic, sociographic, geographic, and so forth). Audience segmentation studies may help to better identify segment-based differences and therefore support the development of tailored communication strategies accordingly. Furthermore, this study focused exclusively on the pork industry. Future studies should examine other animal agriculture sectors to reveal whether similar framing patterns and audience reactions occur across different domains of food animal production.

7 Limitations

While this study provides valuable insights into the framing of pork production on YouTube and its influence on audience perceptions, several limitations should be acknowledged. First, the analysis was limited to metadata elements—specifically video titles, descriptions, thumbnails, and user comments. The actual video content, which may offer deeper insights into narrative structure, visual framing, and tone, was not analyzed. Therefore, this study does

not fully capture the nuances and depth of the communicative strategies employed in the videos. Second, the use of a binary coding scheme (present/absent) for identifying frames does not fully reflect the complexity, intensity, and layering of communicative cues present in the media and audience discourse that often operates on a spectrum. Third, the influence of YouTube's recommendation algorithm may have affected video visibility and engagement in ways not accounted for in this study. Algorithmic filtering and amplification could have shaped the prominence of certain frames or sentiments, introducing potential selection biases. Lastly, the platform-specific nature of the research confines the applicability of the findings to YouTube. Other emerging platforms like Instagram, which have different content formats, user demographics, and engagement patterns, may exhibit alternative framing dynamics that merit investigation.

8 Conclusion

This study provides insights into the framing of pork production on YouTube and its impact on public perceptions and discussions. By identifying the prominent media and audience frames and analyzing the associated sentiments, the research highlights the complex interplay between media content and audience reactions. The findings underscore the importance of strategically framing messages to address ethical concerns while promoting transparency, technological advancements, and entrepreneurial successes in the pork industry. By leveraging emotional appeals and aligning sentiments in content with audience values, communicators can effectively engage viewers, counteract misinformation, and foster trust. Incorporating visual and narrative elements that resonate with public concerns—such as ethical farming practices and animal welfare—can help bridge gaps in understanding. Additionally, this study contributes to the broader understanding of social media's role in shaping public opinion, offering practical implications for communication strategies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the study involving human data in accordance with the local legislation and institutional requirements. Written informed consent was not required, for either participation in the study or for the publication of potentially/indirectly identifying information, in accordance with the local legislation and institutional requirements. The social media data was accessed and analyzed in accordance with the platform's terms of use and all relevant institutional/national regulations.

Author contributions

AK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. SQ: Conceptualization, Formal analysis, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing, Funding acquisition. FM-K: Writing – review & editing. MR: Writing – review & editing. AL: Writing – review & editing. KL: Writing – review & editing. CS: Writing – review & editing. AB: Writing – review & editing. NG: Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This research is a product of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa, project no. IOW05705 and sponsored by the Hatch Act and State of Iowa funds. This research was also supported by the Pork Checkoff, through the National Pork Board.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that Gen AI was used in the creation of this manuscript. The authors used the help of the free version of ChatGPT (GPT-4o mini) to improve the wording and flow of the manuscript. All suggestions made by the tool were reviewed and edited.

Publisher's note

References

Alonso, M. E., González-Montaña, J. R., and Lomillos, J. M. (2020). Consumers' concerns and perceptions of farm animal welfare. *Animals* 10:385. doi: 10.3390/ani10030385

AniBusiness. (2022). How to make cheap but rich pig feed formula || pig farming in Nigeria [Video]. YouTube. Available at: https://www.youtube.com/watch?v=py5jXaFRH60

Animals Australia (2023). How gas chambers are used to slaughter pigs. [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=-leHeUOYAKk

Bacon, T. (2022). Branding the pork industry: a content analysis of Instagram posts using# Realpigfarming (PhD thesis, Oklahoma State University). Available at: https://

search.proquest.com/openview/4961e3742f73e05cf1f75916ba99ad66/1?pq-origsite=gscholar&cbl=18750&diss=y&casa_token=QKtsbfGrqG4AAAAA:qyC9OUumIfAHUEADDxg0uafqPmhzQAkONfv77OLccCMgzp2lDJH8Tp_UnNWljcFW2Uw_OwsF

Basch, S. I., Samuel, L., and Fera, J. (2023). What do popular YouTube videos say about genetically modified foods? A content analysis. *Dialogues in Health* 2:100131. doi: 10.1016/j.dialog.2023.100131

Brader, T. (2006). Campaigning for hearts and minds: How emotional appeals in political ads work. University of Chicago Press. Available at: https://press.uchicago.edu/ucp/books/book/chicago/C/bo3640346.html

Brüggemann, M., Kunert, J., and Sprengelmeyer, L. (2022). Framing food in the news: still keeping the politics out of the broccoli. *Journal. Pract.* 18:2712-2734. doi: 10.1080/17512786.2022.2153074

Busch, G., and Spiller, A. (2018). Pictures in public communications about livestock farming. *Anim. Front.* 8, 27–33. doi: 10.1093/af/vfx003

Cahill, S., Morley, K., and Powell, D. A. (2010). Coverage of organic agriculture in north American newspapers: media: linking food safety, the environment, human health and organic agriculture. *Br. Food J.* 112, 710–722. doi: 10.1108/00070701011058244

China Uncensored (2023). *China is building pig skyscrapers* [Video]. *YouTube.* Available at: https://www.youtube.com/watch?v=w9z_zZs_cPI

Capper, J. L. (2020). Opportunities and challenges in animal protein industry sustainability: the battle between science and consumer perception. *Anim. Front.* 10, 7–13. doi: 10.1093/af/vfaa034

Chakma, K., Ruba, U. B., Hossain, A., Era, T. N., Tahzin, T., Akter, A., et al. (2022). Quality assessment of YouTube contents regarding hydroponic technology. Educ. Res. Int. Available online at: https://www.hindawi.com/journals/edri/2022/7769343/

Chan, J., and Babbitt, C. (2014). Exploring the politics of pork: industrial hog farming and the role of local newspaper coverage in state agenda setting. *Great Plains Res.* 24, 59–69. doi: 10.1353/gpr.2014.0006

Clancy, K. A., and Clancy, B. (2016). Growing monstrous organisms: the construction of anti-GMO visual rhetoric through digital media. *Crit. Stud. Media Commun.* 33, 279–292. doi: 10.1080/15295036.2016.1193670

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educ. Psychol. Meas.* 20, 37–46. doi: 10.1177/001316446002000104

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. *2nd* Edn. New York: Routledge.

de Araújo, P. D., Araújo, W. M. C., Patarata, L., and Fraqueza, M. J. (2022). Understanding the main factors that influence consumer quality perception and attitude towards meat and processed meat products. *Meat Science* 193:108952. doi: 10.1016/j.meatsci.2022.108952

Discover Agriculture (2021). *Free range pig farming | organic pork farm* [Video]. *YouTube.* Available at: https://www.youtube.com/watch?v=pDw4voKHdM0

Edgar, L. D., Johnson, D. M., and Estes, S. (2017). Poultry production messaging in two national-circulation newspapers. *J. Appl. Commun.* 101:2. doi: 10.4148/1051-0834.1010

Entman, R. M. (1991). Framing US coverage of international news: contrasts in narratives of the KAL and Iran air incidents. *J. Commun.* 41:52. doi: 10.1111/j.1460-2466.1991.tb02328.x

Entman, R. M. (1993). Framing: toward clarification of a fractured paradigm. *J. Commun.* 43, 51–58. doi: 10.1111/j.1460-2466.1993.tb01304.x

Estes, S., Edgar, L. D., and Johnson, D. M. (2017). Poultry production messaging: frames and emergent themes in three national newspapers, 1994 to 2014. *J. Appl. Commun.* 101, 31–44. doi: 10.4148/1051-0834.1012

Fahmy, S. (2010). Contrasting visual frames of our times: a framing analysis of English- and Arabic-language press coverage of war and terrorism. *Int. Commun. Gaz.* 72, 695–717. doi: 10.1177/1748048510380801

Farabi, T., Islam, M. M., and Ahmed, M. B. (2023). Prospects and problems of YouTube and virtual video channels in agricultural content dissemination. *International Journal of Agricultural Research, Innovation and Technology (IJARIT)* 13, 31–40. doi: 10.3329/ijarit.v13i2.70851

Fischer, L., Opat, K., Jennings, K., and Meyers, C. (2021). Visualizing values: a content analysis to conceptualize value congruent video messages used in agricultural communications. *J. Appl. Commun.* 105, 1–18. doi: 10.4148/1051-0834.2368

Font-i-Furnols, M., Skrlep, M., and Aluwé, M. (2019). Attitudes and beliefs of consumers towards pig welfare and pork quality. *IOP Conf. Ser. Earth Environ. Sci.* 333:012002. doi: 10.1088/1755-1315/333/1/012002

Gamson, W. A., and Modigliani, A. (1987). The changing culture of affirmative action. *Res. Polit. Sociol.* 3, 137–177.

Geise, S., and Xu, Y. (2024). Effects of visual framing in multimodal media environments: a systematic review of studies between 1979 and 2023. *J. Mass Commun. Quart.*:10776990241257586. doi: 10.1177/10776990241257586

Gitlin, T. (1980). The whole world is watching: Mass media in the making and unmaking of the new left. University of California Press. Available online at: https://books.google.com/books?hl=en&lr=&id=00iwHPO73mkC&oi=fnd&pg=PR13&dq=gitlin+2003&ots=GT95lzMqZO&sig=WcsoiDsPfh49PiVXknZiZeyWyqw

Goffman, E. (1974). Frame analysis: an essay on the organization of experience. Harvard University Press. Available oline at: https://psycnet.apa.org/record/1975-09476-000?source=post_elevate_sequence_page

Gross, K. (2008). Framing persuasive appeals: episodic and thematic framing, emotional response, and policy opinion. *Polit. Psychol.* 29, 169–192. doi: 10.1111/j.1467-9221.2008.00622.x

Grunert, K. G., Sonntag, W. I., Glanz-Chanos, V., and Forum, S. (2018). Consumer interest in environmental impact, safety, health and animal welfare aspects of modern pig production: results of a cross-national choice experiment. *Meat Science* 137, 123–129. doi: 10.1016/j.meatsci.2017.11.022

Güran, M. S., and Özarslan, H. (2022). Framing theory in the age of social media. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* 48, 446–457. doi: 10.52642/susbed.1142562

Haroon, M., Chhabra, A., Liu, X., Mohapatra, P., Shafiq, Z., and Wojcieszak, M. (2022). YouTube, the great radicalizer? Auditing and mitigating ideological biases in YouTube recommendations. *arXiv*:10666. doi: 10.48550/arXiv.2203.10666

Holt-Day, J., Curren, L., and Irlbeck, E. (2020). USDA agricultural checkoff programs' YouTube presence and video quality. *J. Agric. Educ.* 61, 190–202. doi: 10.5032/jae.2020.01190

Hot Topics Time (2022). *4 billion to build a 26 story building to raise pigs, China's profitable high tech farm* [Video]. *YouTube.* Available at: https://www.youtube.com/watch?v=3BgrqqV7gXg

Howard, M., Stephens, C. A., Stripling, C. T., Brawner, S., and Loveday, H. D. (2017). The effect of social media on university students' perceptions of the beef industry. *J. Agric. Educ.* 58, 316–330. doi: 10.5032/jae.2017.02316

Hunter, J. (2023). GMO framing in the United States and European Union. *N. C. J. Eur. Stud.* 4, 1–9. doi: 10.17615/8rj9-wx42

Kouarfaté, B. B., and Durif, F. (2023). Understanding consumer attitudes toward cultured meat: the role of online media framing. *Sustain. For.* 15:16879. doi: 10.3390/su152416879

Kovar, K. A., and Ball, A. L. (2013). Two decades of agricultural literacy research: a synthesis of the literature. *J. Agric. Educ.* 54, 167–178. doi: 10.5032/jae.2013.01167

Kühne, R., and Schemer, C. (2015). The emotional effects of news frames on information processing and opinion formation. *Commun. Res.* 42, 387–407. doi: 10.1177/0093650213514599

Lee, N. J., AP, M. D. N., and Chowanda, A. (2023). How digitally extractable attributes of YouTube video thumbnails and titles affect video views. 2023 IEEE 7th International Conference on Information Technology, Information Systems and Electrical Engineering (ICITISEE), 82–87. Available online at: https://ieeexplore.ieee.org/abstract/document/10405243/?casa_token=B8AvrorZ-0UAAAAA:pNTVGkGzOjj-LXD8g6GpfCEXVnOoAtLWTvseurQxUxSKHaWCLJ0_x2x3Ol2EWNekK_oE28aeNG8

Lee, C. S., Osop, H., Goh, D. H.-L., and Kelni, G. (2017). Making sense of comments on YouTube educational videos: a self-directed learning perspective. *Online Inf. Rev.* 41, 611–625. doi: 10.1108/OIR-09-2016-0274

Lopez, B. E., Magliocca, N. R., and Crooks, A. T. (2019). Challenges and opportunities of social media data for socio-environmental systems research. *Land* 8:107. doi: 10.3390/land8070107

Mahon, N., Holloway, L., Clark, B., and Proctor, A. (2023). The application of a sentiment analysis approach to explore public understandings of animal agriculture. *J. Rural. Stud.* 103:103127. doi: 10.1016/j.jrurstud.2023.103127

Mandal, A., Thakur, S., and Basu, D. (2022). Unearthing the knowledge of natural farming through content analysis of English YouTube videos. *J. Ext. Educ.* 34, 6910–6919. doi: 10.26725/JEE.2022.4.34.6910-6919

McHugh, M. L. (2012). Interrater reliability: the kappa statistic. *Biochem. Med.* 22, 276–282. doi: 10.11613/BM.2012.031

McLean, H. E., Jaebker, L. M., Anderson, A. M., Teel, T. L., Bright, A. D., Shwiff, S. A., et al. (2022). Social media as a window into human-wildlife interactions and zoonotic disease risk: an examination of wild pig hunting videos on YouTube. *Hum. Dimens. Wildl.* 27, 307–320. doi: 10.1080/10871209.2021.1950240

Mercyforanimals. (2022). Pork industry lawyer argues against animal protection law before SCOTUS [Video]. *YouTube*. Available at: https://www.youtube.com/shorts/982X_IcSb7w

Meyers, C., and Abrams, K. (2010). Feeding the debate: a qualitative framing analysis of organic food news media coverage. *J. Appl. Commun.* 94:3. doi: 10.4148/1051-0834.1190

Mörner, C., and Olausson, U. (2017). Hunting the beast on YouTube: the framing of nature in social media. *Nordicom Rev.* 38, 17–29. doi: 10.1515/nor-2016-0038

Nabi, R. L. (2003). Exploring the framing effects of emotion: do discrete emotions differentially influence information accessibility, information seeking, and policy preference? *Commun. Res.* 30, 224–247. doi: 10.1177/0093650202250881

Narayanan, A. (2023). Understanding social media recommendation algorithms. Columbia: Academic Commons, 1–7.

PETA (People for the Ethical Treatment of Animals). (2021). PETA Asia exposes horrific cruelty to pigs at Nippon ham in Japan [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=HTZYx36ZdAE

Pjesivac, I., Hayslett, M. A., and Binford, M. T. (2020). To eat or not to eat: framing of GMOs in American media and its effects on attitudes and behaviors. *Sci. Commun.* 42, 747–775. doi: 10.1177/1075547020947743

Qu, S., Lamm, A., Rumble, J., and Telg, R. (2017). The effects of online video on consumers' attitudes toward local food. *J. Appl. Commun.* 101, 1–20. doi: 10.4148/1051-0834.1841

Rhodes, J. (2022). *I'm starting a one acre pig farm | the ideal aet up* [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=0jWxbiQjyKs

Rieder, B. (2015). YouTube data tools (version 1.42) [computer software]. Available online at: https://ytdt.digitalmethods.net/

Rodriguez, L., and Dimitrova, D. V. (2011). The levels of visual framing. *J. Vis. Literacy* 30, 48–65. doi: 10.1080/23796529.2011.11674684

Rose, G. (2008). Using photographs as illustrations in human geography. *J. Geogr. High. Educ.* 32, 151–160. doi: 10.1080/03098260601082230

Rowow. (2022). Making $27k a year from $3500 and under a acre farming pigs profit [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=uTiFOow0UJM

Rumble, J. N., and Irani, T. (2016). Opening the doors to agriculture: the effect of transparent communication on attitude. *J. Appl. Commun.* 100:6. doi: 10.4148/1051-0834.1030

Runge, K. K., Chung, J. H., Su, L. Y.-F., Brossard, D., and Scheufele, D. A. (2018). Pink slimed: media framing of novel food technologies and risk related to ground beef and processed foods in the US. *Meat Sci.* 143, 242–251. doi: 10.1016/j.meatsci.2018.04.013

Rutsaert, P., Regan, Á., Pieniak, Z., McConnon, Á., Moss, A., Wall, P., et al. (2013). The use of social media in food risk and benefit communication. *Trends Food Sci. Technol.* 30, 84–91. doi: 10.1016/j.tifs.2012.10.006

Scheufele, D. A. (1999). Framing as a theory of media effects. *J. Commun.* 49, 103–122. doi: 10.1111/j.1460-2466.1999.tb02784.x

SeppÄNen, J., and VÄLiverronen, E. (2003). Visualizing biodiversity: the role of photographs in environmental discourse. *Sci. Cult.* 12, 59–85. doi: 10.1080/0950543032000062263

Shimono, A., Kakui, Y., and Yamasaki, T. (2020). Automatic youtube-thumbnail generation and its evaluation. Proceedings of the 2020 joint workshop on multimedia artworks analysis and attractiveness computing in multimedia, 25–30.

Sievert, K., Lawrence, M., Parker, C., Russell, C. A., and Baker, P. (2022). Who has a beef with reducing red and processed meat consumption? A media framing analysis. *Public Health Nutr.* 25, 578–590. doi: 10.1017/S1368980021004092

Sitton, S., Terry, R., Cartmell-II, D. D., and Keys, J. P. (2004). Newspaper coverage of swine production issues: a closer look at reporters and their objectivity. *J. Appl. Commun.* 88, 21–35.

Spain, C. V., Freund, D., Mohan-Gibbons, H., Meadow, R. G., and Beacham, L. (2018). Are they buying it? United States consumers' changing attitudes toward more humanely raised meat, eggs, and dairy. *Animals* 8:128. doi: 10.3390/ani8080128

Specht, A. R., McKim, B. R., and Rutherford, T. (2014). A little learning is dangerous: the influence of agricultural literacy and experience on young people's perceptions of agricultural imagery. *J. Appl. Commun.* 98:6. doi: 10.4148/1051-0834.1086

Specht, A. R., and Rutherford, T. (2013). Agriculture at eleven: visual rhetoric and news media portrayals of agriculture. *J. Appl. Commun.* 97:8. doi: 10.4148/1051-0834.1130

Stevens, T. M., Aarts, N., Termeer, C., and Dewulf, A. (2016). Social media as a new playing field for the governance of agro-food sustainability. *Curr. Opin. Environ. Sustain.* 18, 99–106. doi: 10.1016/j.cosust.2015.11.010

Stevens, T. M., Aarts, N., Termeer, C. J. A. M., and Dewulf, A. (2018). Social media hypes about agro-food issues: activism, scandals and conflicts. *Food Policy* 79, 23–34. doi: 10.1016/j.foodpol.2018.04.009

Syman Says Farms. (2021). Easy pig feed mix—Only 3 ingredients 14% protein [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=j-1farSx5xg

Tafesse, W. (2020). YouTube marketing: how marketers' video optimization practices influence video views. *Internet Res.* 30, 1689–1707. doi: 10.1108/INTR-10-2019-0406

Taylor, C. A., Boulos, C., and Almond, D. (2020). Livestock plants and COVID-19 transmission. *Proc. Natl. Acad. Sci.* 117, 31706–31715. doi: 10.1073/pnas.2010115117

Teixeira, A., and Rodrigues, S. (2021). Consumer perceptions towards healthier meat products. *Curr. Opin. Food Sci.* 38, 147–154. doi: 10.1016/j.cofs.2020.12.004

This'll Do Farm (2022). *Working on a Iowa pig farm* [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=UODIq__jFDk

Thomas, M., Haynes, P., Archila-Godínez, J. C., Nguyen, M., Xu, W., and Feng, Y. (2021). Exploring food safety messages in an era of COVID-19: analysis of YouTube video content. *J. Food Prot.* 84, 1000–1008. doi: 10.4315/JFP-20-463

Tønnesen, M. T., and Grunert, K. G. (2021). Social-psychological determinants of young consumers' consumption of pork. *Food Qual. Prefer.* 93:104262. doi: 10.1016/j.foodqual.2021.104262

Tonsor, G. T., and Lusk, J. L. (2022). US perspective: meat demand outdoes meat avoidance. *Meat Sci.* 190:108843. doi: 10.1016/j.meatsci.2022.108843

UpFlip. (2021). Starting a $188K/year pig farm business (from scratch) [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=eetbgeLDy6M

Utmost Precision. (2021). Value-addition ensures that we get every shilling worth from pig farming. #DaiichiFarm [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=0z1ncBO4au8

Van Boxtel, D., Swenson, R., and Steede, G. (2022). Green framing in corporate poultry videos: an analysis of sustainability messaging. *J. Appl. Commun.* 106:3. doi: 10.4148/1051-0834.2454

Van Gorp, B., and van der Goot, M. J. (2012). Sustainable food and agriculture: stakeholder's frames. *Commun. Cult. Crit.* 5, 127–148. doi: 10.1111/j.1753-9137.2012.01135.x

Vargas Meza, X., and Yamanaka, T. (2020). Food communication and its related sentiment in local and organic food videos on YouTube. *Journal of Medical Internet Research* 22:e16761. doi: 10.2196/16761

Wardekker, A., and Lorenz, S. (2019). The visual framing of climate change impacts and adaptation in the IPCC assessment reports. *Clim. Change* 156, 273–292. doi: 10.1007/s10584-019-02522-6

Whittaker, J., Looney, S., Reed, A., and Votta, F. (2021). Recommender systems and the amplification of extremist content. *Int. Policy Rev.* 10, 1–29. doi: 10.14763/2021.2.1565

WHO. (2020), WHO director-general's opening remarks at the media briefing on COVID-19—11 march 2020. World Health Organization. Available at: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Wildraut, C., Plesch, G., Ziron, M., Mergenthaler, M., Härlen, I., Simons, J., et al. (2015). Multimethodische Bewertung von Schweinehaltungsverfahren durch Verbraucher anhand von Videos aus realen Schweineställen [Report]. Rheinische Friedrich-Wilhelms-Universität Bonn, Landwirtschaftliche Fakultät, Lehr- und Forschungsschwerpunkt Umweltverträgliche und Standortgerechte Landwirtschaft USL. Available online at: https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/1276?locale-attribute=en

Wolfert, S., Ge, L., Verdouw, C., and Bogaardt, M.-J. (2017). Big data in smart farming–a review. *Agric. Syst.* 153, 69–80. doi: 10.1016/j.agsy.2017.01.023

Zhang, S., Aktas, T., and Luo, J. (2021). Mi YouTube es Su YouTube? Analyzing the cultures using YouTube thumbnails of popular videos. 2021 IEEE international conference on big data (big data), 4999–5006.

60 Minutes Australia (2023). Shocking reality of pig farming in Australia | 60 minutes Australia [Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=he1EbN97W9U