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Experts' Views on Issues Affecting Egg Labeling in the United States: A Delphi Study

Rexanna Powers
Louisiana State University and Agricultural and Mechanical College

EXPERTS' VIEWS ON ISSUES AFFECTING EGG LABELING IN THE UNITED STATES: A DELPHI STUDY

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Rexanna Powers
B.S., Texas A&M University, 2016
M.S., Texas Tech University, 2018
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Who is wise and understanding among you? Let them show it by their good life, by deeds done in the humility that comes from wisdom. James 3:13

The word *wisdom* is mentioned 367 times throughout the Old and New Testament of the Bible. When I think about the characteristics of someone who is wise, one person comes to mind. Therefore, this dissertation is dedicated to my grandfather, Robert D. Cousins, whose demonstration of love, kindness, and humility since day one of my life has been an example of living faith in the presence of wisdom. My love of learning and deep appreciation for agriculture comes from hearing you engage in thoughtful and thought-provoking dialogue with those around you and how you have been an exemplary steward of the agricultural knowledge that the Lord has given you. You have encouraged me, prayed for me, and mentored me in such a gentle and loving way and I would not be the passionate thinker I am today if it were not for you. Your servant heart and kind spirit has inspired me to approach research and education in such a way that not only seeks to solve problems, but to cultivate relationships.

ACKNOWLEDGEMENTS

The Lord has a perfect, divine appointment that is set forth for each of us and as I reflect on this experience, I must acknowledge Him and those who have encouraged me along the way. This dissertation is a result of many who have invested time, energy, and resources in me and encouraged me to pursue higher education and academia.

I would first like to thank my family. I simply would not be here achieving my goals if it were not for your unwavering support. Mama and Daddy – thank you for loving me and pushing me to succeed and for always being there for me. Haylon, thank you for your comedic relief and gentle encouragement.

I could not have powered through the long nights, emotional rollercoaster rides, and frustrations if it were not for Dylan. Thank you for your steadfast love for me and your patience with me as I went through this process. I have been in many ruts and you have pulled me out of all of them, reminded me that the Lord created me in His image, and that I am loved by the one true King. I am so grateful for your support and encouragement.

Next I would like to express my sincerest thanks to my graduate committee. You have each provided encouragement and wisdom to complete this endeavor one step at a time and I am grateful for not only your professional insight, but for the life advice given along the way as well. I would be remise to not extend a special acknowledgement to Dr. Roberts. You have been incredibly thoughtful and detailed in every word of feedback that you have given me and your passion for academia has not gone unnoticed. You have been an incredibly valuable example of the kind of educator I aspire to be.

I would also like to thank Dr. Temple Grandin for mentoring me in the beginning phases of this work. Your encouragement to remedy animal welfare-related issues in the laying hen industry served as the “fuel to my fire” and I am thankful to have had your guidance.

I would lastly like to thank Lolly. She’ll never read this (because she’s a dog) but she will also never know how much her warm snuggles, wet kisses, and sassy personality have helped me through my educational career. She has been with me since my second semester at Texas A&M University and has seen more tears, laughs, and late nights working on papers with me than any person has.

The Lord has blessed me with a tremendous support system that I could not have done this without. I am forever grateful for each of you. Thank you! Gig ‘Em, Wreck ‘Em, and Geaux Tigers!

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ABSTRACT

When purchasing food, many consumers have reported they question the ethical and humane treatment of products derived from animals at the point of purchase. To complicate this issue further, many U.S. consumers lack exposure, interaction, and involvement with the agricultural industry. As a result, they have reported a willingness to pay premium prices for meats, dairy, and eggs whose packaging suggests quality welfare practices. Therefore, the purpose of this investigation was three-fold: (1) establish operational definitions for poorly understood poultry industry terms, i.e., cage-free, free-range, pasture-raised, and organic; (2) describe experts' perceptions of the strengths, weaknesses, opportunities, and threats (SWOT) of poultry industry practices such as packaging, labels, and on-farm welfare practices; and (3) examine the egg production practices that may contribute to consumers' concerns about hen welfare. To achieve this, I researched the phenomenon through a three-article anthology using a Delphi approach. In the first article, I used consensus building theory (CBT) to achieve consensus using a panel of experts regarding commonly misunderstood terms, i.e., cage-free, free-range, pasture-raised, and organic, used to market eggs to consumers. The second article examined experts' perceptions of the strength, weaknesses, opportunities, and threats (SWOT) of producers raising laying hens for niche markets. In the final article, I aimed to reach a consensus among the study's selected expert panelists about the egg production practices that may contribute to consumers' concerns about hen welfare. Findings from this study provided a better understanding of the perspectives of experts in the U.S. egg industry regarding commonly misunderstood egg labeling terms while also creating a case for food marketing and branding agencies to address product differentiation tactics that more effectively benefit consumers. Moving forward, future research should explore

these issues more acutely to determine what strategies could be effective to reinvent food marketing ideology and develop more comprehensive food labeling policies.

CHAPTER 1
BACKGROUND AND SIGNIFICANCE OF THE STUDY

Consumers have increasingly struggled to make sense of food label jargon and symbols (Scott & Vallen, 2019). Once a highly coveted liberty, the power of choice has become a point of contention and confusion in the modern grocery store (Leach et al., 2020). For example, in recent years, consumers have been faced with more choices than ever before. In fact, the typical U.S. consumer will make roughly 200 to 300 decisions regarding the food they consume in one week (Wansink & Sobal, 2007). Although food choice has been touted as desirable, the oversaturation of niche products and the increased buying power of retail grocery stores have contributed false depictions of some products (Woodall & Shannon, 2018). As a result, consumers have become skeptical of marketing strategies that have attempted to differentiate food brands and products (Powers et al., 2020).

When considering food product attributes, many consumers pay attention to products that were derived from animals and question the ethical and humane treatment of products derived from animals at the point of purchase. Previous research has indicated that because of increased concern for the treatment of farm animals, consumers also indicate a willingness to pay for products that suggest high welfare environments (Lombardi et al., 2021; Coelho et al., 2018; Wang, 2013). In contrast, some studies have reported a juxtaposition of concern for animal welfare and consumers' willingness to pay for products with animal welfare-related labels. For example, Powers et al. (2020) reported consumers' low knowledge about shell egg labeling terms and high concern for animal welfare did not correspond with their willingness to pay premium prices for niche egg products.

Although many consumers have indicated elevated levels of interest and concern for animal welfare at the point of purchase, the topic has received conflicting attention in recent

years. Lusk and Norwood (2018) described the relationship that consumers have with the food they purchase as an emotional experience that can influence purchasing decisions.

> Of course, not everyone agrees that the goal of life is to maximize the well-being of animals. Still, animals' matter because people care about them. Because the happiness of animals is tied to the happiness of humans, improving the welfare of humans means finding out what we want for animals. (p. 5).

Many U.S. consumers lack exposure, interaction, or involvement with the agricultural industry. According to the American Farm Bureau Federation (2018), roughly 2% of Americans were directly involved in agriculture and the non-agriculture populations have become at least five generations removed from the industry. As a result of this disconnect, it is important to investigate how the public forms opinions about agriculture. On this point, Duncan and Broyles (2006) reported that the general public formed their opinions of agriculture based on their lived experiences, which does not usually allow them to form an accurate perception of the industry. Despite this, consumers have recently indicated that they have become concerned about farm animals' housing and welfare standards (Powers et al., 2020). As a result, they have reported a willingness to pay higher prices for meats, dairy, and eggs whose packaging suggests quality welfare practices (Coelho et al., 2018; Powers et al., 2020).

Although consumers have indicated an increased willingness to pay for animal welfare-related product attributes, knowledge and awareness of agricultural production have declined significantly in recent years (Specht et al., 2014). As a result, consumers have become more skeptical about the origins of their food and of the variety of food labels printed on the products that they purchase (Mitra et al., 2019). Consequently, third-party organizations have capitalized on consumers' lack of knowledge by increasing branding efforts to differentiate their products (Vredenburg et al., 2020). This practice has created more options and fueled confusion for consumers.

Although some studies have shown that consumers have mixed views on food labeling (Ares et al., 2011; Parker et al., 2019), others have indicated that consumers find value in labels that aid in making educated food choices (Borra, 2006). On the other hand, consumers have also reported an aversion to food labeling practices because they believe they have become too difficult to decipher (Lombardi et al., 2021). As a result of inconsistent product differentiation tactics (Mitra et al., 2019) combined with consumers' lack of knowledge regarding agriculture and food production practices, food purchasing decisions have often been made based on misinformation (Bezbaruah et al., 2021; Castellini et al., 2021; Wansink & Sobal, 2007).

Regarding the humane treatment of animals, the agricultural industry has historically experienced significant scrutiny (Hannan, 2020). When housing environments in modern animal agricultural production systems have been considered, public outcry has been widespread (Croney, 2010). However, recent criticisms have surrounded the lack of concrete definitions and labeling standards for eggs (Charge, 2020). Although the USDA has been responsible for enforcing the standards for laying hen welfare (Negowetti, 2018) there have been a wide variety of terms being used on egg labels that have been left largely unregulated (Bismuth et al., 2018). For example, terms like pasture-raised, free-range, and cage-free eggs have all been used ambiguously by brands that market shell eggs. Although these terms have been convenient for the marketing and sales of products, the average consumer has become overwhelmed and confused (Ochs et al., 2019). On this point, Tonsor et al. (2011) explained: "given th[e] lack of concrete definitions and the inherent range of public perceptions. . . it is hardly surprising that opinions vary regarding the acceptability of current production practices" (p. 713). This deficiency in knowledge motivated the current investigation.

Statement of Purpose and Research Objectives

The purpose of this investigation was three-fold: (1) establish operational definitions for poorly understood poultry industry terms, i.e., cage-free, free-range, pasture-raised, and organic; (2) establish consensus for on-farm welfare practices; and (3) describe experts' perceptions of the strengths, weaknesses, opportunities, and threats (SWOT) of poultry industry practices such as packaging, labels, and on-farm welfare practices. Three objectives guided this investigation.

Research Objectives

To accomplish the purpose of this investigation, five research objectives were addressed:

1. Describe the personal and professional characteristics of the study's panel of experts.
2. Establish operational definitions for poorly understood poultry industry terms, i.e., cage-free, free-range, pasture-raised, and organic.
3. Compare the perspectives of experts regarding general on-farm hen welfare and commonly used terms and labels found of egg packaging using SWOT analysis as a decision-making framework.

Overview of the Study

Population and Data Collection

To describe experts' perceptions of the strengths, weaknesses, opportunities, and threats (SWOT) of poultry industry practices such as packaging, labels, and on-farm welfare practices, the phenomenon used a three-article anthology approach. To gain a deeper understanding of the phenomenon, each article analyzed animal welfare standards in the laying hen sector from a variety of expert panelist perspectives.

Organization of Dissertation Articles

This study was organized into a series of three articles that were designed to contribute to a growing body of literature regarding food labeling as well as the labeling of niche market eggs. This chapter provided a background of the study and a brief overview of the most relevant factors that shaped the phenomenon. Chapters two, thee, and four include a targeted background, purpose, methodology, findings, and conclusions for each article. Chapter five concluded the examination by providing meta-conclusions, recommendations, and implications across the three articles. The final sections of this chapter provide a brief overview of each article's purpose, guiding questions, and methods. A description of each article follows.

Article One. Consensus building theory served as the theoretical basis for article one. The purpose of the article was to describe similarities and differences among experts in the laying hen sector of the poultry industry regarding characteristics that define cage-free, free-range, pasture-raised, and organic housing systems. Additionally, this article described the demographic factors of the panel of experts. The guiding objectives for this article were: (1) describe the characteristics and experiences of the study's panel of experts and (2) establish operational definitions for poorly understood poultry industry terms, i.e., cage-free, free-range, pasture-raised, and organic.

Article Two. The purpose of article two was to compare the perspectives and perceptions of this study's panel of experts regarding general on-farm hen welfare and the commonly used terms and labels that are found of egg packaging using SWOT analysis as a decision-making framework. Data collection involved panelists qualitatively listing strengths, weaknesses, opportunities, and threats regarding general on-farm hen welfare and the commonly used terms

and labels found of egg packaging. Finally, data were analyzed via qualitative coding process outlined by Saldaña (2021) to refine items for rounds two and three.

Article Three. The purpose of this article was to report results and consensus of agreement among the selected expert panelists for this study regarding experts' perception of the egg production practices that may contribute to consumers' concerns about hen welfare. To achieve this, I evaluated responses over the course of three rounds of data collection. Each round built upon the previous and allowed panelists to reach controversial poultry terms. To analyze the data, I employed a qualitative coding process that reduced the amount of information gathered, as recommended by Saldaña (2021). Round two consisted of the panelists rating the statements derived from round one using a six-point, Likert-type scale. Analysis of data collected in rounds two and three employed descriptive statistics to determine consensus on items.

Limitations

The following were identified as limitations of the study:

1. The opinions and insight of the study's panelists represented a sample of the laying hen industry's experts. Therefore, the results of this study should not be generalized to experts in other agricultural sectors.

Assumptions

The following assumptions were made when conducting this study:

1. All industry experts were familiar with niche eggs and their respective raising environments.
2. All industry experts were familiar with current labeling policy and marketing tactics regarding the welfare of hens.

Significance of the Study

The poultry industry in the U.S., specifically the egg sector, has played a significant role in the viability of the agricultural industry and economy (Mench et al., 2011). However, public criticisms and scrutiny regarding the welfare of laying hens (Hannan, 2020) have inspired the development of third-party egg labels that give the illusion of high welfare environments (Ochs et al., 2019). Additionally, egg brands have implemented marketing tactics that have used niche egg terms, i.e., cage-free, free-range, pasture-raised, and organic as tools for product differentiation rather than consumer education (Cao et al., 2021). As a result, consumers in the U.S. have become skeptical of egg labeling (Ochs et al., 2019; Powers et al., 2020).

Egg labeling in the U.S. has historically been regulated by the USDA and segments within the organization (USDA, 2020). Although the USDA has adopted definitions for cage-free and organic eggs, the requirements have been broad and have allowed room for interpretation (Miller & Stier, 2018). Because of a perceived lack of regulation, consumers have demanded more egg varieties with more stringent animal welfare-related standards. Accordingly, third-party organizations and egg companies have forgone traditional USDA regulation and developed their own standards and definitions for niche eggs (Mench et al., 2011). Although the niche egg market has been successful in marketing their products, is has generally been unregulated (Wilson & Lusk, 2020). Consequently, egg labeling terms have been used ambiguously and contributed to consumers' misinformation and distrust of the egg industry (Scott & Sesmero, 2022). As a result, a need emerged to define common egg labeling terms.

Operational Terms and Definitions

Agricultural Industry – an extensive industry that is responsible for the production of food, fiber, fuel, and textiles and the managing, marketing, and dissemination of agricultural products (Herren & Donahue, 2000).

Brand Differentiation – marketing and branding strategies that incorporate visually and emotionally appealing tactics that often capitalize on consumers' curiosity and lack of knowledge (Salazar-Ordóñez et al., 2018).

Commercial Eggs - The term means that eggs were sourced from a large-scale facility from domesticated chickens that are housed in a vertically integrated system (Law Insider, 2022).

Consensus of Agreement – the level of agreement regarding a targeted issue or idea determined by statistical agreement among the members of a group (McKenna, 1994).

Delphi Technique – A process of communication that produces a comprehensive assessment of an issue or topic and analysis of the contributing group (i.e., expert panel), but does not force negotiation (Linstone & Turoff, 1975)

Expert - a person with a special skill or knowledge that represents mastery of a subject (Merriam-Webster, 2002).

Front of Pack Interpretative Labels – labels that elicit some level of superiority of product attributes among competing products (Jewell, 2019).

Laying Hen – a female chicken that is of egg laying age (at least 20 weeks old) and is raised for the purpose of producing eggs (Hemsworth & Edwards, 2020).

Niche Market – involving strategy and marketing, niche markets are a space that represent specific needs or desires of consumers that target the purchasing preferences of certain demographic groups or geographic locations (Teplensky et al., 1993).

Perception – a result of observation, the formation of a mental image (Merriam-Webster, 2002).

Third-Party – an independent organization that endorses the production, processing, or manufacturing of a product and determines if the product has met the requirements in place by the organization (Nie et al., 2021).

CHAPTER 2
CONCERNS ABOUT HEN WELFARE IN POULTRY EGG PRODUCTION: EXPERTS' VIEWS ON THE UNSATISFIED CONSUMER DEMANDS THAT COULD AFFECT THE MARKING AND SALES OF EGG PRODUCTS

Introduction and Review of Literature

More now than ever before, consumers have become inundated by various food products (Muratore & Zarbà, 2011). For example, modern food labels have begun to use language that has suggested that a product has been produced in ways that could be considered environmentally conscious, antibiotic-free, or hormone-free. These claims not only provide product information but have also been shown to increase consumers' concerns about similar products that lack such claims on their labels (Nayga, 1999). Since the development of civilization, people have shown interest and concern for food safety and quality (U.S. Food and Drug Administration, 2018). However, the first concerns regarding food safety, quality, and accurate advertisement were not addressed on a policy level until 1880 by a U.S. House bill that ultimately failed to pass (U.S. Food and Drug Administration, 2018).

It was not until the beginning of the 20th Century that the first food legislation was passed – a policy known as the Pure Food and Drugs Act (1906). This Act prohibited misbranded food, drink, and drug products into interstate commerce and outlawed supplementing food dyes that concealed inferior products (Meadows, 2006). Several hours later, the Meat Inspection Act (1906) was also enacted. Meadows (2006) explained that the passage of these two legislative acts occurred when a decline in meat sales began after Upton Sinclair (1906) published *The Jungle*, which featured a vivid depiction of the unsatisfactory and unsanitary conditions in U.S. meatpacking plants.

The *Pure Food and Drugs Act* (1906) was later revised under the Federal Food, Drug, and Cosmetic Act (1938). This Act described a label as:

> …a display of written, printed, or graphic matter upon the immediate container of any article; and a requirement made by or under authority of this chapter that any word, statement, or other information appear on the label shall not be considered to be complied with unless such word, statement, or other information also appears on the outside container or wrapper. (Food, Drug & Cosmetic Act, 1938, p. 14)

The Pure Food and Drug Act (1906) also banned the use of declarations on food labels that were "false or misleading in any particular" (p. 13) which has been interpreted prohibiting label claims that indicate health attributes. In response, The Pure Food and Drug Act (1906) sparked legal opposition from food manufacturers. Consequently, Congress passed the Shirley Amendment in 1912. This amendment allowed legal ramifications to occur if food manufacturers made health claims that were false or misleading (FSIS, 2015). Since the enactment of the Pure Food and Drug Act (1906) and the Shirley Amendment (1912), the FDA has interpreted any health indicators on labels as either meeting or exceeding the pre-determined labeling criteria. After these Acts, food companies were also acutely aware of labeling exclusions and began listing the nutritional content of their products. Nestle (2013) explained that food manufacturers began to realize the marketing potential of labeling exemptions during this period and, as a result, started marketing foods with key vitamins as superior health products.

It should also be noted that the U.S. Food and Drug Administration (FDA) has maintained regulatory authority over the Federal Food, Drug, and Cosmetic Act (1938). However, the USDA has historically remained responsible for labeling meat and poultry products, eggs, and egg products because these items have been considered exempt from FDA standards (AGQlabs, 2020). Therefore, the USDA's regulatory control has uniquely shaped the labeling of egg products.

USDA Labeling

Government intervention in food labeling began as a way to "improv[e] human health and safety, support domestic agricultural and food manufacturing industries, and averting international trade disputes" (National Agricultural Law Center, 2013, p. 2). In the U.S., food labeling has generally been regulated by three primary entities, including the: (1) USDA, (2) FDA, and (3) United States Federal Trade Commission (FTC) (NALC, 2013). The Food Safety and Inspection Service (FSIS) has served as the public health organization housed in the USDA that has been responsible for ensuring the proper labeling and packaging of meat, poultry, and egg products.

In the USDA, the FSIS (2007) has also inspected wrappings, cargo packaging, and the labeling of meat, poultry, and egg products. In addition to developing labeling requirements for meat and poultry products, FSIS has created a strict food label policy that determines meat or poultry product misbranding (FSIS, 2020). For eggs and egg products to bear any official USDA affiliated markers, seven requirements must be met:

1. Name of the product.
2. Name of the manufacturer.
3. Official identification.
4. USDA approval number.
5. Ingredient's statement.
6. Net weight.
7. Nutrition information (FSIS, 2007).

Government oversight has historically been used to enforce and regulate changes to production practices in the egg industry. In many cases, market prices and fluctuations in market

expectations and standards have also influenced changes as consumers demand that restaurants and grocery stores source products from brands with welfare standards (Derstappen et al., 2021; Othman et al., 2021). To help facilitate a more seamless selection of food products, food manufacturers and policymakers have employed a meticulous process of revising package designs and updating regulations for food labels (Shen et al., 2018). Examples of company initiatives to revise package designs to meet consumers' calls have included Walmart, Tyson Foods, and Perdue Farms (Ares et al., 2011; Becker et al., 2015; Boesen et al., 2019). In addition to other consumer-driven demands for transparency regarding egg production practices, these brands have also endorsed and offered products bearing an antibiotic-free claim (Kesmodel et al., 2014). Similarly, in 2015, Mcdonald's began advertising that only eggs sourced from cage-free production systems should be used for menu items that included eggs (Strom, 2015). Because of this tactic's success, Strom (2015) predicted that other fast-food restaurants would soon develop similar practices. In addition to changes in restaurants, 93% of leading grocery retailers established clear goals to transition the sourcing of eggs to cage-free eggs by the end of April 2016 (Shields et al., 2017). Consumers have generally assumed that the market for eggs from alternative housing systems has been high quality because they imply superior animal welfare practices on their labels. However, research has indicated that has not been the case (Alonso et al., 2020; Bernard et al., 2019; Kumar & Kapoor, 2017).

For example, in recent years, the poultry industry has seen an increase in alternative housing systems, i.e., cage-free, free-range, pasture-raised, organic (Alonso et al., 2020; Janczak & Riber, 2015). As an illustration, cage-free aviary systems often allow hens to lay eggs outside the nest box (Campbell et al., 2016). Nevertheless, this system has led to lower quality egg collection approaches, and in many cases, the eggs have been rendered unmarketable (Matthews

& Sumner, 2015). On this point, Matthews and Sumner (2015) explained that compared to conventional housing, many alternative hen housing operations accrue higher operating costs because they have become more labor-intensive. Despite this, it is nearly impossible for consumers to decipher between socially accepted and industry-accepted production practices and welfare standards. Consequently, it has become important for producers to consider public opinion and respond to demands for changes to labels that suggest that a product has been raised using superior animal welfare practices (Tonsor & Wolf, 2019).

Labels have been defined as ‘‘any words, particulars, trademarks, brand names, pictorial matter or symbols on any packaging, document, notice, board or collar accompanying or referring to a product” (Fliess et al., 2007, p. 6). As such, labels have been used for various reasons, including a way for food companies to differentiate their products from their competition (Ares et al., 2013). When messages regarding health have been included on food labels, the FDA has required companies to include nutrition labeling and specify nutrient contents (FDA, 2013). Beyond mandatory labeling, some manufacturers of food products have chosen to voluntarily include other information on their labels (FDA, 2018). According to the FDA (2018), this trend often occurs because egg companies want to provide customers with specific information of interest. Nevertheless, the USDA has maintained regulatory oversight for shell egg labels and requirements. Despite this oversight from the USDA, however, confusion has persisted from the general public about the policies that guide animal welfare standards in egg production, especially in regard to how hens have been housed and the foods they consume. As a result, little has been known about the ways in which consumers’ concerns about hen welfare may impact the poultry industry. This deficiency in knowledge inspired the current investigation.

Theoretical Framework

This study was grounded in consensus-building theory (CBT). Consensus building has been used in a variety of disciplines to capture the opinions and knowledge of experts regarding specific topics (Innes, 2004). Consensus building has been used as a technique for analyzing common interests and has allowed for authentic and organized dialogue to transpire (Dong, 2015). Previous research on consensus-building theory has indicated that the process of building consensus has yielded collaborative education, problem solving, and shared understanding of topics and perspectives (Booher and Innes, 2002; Connick and Innes, 2003; Innes et al., 1994; Ostrom, 1990). As a result, consensus building has been used to encourage experts to thinking more critically about an issue or problem (Connick & Innes, 2003).

Understanding the conflicting opinions of experts has been cited as a key benefit of consensus building (Innes, 2004). Nevertheless, describing the converging perceptions of expert panelists has also been a primary outcome of the theory (Schively, 2007). Further, changes in participants' attitudes and commitment to a position have also been reported to evolve through the consensus-building process (Innes, 1992). As such, consensus building theory has primarily been used in research to provide an "approximation of the public interest" (Innes & Booher, 1999, p. 21).

Statement of Purpose

The purpose of this study was to reach a consensus among the study's selected expert panelists about the egg production practices that may contribute to consumers' concerns about hen welfare.

Methodology

In this study, I used a survey research approach that incorporated a modified Delphi technique (Sackman, 1975). Developed in the 1950s by two research scientists, a Delphi is a

procedure that has been used to forecast future events using a series of concentrated questions that allow for findings to emerge (McCampbell & Hemler, 1993). Well-known for its ability to capture convergent opinions, the Delphi technique solicits experience and knowledge from experts within a field or discipline (Hsu & Sanford, 2007). Linstone and Turoff (1975) suggested that the Delphi technique, by design, should be conducted in four distinct phases (see Figure 2.1).

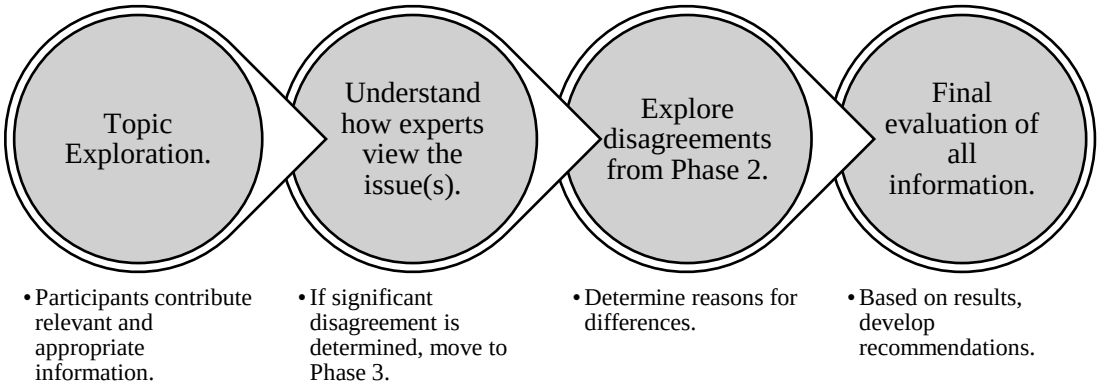

Figure 2.1. Four phases of the Delphi technique (Linstone & Turoff, 1975).

Linstone and Turoff (1975) further explained that the Delphi technique was a meticulous process of communication that could be used to provide detailed examinations of a topic by expert panelists without forcing compromises of opinions. Rather than forcing a compromise, the Delphi technique's purpose is to collect perspectives and responses from expert panelists and distill ideas into useful statements, suggestions, or positions about the topic at hand (Stitt-Gohdes & Crews, 2004).

To use the Delphi approach, I evaluated responses over three rounds of data collection using web-based questionnaires. Each round built on the previous and allowed panelists to anonymously come to a consensus on items that might not typically be agreed on. The data analysis in round one employed a qualitative coding process that reduced the amount of

information gathered, as recommended by Saldaña (2021). Round two consisted of the panelists rating the statements derived from round one using a six-point, Likert-type scale: 1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Slightly Disagree,* 4 = *Slightly Agree,* 5 = *Agree, or* 6 = *Strongly Agree.* Analysis of data collected in rounds two and three employed descriptive statistics to determine items reaching consensus.

Instrumentation and Data Collection

To gather data, I used three distinct web-based instruments to collect data for each individual round of the three-part Delphi study (i.e., each rounds' instrument was unique but representative of the previous rounds' results). All three instruments were developed via Qualtrics. For each of the three rounds, the instrument was distributed to panelists via e-mail using Dillman et al. (2014) tailored design procedures. To ensure panelist retention and response rate, I sent three timed reminders to non-respondents (Dillman et al., 2014).

The e-mail sent for the first-round included a brief description of the study, information regarding the necessary time commitment and an explanation of research goals, and a link to access the first-round instrument. The first-round instrument included four qualitative items that allowed panelists to provide narrative, open-ended responses. To achieve the purpose of this article, only the first item of the instrument and demographic information was analyzed. The first item was an open-response item that asked the panelists to list the traditional or non-traditional egg production methods may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns regarding laying hen welfare.

Reliability and Validity

A determining factor of reliability and validity of a Delphi study's findings is its number of panelists (Dalkey et al., 1972). The Delphi method has been considered reliable if 10 to 15

panelists have been assembled and represent a homogenous group (Dalkey et al., 1972; Dalkey & Helmber, 1963; Delbecq et al., 1975). Based on Dalkey et al. (1972) suggestions for reliability, the number of panelists in all three rounds of this study (n = 12) meet the suggested criteria.

Meanwhile, validity is essential to any research instrument (Lincoln & Guba, 1985). The application of a three-round Delphi process strengthened the validity of this study (Hasson & Keeney, 2011). I was most interested in the content validity if the instruments that were used in this research. Therefore, each instrument was reviewed by an expert at Louisiana State University. Based on the feedback that was provided, I revised the formatting and verbiage of some items and reformatted the instructions to increase comprehension.

Determining Consensus of Agreement

Consensus-building procedures have been used in a variety of disciplines to solve problems, generate ideas, or developing priorities (Delbecq et al., 1975). Determining consensus has been identified and operationalized based upon the research objectives of a study (Black et al., 1999). The decision rules for this study were determined by considering both rigorous and more flexible criteria (McMillan et al., 2016). I determined that during round two, at least 66% of panelists should respond within two categories on a six-point Likert-type scale and have a mean of at least 3.96. To reach a consensus of agreement during round three, nine or more (>75.00%) panelists must have *Agreed* for each item to be retained.

Data Analysis

Data were analyzed using Microsoft Office Excel® version 2021 and IBM® SPSS® Statistics Version 26 software. Nominal data, i.e., some demographic characteristics, were analyzed using frequencies and percentages. For the panelists' ages and years of experience,

ranges and averages were also calculated. For each item in rounds two and three, the frequency distribution validity percentage was used to determine if consensus had been reached, the item should be retained for further consideration, or removed from the study (Buriak & Shinn, 1989; Jenkins & Kitchel, 2009). I accomplished this by presenting one open-ended question in round one. Therefore, the panelists were asked to explain their assessments on the egg production methods that may reflect an unsatisfied consumer demand. The question that guided data collection in the first round was:

1. Please list or describe what you believe to be the production methods that may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns for laying hen welfare?

As a result of round one of the Delphi, 28 items were presented via six-point, Likert-type scale in round two by the expert panel (n = 12; 100% response rate) in which more than two-thirds (>66.00%) of the participants either *Strongly Agreed* or *Somewhat Agreed* and were considered items that reached consensus (Buriak & Shinn, 1989; Hsu & Sandford, 2007). Additionally, five items for which less than one-half (50.00%) of the participants *Strongly Agreed* or *Somewhat Agreed* and were removed from the study.

Round three of the study included items presented by the expert panel in which more than one-half (>50.00%) but less than two-thirds (<66.00%) of the panelists selected *Strongly Agree* or *Somewhat Agree* during round two. In round three, 11 items were presented for reconsideration by the panelists (n = 12; 100% response rate). Panelists were asked to *Agree* or *Disagree* to each item. As a result, all remaining items failed to reach a consensus.

The Delphi Panelists

The group of experts who participated in this study were industry professionals in the laying hen sector of the poultry industry. The participants were recruited based on recommendations from Louisiana State University faculty. Thereafter, we used a snowball sampling approach in which our initial participants nominated other individuals who fit the parameters of this investigation. In total, we recruited 12 poultry experts. These individuals participated in all three rounds of data collection which rendered a response rate of 100% for all three rounds. This study's participants were categorized into the following groups: university faculty, extension educators, animal welfare specialist, and leadership in professional poultry organizations. Of the 12 experts in the study, 10 (83.33%) were male, and two (16.67%) were female. Regarding participants' ages, one panelist (8.34%) reported an age from 25-31 years, three panelists (25%) responded as falling between 32-40 years, four panelists' (33.33%) ages were in the range of 41-48, and four panelists (33.33%) responding that they were 57 years or older. Meanwhile, the experts' mean age was 46.83 years. Regarding participants' ethnicity or race, 11 (91.67%) identified as White and one as Black (8.33%).

The experts' education and related work experience was also examined. Six (50%) of participants reported they held a bachelor's degree, four (33.33%) had a master's degree, and two (16.67%) held a doctorate. Regarding years of related work experience, nine (75%) of the panelists reported 21 or more years of experience and three (25%) indicated 16 to 20 years (see Table 2). The experts' years of work experience ranged from 17 to 47 years. The experts' related work experience averaged 29.33 years. The panelists were also asked to indicate their job positions or titles. Six participants (50%) held positions as directors, managers, or specialists or corporate enterprises or foundations. For example, one expert represented Cargill, two

represented United Egg Producers, and two held positions within the USDA. Additionally, three participants (25%) specified being full-time extension educators within the University of Arkansas extension system, two were full-time university faculty at Purdue University, and one participant reported being an animal welfare consultant (see Table 1)**.**

Table 2.1. Experts' Personal and Professional Characteristics (n = 12)

Characteristics	*f*	%
Gender		
Male	10	83.33
Female	2	16.67
Age		
25-31	1	8.34
32-40	3	25
41-48	4	33.33
57+	4	33.33
Race/Ethnicity		
White	11	91.67
Black or African American	1	8.33
Highest Educational Degree Earned		
Doctorate	2	16.67
Master's	4	33.33
Bachelor's	6	50
Years of Work Experience		
16 to 20	3	25
21 or more	9	75
Job Title		
Director/Manager/Specialist	6	50
Extension Educator	3	25
Professor/University Faculty	2	16.67
Consultant	1	8.33

Findings

In round one of this study, the expert panelists (n = 12) provided 28 emergent statements that were identified as having the potential to contribute to consumers' concerns about hen welfare (see Table 2.2).

Table 2.2. Statements (N = 28) Provided by Experts about the Egg Production Practices that may Contribute to Consumers' Concerns about Hen Welfare.

Statements	*M*	*SD*	% Agreement after Round two
Battery Cages.	5.09	1.446	84.8
Intense Confinement.	4.91	1.758	81.8
Painful Procedures.	4.91	1.578	81.8
Male Chick Culling.	4.73	1.489	78.8
Feed Withdrawal.	4.55	1.572	75.8
Lack of empathy from producers.	4.55	1.864	75.8
Higher Levels of Stress.	4.55	1.368	75.8
Unnatural environments.	4.36	1.362	75.6
Beak Trimming.	4.45	1.508	74.2
Inability to express normal behaviors.	4.45	1.572	74.1
Physical Alterations to Poultry	4.27	1.421	71.2
Interflock Cannibalism.	4.09	1.640	68.2
Depopulation.	4.09	1.578	68.2
Limited Retreat from Predators.	3.91	1.446	65.2
Unstable Social Interactions within a Flock.	3.91	1.221	65.2
Feather Pecking.	3.91	1.514	65.1
Air Quality/Ventilation (dust, ammonia, etc.)	3.73	1.421	62.2
Foot Health of Poultry	3.73	1.191	62.2
No access to the outdoors.	3.73	1.348	62.1
Respiratory Health of a Flock.	3.64	1.286	60.7
Molting.	3.64	1.362	60.6
Environmental Comfort.	3.64	1.690	60.6
Insect and Pest Maintenance.	3.09	1.136	51.5
Disease control.	3.00	1.414	50
Cage Free Housing Systems.	2.91	1.578	48.5
Vegetarian Poultry Diets.	2.82	1.328	47
Aviary housing.	2.73	1.348	45.5
Organic Egg Production.	2.18	1.328	36.3

In round two, panelists were asked to indicate their level of agreement with each item on a 6-point Likert-type scale. The researcher determined that in round two, at least 66% of panelists respond within two categories on a six-point scale and had a mean of at least 3.96. To reach a consensus during round three, nine or more (>75.00%) panelists must have *Agreed* for each item that has been retained. Additionally, items achieving less than one-half (<50.00%) of panelist agreement in round two were discarded and excluded from round three. After evaluation of the data from round two, I determined that 13 items reached a consensus (see Table 2.3).

Table 2.3. Statements (N = 13) Provided by the Experts that reached a Consensus During Round Two of the Study about the Egg Production Practices that may Contribute to Consumers' Concerns about Hen Welfare

Statements	*M*	*SD*	% Agreement after round two
Battery cages.	5.09	1.446	84.8
Intense confinement.	4.91	1.758	81.8
Painful procedures.	4.91	1.578	81.8
Male chick culling.	4.73	1.489	78.8
Feed withdrawal.	4.55	1.572	75.8
Lack of empathy from producers.	4.55	1.864	75.8
Higher levels of stress.	4.55	1.368	75.8
Unnatural environments.	4.36	1.362	75.6
Beak trimming.	4.45	1.508	74.2
Inability to express normal behaviors.	4.45	1.572	74.1
Physical alterations to poultry	4.27	1.421	71.2
Interflock cannibalism.	4.09	1.640	68.2
Depopulation.	4.09	1.578	68.2

After data analysis in the final round, I determined that 10 additional items reached consensus after the experts reconsidered the items (see Table 2.4). I was also able to determine that a total of 23 items out of the original 28 (82.14%) reached a consensus.

Table 2.4. Statements (N = 10) Provided by the Experts During that reached Consensus during Round Three of the Study about the Egg Production Practices that may Contribute to Consumers' Concerns about Hen Welfare

Statements	*M*	*SD*	% Agreement after Round Three
No access to the outdoors.	1.83	0.389	91.5
Insect and pest maintenance.	1.83	0.577	91.5
Limited retreat from predators.	1.75	0.622	87.5
Unstable social interactions within a flock.	1.75	0.622	87.5
Air quality/ventilation (dust, ammonia, etc.)	1.75	0.452	87.5
Molting.	1.75	0.452	87.5
Respiratory health of a flock.	1.67	0.492	83.5
Environmental comfort.	1.67	0.492	83.5
Feather pecking.	1.58	0.515	79
Foot health of poultry	1.50	0.522	75

Conclusions

The intent of this study was to reach a consensus among the study's selected expert panelists about the egg production practices that may contribute to consumers' concerns about hen welfare. As a result, I concluded that there were a wide variety of standard production practices that could contribute to consumer concerns for animal welfare. For example, the experts (n = 12) of this study submitted 28 primary factors that could potentially reflect unsatisfied consumer demands and ultimately reached consensus on more than three-fourths (82.14%) of the items. Therefore, I conclude that acknowledgement of these challenges regarding animal welfare in the laying hen sector of the poultry industry would be beneficial. By evaluating the responses and corresponding data, I identified four primary categories of concerns elicited by panelists: (1) biological factors, (2) environmental factors, (3) animal welfare factors, and (4) animal health-related factors. As a result, I conclude that alternative housing of laying hens presented a wide variety of issues that should be addressed when labeling eggs and egg

products – a finding that has not previously been reported. To further describe this study's findings, a discussion of the conclusions derived from each theme follows.

The first category of concerns illustrated the biological factors that could contribute to consumer concerns for animal welfare. In many cases, poultry exhibit behaviors or biological process that can affect their appearance. For example, when poultry go through the process of molting, many if not most of the feathers fall out. This process gives the animal an appearance of being mistreated or malnourished. As such, I conclude that consumer education efforts should include explanations of natural biological processes. The second category embodied the environmental factors that have the potential to contribute to consumer concerns. For example, any level of confinement presents issues for air quality and ventilation. In some cases of intense confinement, poultry can develop diseases and respiratory constriction that inhibits proper breathing. Consequently, I recommend that future research explore how poultry producers can better communicate how they seek to mitigate environmental factors that may negatively affect hen health.

The third category focused on animal-welfare related factors. Examples of animal welfare-related issues that contributed to consumer concerns were intense confinement, feed withdrawals, the culling of male chicks, and depopulation. Therefore, I conclude that environmental and animal welfare-related factors exhibited some overlapping characteristics that should be addressed more explicitly – a finding that has not been explored in previous literature. The final category encompassed factors concerning animal health or flock maintenance that could contribute to consumer concerns. For instance, beak trimming, insect and pest maintenance, disease control, and painful procedures have sometimes become necessary to preserve life or to prevent flock loss but could be perceived negatively by consumers and

contribute to distrust. Therefore, I conclude that flock maintenance procedures should be depicted in a positive manner to provoke more optimistic reactions from consumers – a finding that has not been explored in previous literature.

Discussion, Implications, and Recommendations

Food labeling and agricultural production practice operate within the confines of policy and regulation that have been enforced by the U.S. government and have also been reflective of consumer and stakeholder expectations (Mench et al., 2011). Food labeling policy, specifically regarding eggs, has become ambiguous and has introduced the misinterpretation of animal welfare, environmental, sustainability standards. Therefore, I recommend an evaluation of past and present policy and legislation related to egg production. Further, I recommend that policymakers be required to complete basic education and training on the production practices that have been necessary to produce food. Regarding egg labeling policy, I recommend that industry professionals not only lobby for policies that support accepted production standards and consumer demands but also advocate for policy related to greater poultry and egg education.

Flock maintenance, environmental sustainability, and issues surrounding animal welfare have historically been portrayed by activists and media as neglective or irresponsible practices (Grandin, 2014; Lusk, 2010; Ochs et al., 2018). However, in many cases, practices that have been perceived as abusive or neglectful have benefited poultry health (Mathews & Sumner, 2015). Therefore, I recommend that marketing professionals develop industry standards that cultivate creativity and product differentiation in the egg industry while also communicating the necessary product attributes.

Moving forward, I also recommend an evaluation of policymakers' knowledge of egg production practices. Food labeling policy has often been influenced by consumer demands

(Nayga, 1999). Consequently, I recommend that future research determine consumer knowledge of agricultural practices. Powers et al. (2020) determined that consumers have high levels of concern for animal welfare and on-farm practices but have a scant amount of knowledge regarding agricultural production. As such, I also recommend that future research on food labeling address the terms and practices that consumers associate with product attributes so that differences among egg products can be better communicated.

CHAPTER 3
EXPERTS' VIEWS ON POORLY UNDERSTOOD TERMS USED TO MARKET POULTRY EGGS: CAGE-FREE, FREE-RANGE, PASTURE-RAISED, AND ORGANIC EGG PRODUCTION

Introduction and Review of Literature

Housing systems for laying hens have become an increasingly complex issue for the poultry industry. It has been widely accepted that the housing of laying hens must provide necessities to ensure a positive quality of life, e.g., food, water, and shelter, as well as promote good health and welfare (American Veterinary Medical Association, 2012). Further, "housing systems should [promote the] expression of important natural behaviors, protect the hens from disease, injury and predation, and promote food safety" (American Veterinary Medical Association, 2012, p. 4). Historically, the basic principles of farm animal welfare have been somewhat straightforward (Hemsworth et al., 2015). However, in recent years a debate has emerged regarding acceptable standards for animal production systems – especially for the laying hen industry (MacRae et al., 2007).

The well-being of farm animals has been a priority for policymakers, activist groups, and agriculturalists for many years (Hemsworth et al., 2015). The ideologies that have traditionally guided animal welfare-related decisions have been rooted in science. However, in the 1990s, the principles of animal welfare began to shift from science-based to a social issue that ignited ethical, political, and environmental debates (Swanson, 1995). As a result of this shift, an increase in public concern for on-farm animal welfare standards emerged (Alonso et al., 2020; Powers et al., 2020). In addition to this new trend, consumers also became increasingly disconnected and unfamiliar with the food they purchased (Hepting et al., 2014). Because of these changes, food labels have played a critical role in influencing consumers' who have become more focused on how their food has been raised (Ingenbleek & Immink, 2011). For

example, some studies have indicated that consumers have been willing to pay premium prices for eggs labeled with product attributes related to hen health and well-being and their raising environment, which has led to the rise of hen welfare labeling (Alonso et al., 2020; Hepting et al., 2014; Powers et al., 2020).

Hen Welfare Labeling

The number of food labels that indicate egg production and animal welfare-related production practices (e.g., Cage-Free) has drastically increased (Lee &Lee, 2020). However, the accuracy and authenticity of food labels have been difficult to determine (Charlebois et al., 2016). For this reason, food labels that communicate specific product attributes have emerged (Batte et al., 2007; Loureiro & Umberger, 2007; Gao & Schroeder, 2009; Gadema & Oglethorpe, 2011). For shell eggs, labels that describe product attributes include production practices, e.g., Organic and All-Natural labels, whether certain ingredients were present, e.g., Non-GMO and Antibiotic-Free labels, and the extent to which the method of production affects the environment and animal welfare, e.g. Global Animal Partnership, United Egg Producers Certified, and Certified Humane).

USDA Organic. Eggs that have been produced by laying hens that have been fed a diet and housed according to the standards established by the USDA and that bear the USDA Organic seal (USDA, 2018). Additionally, the USDA has defined organic production as "a production system that is managed to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity," (USDA, 2018, p.1).

Global Animal Partnership. The Global Animal Partnership (GAP) was "designed to facilitate a change in animal agriculture" (Global Animal Partnership, 2020, p. 4). Meanwhile,

the mission of this organization has been "to drive meaningful, continuous improvement of farm animal welfare through multi-level standards development, application, and verification across the supply chain," (Global Animal Partnership, 2019, p. 2). Products that have been labeled with GAP's Animal Welfare Certified Program label have been assessed and approved of the level of welfare of animals on-farm, during transport, and at slaughter (Global Animal Partnership, 2020, p. 1).

United Egg Producers Certified. United Egg Producers (UEP) has become "a cooperative of U.S. egg farmers working to address legislative, regulatory and advocacy issues impacting the industry through active farmer-member leadership, while also providing a unified voice and partnership across the agricultural community" (United Egg Producers Certified, 2018, para. 2). Additionally, more than "85% of eggs produced in the U.S. come from farms that voluntarily participate in UEP Certified, choosing to open their farms to independent auditors" (United Egg Producers Certified, 2018, para. 2).

Certified Humane Raised and Handled®. Humane Farm Animal Care (HFAC) is an internationally accredited non-profit organization that has assured consumers that food products that have been labeled with the Certified Humane® Raised and Handled® label "have come from facilities that meet precise, objective standards for farm animal treatment" (Humane Farm Animal Care, 2018, para. 1). According to HFAC (2018), the Certified Humane® Raised and Handled® label indicates the following:

> The producer meets our Animal Care Standards and applies them to farm animals, from birth through slaughter, animals are never kept in cages, crates, or tie stalls, animals must be free to do what comes, animals must be fed a diet of quality feed, without animal by-products, antibiotics or growth hormones, producers must comply with food safety and environmental regulations. (p. 3).

Figure 3.1. Examples of Value-Added Labels Commonly Found on Shell Egg Packaging

Note. Images of common value-added egg labels. [1]USDA-Organic Label (Left-Top), [2]Non-GMO Project Verified Label (Top-Center), [3]Vegetarian Fed and Antibiotic Free Label (Top-Right), [4]Global Animal Partnership Label (Bottom-Left), [5]United Egg Producers Certified Label (Bottom-Center), [6]Certified Humane Label (Bottom-Center), and [7]All Natural Label (Bottom-Right).

Consumer Acceptance

Previous research has suggested that many factors contribute to consumer acceptance of food products (Kumar & Kapoor, 2017; Lusk et al., 2018; Neal et al., 2017; Shen et al., 2018). In addition to increased consumer concern regarding animal welfare, the public has also advocated for more sustainable practices (Chintakayala et al., 2018; Mench et al., 2011). As a result, researchers of social and environmental sciences have begun viewing animal welfare as a multi-dimensional issue that can be addressed from various angles (Thompson et al., 2011). As such, public opinion and perceptions of animal welfare have become increasingly influential (Bernard et al., 2019).

For example, consumers of eggs and egg products have consistently indicated a preference for eggs labeled with suggestions of ethical animal welfare practices (Wang, 2013).

Previous studies have also indicated that this preference may be guided by the perception that such practices have higher nutritional quality (Neal et al., 2017). However, a growing body of research has assessed the role of the raising environments and husbandry on egg quality, food safety, and environmental sustainability (Campbell et al., 2016; Hisasaga et al., 2020; Lay et al., 2011; Lordelo et al., 2017; Matthews & Sumner, 2015; Ochs et al., 2019; Sumner et al., 2011; Zhao et al., 2015). Although many studies have evaluated the nutritional differences and quality exceptionalities from eggs produced in alternative housing environments, Lordelo et al. (2017) concluded that higher quality could not be guaranteed when purchasing eggs based on an animals' raising environment. Nevertheless, consumers' purchasing behaviors have increasingly become connected to ethic-based egg product attributes. As a consequence, it has become critical for consumers to understand the differences that exist between certified and non-certified labeling agencies.

Non-Certified Alternative Housing Shell Egg Labels

The humane treatment of animals has become critical to a broad range of individuals and has quickly become a measure that consumers use when deciding the food products they purchase (Alonso et al., 2020; Heerwagen et al., 2014). However, as food manufacturers attempt to differentiate products to attract a more label-savvy consumer with increasingly specialized and targeted labeling claims, the risk of unlawfully representing products has been shown to increase substantially (Endres & Johnson, 2011). On this point, Ochs et al. (2019) argued that consumers have been misinformed about the criteria needed to determine the ethical production of eggs. As such, it has become increasingly evident that the lack of definitions for commonly used egg labeling claims, specifically those related to hen welfare, has exhausted the commercial egg industry. Therefore, it has become essential to clarify this issue by reaching a consensus on the meaning of terms such as cage-free, free-range, pasture-raised, and organic.

Free Range. The welfare of poultry and egg-laying hens has been a priority of the public and policymakers for many years (Singer, 1975). Because of this focus, the laying hen sector of the poultry industry has experienced government intervention and supervision to ensure proper and sufficient welfare standards (Rolfe, 1999). Rolfe (1999) explained the way society expresses concerns about the welfare of laying hens:

> First, regulations are used to ensure that minimum conditions are met in the care of laying hens, although there are still widespread concerns from the animal liberation and other groups that those conditions are set too low. Second, consumers may choose not to express demands for eggs that are produced from conventionally housed hens. In this case, people may choose not to consume eggs at all, or may use eggs from alternative production sources by purchasing free range eggs or even producing eggs in their own backyards. (p. 191)

Although the concept is more than two decades old, the ideology presented has remained significant and applicable. However, consumers call for ethically raised laying hens and free-range eggs have led to an emotionally motivated purchasing decisions (Stanescu, 2013). As an illustration, Chintakayala et al. (2018) argued that "feeling good about yourself" has been offered as one of the major factors driving [the] consumption of free-range eggs (p. 11).

Free-range eggs were one of the first niche or alternatively housed eggs in the grocery store. Since their debut, the free-range label has sparked debate among consumers, lobbyists, and production specialists. For instance, in 2012, U.S. Congress Bill 3798, written and supported by both the United Egg Producers (U.E.P.) and the Humane Society of the U.S. (HSUS), loosely defined Free Range eggs. The definition for Free Range eggs was adopted as: "(1) Eggs from free-range hens to indicate that the egg-laying hens from which the eggs or egg products were derived were, during egg production – – (2) not housed in caging devices; and (3) provided with outdoor access" (Certified Humane, 2014, p. 3). Critics' issues with this definition have been the lack of precise parameters, the undetermined time required for outdoor use, and the lack of

regulation (Chintakayala et al., 2018). Since the USDA and FSIS have been responsible for regulating and enforcing welfare-related claims, their definition has stated that it is required that hens have access to outdoors or outdoor access (USDA, 2017). Animal welfare organizations have also had qualms with this definition because there have not been specific criteria to define outdoor (Certified Humane, 2014). As a result, animal welfare organizations have advocated for a clearer policy for free-range eggs and argued that free-range claims on eggs had not been regulated effectively (Certified Humane, 2014).

Cage-Free. Increased consumer concerns for on-farm animal welfare standards coupled with advocacy groups' push for specificity has influenced organizations in the laying hen sector (Cornish et al., 2016). For example, the American Egg Board (2018) provided the following definition for cage-free eggs:

> Eggs laid by hens at indoor floor operations, sometimes called free-roaming. The hens may roam in a building, room, or open area, usually in a barn or poultry house, and have unlimited access to fresh food and water, while some may also forage for food if they are allowed outdoors. Cage-free systems vary and include barn- raised and free-range hens, both of which have shelter that helps protect against predators. Both types are produced under common handling and care practices, which provide floor space, nest space and perches. Depending on the farm, these housing systems may or may not have an automated egg collection system. (para. 6)

The USDA loosely defined cage-free as "[e]ggs labeled *cage-free* or *from free-roaming hens* are laid by hens that are allowed to roam in a room or open area, which is typically a barn or poultry house" (Barnes, 2017, p. 9). Although the USDA has provided quality assurance and food safety, there has been no guarantee that eggs will not be combined with other eggs produced at other facilities when they reach the processing facility to be graded for quality (Barnes, 2017). Consequently, the potential for mislabeling has remained significant (Parker et al., 2016). Therefore, the USDA Agricultural Marketing Service explained that: "When cage-free eggs arrive at the processing facility with literally millions of other NON-CAGE-FREE [*sic*]

eggs, the company must… demonstrate their ability to segregate cage-free from non-cage-free" (p. 1). Nevertheless, such practices have not been practiced consistently (USDA AMS, 2019). Further, Parker et al. (2016) argued that regulatory inconsistencies and the lack of clear parameters regarding the term cage-free had caused confusion among consumers.

Pasture-Raised. The pasture-raised label claim was developed because of consumer confusion and the increased demand for low confinement raising environments for laying hens. Pasture-based production systems differ from other confinement models because the animals spend most of the growing season outside foraging (Conner et al., 2008). Although pasture-raised label claims have been commonly found on egg packaging, a marginal body of literature has been advanced to define the production approach. As such, third-party labeling organizations have developed animal welfare-related labeling strategies (Heinola et al., 2021). For example, the Humane Farm Animal Care (HFAC) Standards were developed by a group of animal rights advocates. They suggested that pasture-raised eggs met the following criteria:

> Pasture-raised is a management system where adult birds are kept on pasture 12-months of the year, in an outside area that is mainly covered with living vegetation. The birds have access to the pasture through exits from fixed or mobile houses, and covered verandas if present. They are kept indoors at night for protection from predators, but it is prohibited to keep them continually indoors 24-hours per day without access to pasture for more than 14 consecutive days. The minimum outdoor space requirement is 2.5 acres per 1000 birds to meet the Animal Care Standards for Pasture Raised. (Humane Farm Animal Care, 2018, para. 7).

Despite this definition, the controversy surrounding the term has led to a misunderstanding of what constitutes a pasture-raised egg. Consequently, other niche eggs have seen an increase in sales (Bray, 2017). For example, the sale of organic eggs in the U.S. has increased by roughly 81% since 2014 (USDA ERS, 2021).

Organic. Methods of organic food production were developed to address consumers' concerns regarding the impact of agriculture on the environment (Chintakayala et al., 2018).

However, the organic label has since evolved from a symbol of environmental consciousness to assurance of social and ethical standards (Fischer et al., 2012). Since 1990, the agricultural industry has observed an average of 20% growth each year in the organic sector (SARE Outreach, 2003). Although the USDA does not maintain records on U.S. organic sales, data on organic eggs has been reported by other sources.

For example, food and poultry scientists (Bejaei et al., 2011; Blatchford et al., 2016; Campbell et al., 2016; Eyinade et al., 2021), have argued that organic purchasing decisions have been made from a variety of perspectives. On this point, Eyinade et al. (2021) identified the main reasons why individuals purchase organic food: (a) concerns about health and nutrition, (b) superior taste, (c) care for the environment, (d) food safety, (e) lack of trust in conventional food, (f) care for animal welfare, (g) support the local economy, (h) freshness, and (i) curiosity or because they are considered trendy. However, Alonso et al. (2020) suggested that individuals not only consume organic food for the aforementioned reasons but also desire greater animal welfare standards.

As a result, organic food branding has helped create a thriving niche market in the industry (Fatha & Ayoubi, 2021). Further, brands of eggs in the U.S., such as Vital Farms, Organic Valley, and Pete & Gerry's, have established definitions and husbandry standards for the term organic. To date, these third-party brands have been able to bypass USDA regulation (Powers et al., 2020). However, critics have argued these practices have contributed to consumer confusion by creating subjective definitions of organic production systems (Wunderlich et al., 2018).

Statement of the Problem

Food labeling in the egg industry has become increasingly confusing for consumers because of issues surrounding the use of terms such as cage-free, free-range, pasture-raised, and organic (Alonso et al., 2020; Eyinade et al., 2021). Ochs et al. (2019) argued that this issue has occurred because of a lack of consensus in the poultry industry on defining these terms. To complicate this problem further, the commercial egg industry has faced criticisms from consumers and animal rights advocates regarding welfare standards and ambiguous label claims on egg packaging. Consequently, it has become critical to develop transparent and concise definitions that allow consumers to make efficient and educated purchasing decisions.

Theoretical Framework

This study was grounded in consensus-building theory (CBT). Many organizations face complex problems that require input and expertise from multiple perspectives. Partnerships and collaboration have been considered essential when individuals' efforts cannot meet objectives (Schrage, 1990). As such, reaching a consensus on an issue has become important in a variety of disciplines and organizations (Briggs et al., 2005). In group or organizational settings, consensus-building represents an agreement regarding goals or outcomes. Although scholars of CBT have suggested procedures for building consensus (Innes, 2004; Moscovici & Doise, 1994; Scott & Flanigan, 1996; Williamson, 1993), little evidence has existed to describe the cognitive processes that underly how individuals come to a consensus.

Despite this, Innes and Booher (1999) advanced some important insights into building consensus. First, researchers should recruit expert representatives and challenge them to evaluate an area of shared concern (Innes & Booher, 1999). Therefore, consensus-building has been used as a conventional method to "search for feasible strategies to deal with uncertain, complex, and

controversial planning and policy tasks" (Innes & Booher, 1999, p. 412). The benefits of consensus building include: (a) agreement among individuals who may not typically associate, (b) tangible products such as collaborations, and (c) intangible products including social, intellectual, and political gains (Innes & Booher, 1999). It should be noted that previous research has supported the use of this method to identify and generate consensus among stakeholders regarding critical issues in their field (Lamm et al., 2021a; Lamm et al., 2021b). Therefore, consensus-building can be "valuable from a societal perspective because it links the distributed intelligence of many players so they can form a more coherent and responsive planning system" (Innes & Booher, 1999, p. 421).

Statement of Purpose

The purpose of this study was to reach a consensus using a panel of experts regarding commonly misunderstood terms (i.e., cage-free, free-range, pasture-raised, and organic) used to market eggs to consumers.

Methodology

This investigation used a modified Delphi approach. Recognized and employed across a wide range of disciplines, Delphi has been used to reach a consensus among a panel of experts who have experience and expertise on a topic, issue, or concern (Stitt-Gohdes & Crews, 2004; Thangaratinam & Redman, 2005).

The Delphi approach was developed in the 1950s by researchers at the RAND Corporation and was originally designed to obtain a consensus of seven experts regarding politics and military affairs (Fogo, 2014; Reguant & Torrado, 2016; Sackman, 1975). Dalkey (1969) defined the Delphi method as "a systematic approach for a decision-making group to use to reach consensus by responding to specific questions over numerous

rounds interposed with the group members' ongoing feedback" (p. 15). Because of this design, Delphi can distill experts' knowledge and expertise without the limitations of potential group dynamics, i.e., no individual can take charge and influence the opinions of others and differing personalities and opinions cannot persuade outcomes (Kauko & Palmroos, 2014; Martin & Frick, 1998). Similarly, this method allows the researcher to establish and communicate positive or negative factors on an area of interest (Stitt-Gohdes & Crews, 2004).

To successfully conduct a Delphi study, three main criteria must be met. Ho et al. (2018) defined the criteria as a compilation of the following: (1) provide a thorough explanation of the study and develop an appropriate instrument; (2) determine the criteria for expert panelist selection; and (3) assemble and administer the survey and account for at least two rounds of data collection (see Figure 3.2). A precise number of panelists has not been advanced in the literature to determine the number of experts needed to conduct Delphi research. However, five to 10 panelists have been considered sufficient for relatively homogenous populations (Landeta, 2006; Loo, 2002; Robbins & Judge, 2008).

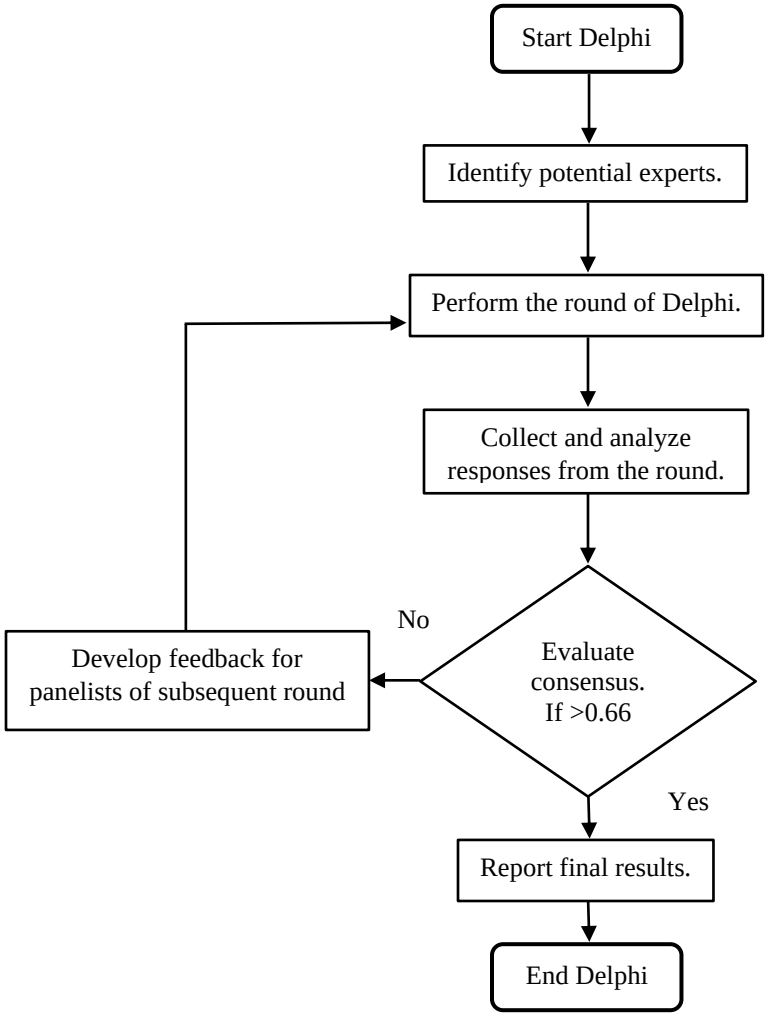

Figure 3.2. Delphi technique model. Adapted from "Identification of Coordination Factors affecting Building Projects Performance" (Alaloul, Liew, & Zawawi, 2016, p. 2693).

Instrumentation and Data Collection

To gather data, I used three distinct survey instruments to collect data for each individual round of the three-part Delphi study (i.e., each rounds' instrument was unique but representative of the previous rounds' results). All three instruments were developed via Qualtrics. For each of the three rounds, the instrument was distributed to panelists via e-mail. To ensure panelist retention and response rate, I sent three reminder e-mails to non-respondents in five-day increments (Dillman et al., 2014)

The e-mail sent for the first-round included a brief description of the study, information regarding the necessary time commitment and an explanation of research goals, and a link to access the first-round instrument. The first-round instrument included four qualitative items that allowed panelists to provide narrative responses. Because this study was part of a larger investigation, only data from the fourth item and demographic characteristics were used for this study. The fourth item allowed the panelists to offer perspectives and insight on the defining characteristics of laying hen housing environments.

Reliability and Validity

A determining factor of reliability of a Delphi study is the study's number of panelists (Dalkey et al., 1972). The Delphi method has been considered reliable if 10 to 15 panelists have been assembled and represent a homogenous group (Dalkey et al., 1972; Dalkey & Helmber, 1963; Delbecq et al., 1975). Based on Dalkey et al. (1972) suggestions, the number of panelists in all three rounds of this study (n = 12) meet base criteria.

Validity is essential in all research. In this study, I focused on content validity of the instruments used in this study. Therefore, each instrument was reviewed by a panel of experts at Louisiana State University. Based on the feedback that was provided, I revised the formatting and verbiage of some items and reformatted the instructions to increase comprehension.

Determining Consensus of Agreement

When determining consensus-building decision rules, Hsu and Sandford (2007) suggest that the level of criteria is subject to interpretation. However, at the most basic level, consensus on an issue or topic can be determined when a specific number of panelist responses falls within a certain range (Miller, 2006). Some consensus recommendations include rigorous decision rules

and include having 80% of panelist responses fall within two categories on a seven-point scale (Ulschak, 1983). In contrast, some recommendations offer more flexibility in determining decision rules. Green (1982) suggested that a minimum of 70% of panelists should rate three or higher on a four-point Likert-type scale and garner a mean of at least 3.25.

Because the Delphi process allows for qualitative and quantitative data, the primary means of statistical analyses are measures of central tendency (Hasson, Keeney, & McKenna, 2000). The decision rules for this study were determined by considering both rigorous and more flexible criteria. I determined that during round two, at least 66% of panelists should respond within two categories on a three-point scale and have a mean of at least 1.98. To reach a consensus of agreement during round three, nine or more (>75.00%) panelists must have selected *Agree* for each item to be retained.

Data Analysis

Data were analyzed using Microsoft Office Excel® version 2021 and IBM® SPSS® Statistics Version 26 software. Nominal data, i.e., some demographic characteristics, were analyzed using frequencies and percentages. For each item in rounds two and three, the frequency distribution validity percentage was used to determine if consensus had been reached, the item should be retained for further consideration, or removed from the study (Buriak & Shinn, 1989; Jenkins & Kitchel, 2009). I achieved this by presenting four open-ended questions in round one. Therefore, the panelists were asked to explain their perspectives on the defining characteristics of laying hen housing environments. The four questions that guided data collection in the first round were:

1. Please list or describe what you believe to be the defining characteristic(s) of a Cage-Free operation.

2. Please list or describe what you believe to be the defining characteristic(s) of a Free-Range operation.

3. Please list or describe what you believe to be the defining characteristic(s) of a Pasture-Raised operation.

4. Please list or describe what you believe to be the defining characteristic(s) of an Organic operation.

The Delphi approach has been an adequate method to reach a consensus among expert panelists (Dalkey, 1969; Dalkey & Helmer, 1963; Linstone & Turoff, 1975). As a result of round one of the Delphi, 26 items were presented in round two to the expert panel (n = 12; 100% response rate). Based upon a three-point Likert-type scale, more than two-thirds (>66.00%) of the participants selected either *Extremely Important* or *Slightly Important* and were considered items that reached consensus (Buriak & Shinn, 1989; Hsu & Sandford, 2007). Additionally, six items for which less than one-half (50.00%) of the participants selected either *Extremely Important* or *Slightly Important* were removed from the study.

Round three of the study included items presented by the expert panel in which more than one-half (>50.00%) but less than two-thirds (<66.00%) of the panelists selected *Extremely Important* or *Slightly Important* during round two. In round three, panelists were asked to *Agree* or *Disagree* to seven items that were presented for reconsideration (n = 12; 100% response rate). These items failed to reach a consensus.

Sources of Data: Delphi Panelists

The group of experts who participated in this study were industry professionals in the laying hen sector of the poultry industry. The participants were recruited based on recommendations from Louisiana State University faculty. Thereafter, I used a snowball

sampling approach in which our initial participants nominated other individuals who fit the parameters of this investigation. In total, I recruited 12 poultry experts. These individuals participated in all three rounds of data collection; therefore, our response rate was 100% in all three rounds. Many of this study's participants fell into one or more of the following categories: university faculty, extension educators, animal welfare specialist, and leadership in professional poultry organizations. Of the 12 experts in the study, 10 (83.33%) were male, and two (16.67%) were female. Regarding participants' ages, one panelist (8.34%) reported an age from 25-31 years, three panelists (25%) responded as falling between 32-40 years, four panelists' (33.33%) ages were in the range of 41-48, and four panelists (33.33%) responding that they were 57 years or older. Meanwhile, the experts' mean age was 46.83 years. Regarding participants' ethnicity or race, 11 (91.67%) identified as White and one as Black (8.33%).

The experts' education and related work experience was also examined. Six (50%) of participants reported they held a Bachelor's degree, four (33.33%) had a Master's degree, and two (16.67%) held a doctorate. Regarding years of related work experience, nine (75%) of the panelists reported 21 or more years of experience and three (25%) indicated 16 to 20 years (see Table 2). The experts' years of work experience ranged from 17 to 47 years. The experts' related work experience averaged 29.33 years. Geographical representation included the states of Alabama, Arkansas, California, Colorado, Georgia, Indiana, Iowa, Maryland, Michigan, Pennsylvania, Virginia, and Wisconsin. The panelists were also asked to indicate their job positions or titles. Six participants (50%) held positions as directors, managers, or specialists for corporate enterprises or foundations. For example, one expert represented Cargill, two represented United Egg Producers, and two held positions within the USDA. Additionally, three participants (25%) specified being full-time extension educators within the University of

Arkansas extension system, two were full-time university faculty at Purdue University, and one participant reported being an animal welfare consultant (see Table 3.1).

Table 3.1. Experts' Personal and Professional Characteristics (n = 12)

Characteristics	*f*	%
Gender		
Male	10	83.33
Female	2	16.67
Age		
25-31	1	8.34
32-40	3	25
41-48	4	33.33
57+	4	33.33
Race/Ethnicity		
White	11	91.67
Black or African American	1	8.33
Highest Educational Degree Earned		
Doctorate	2	16.67
Master's	4	33.33
Bachelor's	6	50
Years of Work Experience		
16 to 20	3	25
21 or more	9	75
Job Title		
Director/Manager/Specialist	6	50
Extension Educator	3	25
Professor/University Faculty	2	16.67
Consultant	1	8.33

Findings

Round One Findings

Round one of this study aimed to identify expert views on the defining characteristics of alternative egg production systems, i.e., cage-free, free-range, pasture-raised, and organic housing systems. As a result, the expert (*n* = 12) panelists provided 39 emerging statements to

open-ended prompts. Similar statements were combined. From the 39 original statements, the researcher retained 26 as items to present in round two (Fereday & Muir-Cochrane, 2006; Shinn et al., 2009).

Round Two Findings

In round two, panelists were asked to rate their levels of agreement for the 39 statements derived from round one. The panelists were also asked to indicate how important individual characteristics were to each alternative egg production approach on a three-point, Likert-type scale: *1 = Not Important at All, 2 = Slightly Important, and 3 = Extremely Important.* For the 39 items, more than two-thirds (>66.00%) of the panelists (n = 12) selected either *Slightly Important* or *Extremely Important.* Therefore, a consensus was reached (Carnes et al., 2010; Shinn et al., 2009) [see Table 3.2].

Table 3.2. Experts' Agreement Regarding the Defining Characteristics (N = 26) of Alternative Egg Production Approaches, i.e., Cage-Free, Free Range, Pasture-Raised, and Organic

Round Two Items	*M*	*SD*	% Agreement
Cage-Free			
No Cages.	2.78	0.667	92.7
Freedom of movement within a barn.	2.67	0.500	89
Environment allows for natural behaviors.	2.56	0.527	85.3
Nest Boxes.	2.56	0.726	85.3
Hens can roam vertically and horizontally.	2.44	0.527	80
Free-Range			
Birds have access to indoors and outdoors.	2.89	0.333	96.3
Eggs laid by hens that have some access to the outdoors.	2.67	0.500	89
Free access to outdoors with no confinement.	2.56	0.726	85.3
Hens have access to pasture.	2.22	0.833	74

(table cont'd)

Round Two Items	*M*	*SD*	% Agreement
Freedom to roam around a barn.	2.11	0.782	70.3
Pasture-Raised			
Access to pasture area.	3.00	0.000	100
Hens are raised on pasture for majority of their life.	2.78	0.441	92.7
Eggs laid by hens with access to the outdoors.	2.78	0.441	92.7
Freedom of movement within a confined outdoor area.	2.67	0.500	89
Pasture must have huts to act as shelter.	2.56	0.527	85.3
Hens have access to pasture where grass is available.	2.56	0.726	85.3
Access to pasture year-round.	2.56	0.726	85.3
Flock is rotated so pasture remains fresh.	2.44	0.726	81.3
Grass.	2.22	0.667	74
Pasture is rooted vegetation (e.g. plants, not just grass).	2.11	0.782	70.3
Mobile houses on an outdoor range.	2.00	0.866	66.7
Organic			
Adherence to the USDA's National Organic Program standards	2.89	0.333	96.3
Non-GMO feed ingredients.	2.78	0.667	92.7
Organic standards for raising are followed after day 2 of life.	2.44	0.726	81.3
No exposure to chemicals of any kind.	2.33	0.866	77.7
Access to the outdoors.	2.11	0.928	70.3

In round two, at least one-half (50.00%) but less than two-thirds (<66.00%) of the expert panelists selected *Extremely Important* or *Slightly Important* for seven of the 39 items they were prompted to consider. Therefore, these characteristics did not reach a consensus during round two but met the requirements to be reconsidered. In addition to the items that reached consensus in round one and round two (n = 33), six items were removed and excluded from round three.

Although seven items were reconsidered in round three, all the items were deemed to have not reached a consensus of agreement based on Green's (1982) decision rules.

Conclusions

The purpose of this study was to reach a consensus regarding commonly misunderstood terms used to market eggs to consumers. Using a modified Delphi approach, the experts in this investigation were asked to reach a consensus on the defining characteristics of four alternative egg production approaches: (1) free-range, (2) cage-free, (3) pasture-raised, and (4) organic. As a result, 26 items across the four terms, reached a consensus of agreement. Because 81.25% of the items reached a consensus, I concluded that clear, concise definitions for the four alternative egg production approaches examined could be achieved.

For example, the experts submitted 11 defining characteristics for the term cage-free egg production; however, they only reached a consensus on five (45.46%) items. Based upon the items that reached consensus, I conclude that the following definition should be used for cage-free egg production: Hens should have the ability and freedom to roam within a barn or enclosed area that is free of cages and provides nesting boxes and refuge from predators while also promoting hens to act naturally. In comparison to current definitions of a cage-free egg production system, this definition does not confine laying hens during the egg-laying cycle (USDA, 2017).

Meanwhile, the experts achieved a 62.5% consensus of agreement on eight items for the term free-range egg production. Therefore, I conclude that based on panelists' responses, the following definition should be used for free-range label claims: Hens should have access to freely roam on a pasture area or within the borders of a barn and experience minimal to no confinement.

Because free-range labels have primarily been used by third-party organizations, i.e., American Certified Humane and Certified Humane Raised and Handled, to endorse egg brands' animal welfare standards, the existing definitions have been ambiguous across brands (Bray, 2017). As a result, this definition could serve as a baseline for developing standards for free-range eggs.

For the third alternative egg production term, pasture-raised, the experts achieved a consensus an 84.62% on 11 items. As such, I conclude that pasture-raised production should use the following definition: Hens should have year-round access throughout the majority of their life to a minimally confined, regularly rotated pastured that has been planted with rooted vegetation. The hens should also have the freedom to seek refuge from predators or inclement weather through an outdoor hut or open-concept barn area.

In contrast to the free-range label, pasture-raised labels have been used by third-party organizations and egg brands as product differentiation approaches (Powers et al., 2020). Because there have been no industry-accepted standards for pasture-raised eggs, this definition could provide context to the priorities that should take precedence in a pasture-raised egg production model.

On the final term, organic production egg production, 71.43% of the items reached a consensus. Based upon the experts' responses, I conclude that the following definition could be appropriate for organic egg production: Hens should be raised under the USDA National Organic Program standards from day two of life and beyond and have access to the outdoors, supplied a diet that has been derived from non-GMO ingredients, and experience zero exposure to chemicals of any kind.

Although the USDA has enforced regulation of organic eggs that bear the USDA Organic shield, there are some third-party organizations and egg brands that bypass USDA regulation. Therefore, other standards have been developed for organic eggs that do not adhere to USDA standards. The definitions established through this study could provide valuable insight to the characteristics that have become critical to organic egg production. Additionally, this study substantiates the potential for industry consensus to be reached on difficult or historically controversial issues. Table 3.3 provides a summary of the definitions for each of the four alternative egg production terms that were created as a result of this study.

Table 3.3. Definitions for Cage-Free, Free-Range, Pasture-Raised, and Organic Egg Production that were Created Using Consensus-Building with Poultry Industry Experts

Alternative Egg Production Term	Definition
Cage-Free	• Hens should have the ability and freedom to roam within a barn or enclosed area that is free of cages and provides nesting boxes and refuge from predators while also promoting hens to act naturally.
Free-Range	• Hens should have access to freely roam on a pasture area or within the borders of a barn and experience minimal to no confinement
Pasture-Raised	• Hens should have year-round access throughout the majority of their life to a minimally confined, regularly rotated pastured that has been planted with rooted vegetation. The hens should also have the freedom to seek refuge from predators or inclement weather through an outdoor hut or open concept barn area.
Organic	• Hens should be raised under the USDA National Organic Program standards from day two of life and beyond and have access to the outdoors, supplied a diet that has been derived from non-GMO ingredients, and experience zero exposure to chemicals of any kind

Discussion, Implications, and Recommendations

Previous research has demonstrated that alternative egg production methods and the resulting terms used to market these products have resulted in consumers deriving conflicting and often inaccurate interpretations (Powers et al., 2020). In particular, Parker and de Costa (2016) reported that consumers have struggled to understand terms used to market eggs such as Cage-Free, Free Range, Pasture-Raised, and Organic. In response, the current investigation used a panel of experts to reach a consensus on the defining characteristics of the aforementioned terms. I also derived empirical-based definitions for these alternative egg production terms. Consequently, this study generated important implications for future research and practice.

First, I recommend that in-depth consumer research be conducted to gather a rich understanding of what consumers desire when purchasing eggs. Understanding the purchasing decisions and factors that fuel concerns and distrust could be critical to the success of the poultry industry (Lusk, 2011). I also recommend that efforts to understand consumer preferences and purchasing decisions be transparent and advertised in a way that promotes inclusivity and care. For example, Ochs et al. (2018) suggested that criticisms from consumers regarding their desire for more knowledge regarding how their food has been produced, should inspire greater transparency from the U.S. egg industry.

I also recommend that a curriculum be developed to educate industry professionals and decision-makers on the differences regarding alternative and traditional egg production practices. Tonsor et al. (2009) explained that consumer confusion has largely been the result of a lack of clear definitions and standards in egg production. By being more open to addressing consumers' concerns, perhaps producers could gain more influence regarding the marketing and communication of alternative egg production approaches.

I also recommend that professional egg industry organizations create targeted campaigns to communicate efficient and clear information regarding the definitions, best practices, and efforts be produce safe, nutritious food in both traditional and alternative egg production. Because the average consumer has minimal knowledge and experience with agriculture but has greater access to information, research has indicated they have become more motivated to learn about their food (Doerfort, 2016; Latiff et al., 2016). Despite this, Borgerson and Shroeder (2002) reported that sources of agricultural information found on the internet had been found to be biased and largely misleading. Consequently, the poultry industry should explore ways to distribute accurate information across various media effectively that can be easily accessible to the general public.

Moving forward, I also recommend that future research devise a robust understanding of the factors that motivate consumers to purchase alternative egg production products such as Cage-Free, Free-Range, Pasture-Raised, and Organic. Perhaps this knowledge could help traditional egg producers to learn new strategies to increase consumer trust and profit margins. Future research should also seek to determine policymaker and legislative perceptions of the alternative egg industry. This effort could help determine the most appropriate and effective approaches to influence policy for the poultry industry.

CHAPTER 4
AN EVALUATION OF U.S. EGG INDUSTRY EXPERTS' PERCEPTIONS OF ALTERNATIVE HOUSING ENVIRONMENTS: A S.W.O.T. ANALYSIS

Introduction and Review of Literature

Many consumers and industry professionals have raised concerns about how laying hens have historically been housed and treated (Zhao et al., 2015). As such, the United States Department of Agriculture (USDA) created labeling guidelines that specify that "eggs labeled as *cage-free* or from *free-roaming hens* are laid by hens that are allowed to roam in a room or open area, which is typically a barn or poultry house" (USDA, 2017, para. 2). Additionally, the USDA specified that hens raised outdoors or that have access to outdoor areas should be considered free-range or pasture-fed (USDA, 2017). In contrast, some egg brands have opted out of traditional USDA production and labeling regulations and developed their own raising standards. However, loosely defined and ambiguous definitions of cage-free and free-range hens have created a level of uncertainty among consumers regarding the ethics associated with various alternative housing options that have emerged in the poultry industry.

This issue has been further compounded by consumers' increased demand for choice in the egg industry, which has led to the development of an array of selections available in the retail egg market (Hisasaga et al., 2020). For example, grocery stores have begun to provide new egg products that champion alternative housing options such as cage-free, free-range, pasture-raised, and organic (Hisasaga et al., 2020). However, existing research has suggested that these niche products lack standards concerning the housing environment in which they have been produced (Lusk, 2019). This trend has resulted in consumer confusion because they struggle to differentiate among the various niche-market terms prevalent in the poultry industry (Lusk, 2019). Despite this, demand for these niche markets has increased in recent years (Hisasaga et

al., 2020). For example, recent evidence has indicated that consumers prefer eggs sourced from alternative housing systems (Heng et al., 2013; Lusk, 2019). However, they also reported a reluctance to pay a premium for specialty eggs (Chang et al., 2010; Powers et al., 2020).

Nevertheless, specialty and designer eggs have been promoted by many brands' marketing campaigns (Hisasaga et al., 2020). Case in point, Pete and Gerry's, Vital Farms, and Organic Valley are all brands that have provided consumers with eggs raised in alternative housing environments in response to the rise in demand for the niche products, which has been viewed as a strategic branding device. Consequently, it was critical to examine how poultry producers have used food labels to effectively brand their products.

Food Labels as Branding Devices

Labels often represent a brand. However, it was not until the 1990s that food branding became popular (Moor, 2007). Since the terms rise, it has been difficult to define branding because of the different meanings and contexts associated with its use. Nevertheless, Moor (2007) suggested that branding could be described "…differently in… different contexts, where it makes use of different forms of representation, different techniques and technologies, and different kinds of relationships for different kinds of strategic purpose[s]" (p. 7). Therefore, brands serve as informational tools and provide clear signals to consumers (Loken et al., 2010). According to Moor (2007), brands also make possible a repetition of information, which can help consumers organize experiences and perceptions strategically. As a result, many brands have begun to monitor consumer activity by embedding cultural values in their campaigns to target audiences' beliefs and behaviors (Moor, 2007).

Previous research has explored how consumers view brands and use them to make decisions (Coelho et al., 2018; Hoeffler & Keller, 2003; Songa & Russo, 2018). For example, using a meta-analytic approach, Hoeffler and Keller (2003) described how modern food

companies have demonstrated that effective branding can positively influence consumers' association with their brand (Hoeffler & Keller, 2003). Further, quality brands can also positively influence consumers' attitudes regarding a company's image, reputation, and ethics (Hoeffler & Keller, 2003). On this point, Coelho et al. (2018) explained that quality brands should be designed to meet consumers' desire to express their values and social desires (Coelho et al., 2018). This concept has been termed *brand personality* and refers to the social dynamics that connect products to the human experience (Martineau, 1958).

For instance, brand personality has been used extensively in the U.S. dairy industry. Although brands like Borden Dairy and Horizon Organic boast of their superior pasteurization, they also decorate their cartons with cartoon renderings of dairy cows (Borden Dairy, n.d.; Horizon, n.d.). As a result of this imagery, many consumers have reported that they have more trust in the dairy industry because they perceived the product was naturally produced (Bergsten et al., 2015; Hernandez-Mendo et al., 2007; White et al., 2002). Consequently, brand personality has become critical for agricultural products (Llanos-Herrera, 2019).

Perhaps this marketing tactic has been successful because many consumers have little to no exposure or interaction with livestock animals. As an illustration, it has been reported that 98% of the modern U.S. population has no direct contact with the agricultural industry (American Farm Bureau Federation, 2018). Therefore, members of the non-agriculture population base their opinions on past life experiences, such as poor farm tour experiences, which has not allowed them to form an accurate perception of agriculture (Duncan & Broyles, 2006). Consumers have reported they gain trust in agricultural products when imagery such as red barns, horse-drawn plows, and scenes of animals grazing on an open field have been used to market products (Bergsten et al., 2015). However, when agricultural companies use terms such

as genetically modified, technology-enhanced, or fortified, consumers' skepticism has been shown to increase significantly (Llanos-Herrera, 2019).

To demonstrate how this concept has been engrained in the U.S. cultural psyche, Specht and Rutherford (2016) used a pastoral lens to examine nine agrarian films. They concluded that between 1950 and 1980, films often portrayed the industry as a "pastoral fantasy" (Specht & Rutherford, 2016, p. 13). They also found that these images and ideas used in the films have led to the public's misperceptions of the agricultural industry (Specht & Rutherford, 2016). Consequently, this misunderstanding has likely hampered consumers' acceptance of modern, practical, and effective farm animal welfare practices (Specht & Rutherford, 2016). This issue appears to have been further exacerbated by the media's portrayal of farm animal welfare.

Media Portrayals of Farm Animal Welfare

Ethical food production and purchasing decisions have been increasingly popular media topics since the early 2000s (Phillipov, 2017). As a result, depictions in the news, broadcast, and social media have become integral to food-related discourse and have acted as mediators for consumers by distributing information, both accurate and misleading, in the public sphere (Gong, 2013). Because transparency in food production has become increasingly important to consumers (Rumble & Irani, 2016), the agricultural industry must consider the opinions of consumers, and communicators have been forced to reexamine ways to effectively communicate with the public (Gellynck et al., 2006).

Media coverage of animal welfare-related legislation, such as *Proposition 2* in California, and undercover videos that reveal the mistreatment of farm animals set the tone for animal welfare and husbandry discussions (Lusk, 2010). Recent examples of this phenomenon include *Proposition 12* in California, which brought about cage-free egg production and *Question Three* in Massachusetts, which passed by 78% of voters in 2016 and required the end of gestation

crates in pork production and battery cages in hen production (Brulliard, 2016; Henderson, 2019). One explanation for why such policies have gained acceptance was that the public had received more exposure to negative images and stories that showcase the inhumane treatment of animals associated with the food animal production process, which has led to the public perception that such practices have become norms in the industry (Sweeney et al., 2022).

Because of these issues, consumers have consistently expressed a desire to understand better how their food has been raised. In response, Tarpley et al. (2020) sought to examine the comfort of young adults while viewing videos of cattle and hog harvesting. Further, the study aimed to describe how these practices elicited discomfort for the participants (Tarpley et al., 2020). The results of this study indicated that increased transparency regarding animal welfare and processes involving animal harvesting could lead to increased negative perceptions of common agricultural practices, especially regarding the farm animal industry (Croney & Reynnells, 2008). Consequently, graphic imagery may be met with great discomfort by the viewing audience (Tarpley et al., 2020). Therefore, it was critical to understand experts' perceptions of the perceived strengths, weaknesses, opportunities, and threats for egg producers to raise laying hens for niche markets. Consequently, this knowledge held the potential to generate important implications for agricultural communications professionals.

Theoretical Framework

This investigation was guided by consensus-building theory (CBT) (Fischer & Ury, 1991). In many organizations and industries, a struggle to agree on basic standards has led to considerable confusion. This phenomenon has been termed idealization (Hoffmann, 2021). In some cases, idealizations can be necessary because many issues present a level of complexity that does not allow practical nor "philosophically interesting" insights (Crowley et al., 2016, p.

353). Further, idealizations allow for the fine-tuning and regulating of discussions with differing perspectives (Feldman & Warfield, 2010). Reasoning and justifiable debates can make positive contributions to real-world issues, but they have become vital to determine the relevance and importance of a disagreement for the greater good (Hoffmann, 2021). From there, idealizations become a point of rationale to achieve the ultimate goal of benefiting consumers. Nevertheless, the question has remained – can professionals in the poultry industry agree on some of the industry's most controversial issues?

Developed by Fischer and Ury (1991), there are four principles of consensus-building. The first is to "separate the people from the problem" (Fischer et al., 1991, p. 11). This concept has been rooted in real problems that have existed within conflicts. The root of a problem can be difficult to determine when individuals react to one another with robust emotions or skewed perceptions. The second principle is to "focus on interests, not positions" (Fischer et al., 1991, p. 11). This concept can be understood by the personal positions that individuals take when disagreeing. However, according to Fischer et al. (1991), when building consensus, the focus should be on satisfying common interests rather than personal views.

The third principle suggests that when facing diverse and opposing opinions, creativity and generating multiple options for potential agreement can help aide in building consensus (Fischer et al., 1991). The final principle of building consensus is insisting that "the result be based on some objective standard" (Fischer et al., 1991, p. 11). This notion "can be countered by insisting that an outcome must reflect some fair standard independent of the naked will of either side. … by discussing such criteria rather than what the parties are willing or unwilling to do, neither party need give in to the other; both can defer to a fair solution" (Fischer et al., 1991, pp.

11-12). It is important to note that all four of these principles involve the development of participants' perspective change on key issues (Hoffmann, 2021).

Statement of Purpose

The purpose of this study was to examine experts' perceptions of the strength, weaknesses, opportunities, and threats (SWOT) of producers raising laying hens for niche markets, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production.

Methodology

I conducted a modified Delphi for this study while also using a SWOT analysis approach to interpret the results. The Delphi approach has been commonly used as a method to forecast the level of uncertainty regarding a topic or problem in the absence of adequate data (Schmelzenbart et al., 2018). Delphi studies also allow researchers to examine the perspectives of experts to refine common responses through monitored feedback (Trevelyan & Robinson, 2015).

SWOT Analysis

Since the early 1950s, SWOT analyses have been used successfully as planning tools by industry professionals and researchers (Panagiotou, 2003). The SWOT approach divides perspective on an issue into categories of internal and external factors – with strengths and weaknesses reflecting internal factors and opportunities and threats representing external factors (Duarte et al., 2006; Valentin, 2001).

The Delphi approach has previously been used in combination with a SWOT analysis framework (Hossain & Hossain, 2015; López, 2004; Rehmat et al., 2014; Schmelzenbart et al., 2018) to guide the collection, analysis, and interpretation of data. SWOT analyses have been used in various contexts and have been considered one of the most practical approaches to analyzing risks, forecasting fluctuating trends, and capturing consequences on polarizing topics

(Chernov et al., 2016; Párraga et al., 2014). Therefore, the SWOT analysis and Delphi method can be mutually beneficial when used simultaneously.

In general, a SWOT analysis aids in decision making while the Delphi approach captures emergent views and their level of importance when considered by experts. Therefore, when implementing a SWOT analysis and the Delphi approach, "evaluations of alternate strategic decisions and the positioning of items can be united and may deliver more robust, reliable, and valuable results" (Schmelzenbart et al., 2018, p. 75).

Instrumentation and Data Collection

To collect data, I used three distinct web-based survey instruments for each individual round of the three-part Delphi study (i.e., each rounds' instrument was unique but representative of the previous rounds' results). All three instruments were developed via Qualtrics. For each of the three rounds, the instrument was distributed to panelists via e-mail. To ensure panelist retention and response rate, I sent three reminder e-mails to non-respondents in five-day increments (Dillman et al., 2014).

The e-mail sent for the first-round included a brief description of the study, information regarding the necessary time commitment and an explanation of research goals, and a link to access the first-round instrument. The first-round instrument included four qualitative items that allowed panelists to provide narrative responses. Because this article was part of a larger study, only the second item of the instrument and demographic data were used in this manuscript. The second item asked participants to list *strengths*, *weaknesses*, *opportunities*, and *threats* related to traditional or non-traditional egg producers' potential to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic.

Reliability and Validity

The determine reliability for a Delphi study, Dalkey et al. (1972) argued that such should be based on the number of panelists included in the study (Dalkey et al., 1972). The Delphi method has been considered reliable if 10 to 15 panelists have been assembled and represent a homogenous group (Dalkey et al., 1972; Dalkey & Helmber, 1963; Delbecq et al., 1975). Based on Dalkey et al. (1972) suggestions for reliability, the number of panelists in all three rounds of this study (n = 12) meet the suggested criteria.

Validity is essential to any research instrument. The application of a three-round Delphi process strengthened the validity of this study (Hasson & Keeney, 2011). In the current study, I focused on content validity of the instruments that were used in this research. Therefore, each instrument was reviewed by an expert agricultural education faculty member at Louisiana State University. Based on the feedback that was provided, I revised the formatting and verbiage of some items and reformatted the instructions to increase comprehension.

Determining Consensus of Agreement

Delphi utilizes both qualitative and quantitative data; therefore, the approach to statistical analyses has primarily been measures of central tendency (Hasson et al., 2000). When determining decision rules for reaching consensus, Hsu and Sandford (2007) suggested that the level of criteria was subject to interpretation. At the most basic level, reaching a consensus on an issue can be determined when a specific number of panelists fall within a certain range (Miller, 2006). For example, Ulschak (1983) recommended that consensus be based on rigorous decision rules by which 80% of panelist responses fall within two categories on a seven-point scale (Ulschak, 1983). In contrast, Green (1982) was more liberal when he argued that researchers

should only have 70% of panelists rate three or higher on a four-point Likert-type scale and garner a mean of at least 3.25.

The decision rules for this study were determined by considering both rigorous and more flexible criteria. For example, I determined that at least 66% of panelists should respond to each Likert-type item on a six-point scale with either *Agree* or *Somewhat Agree* in round two to reach a *consensus of agreement*. Meanwhile, items falling within 50% to 65.9% were retained for reconsideration in round three. Further, items below 50% were discarded from the study.

Data Analysis

Data were analyzed using Microsoft Office Excel® 2021 and IBM® SPSS® Statistics Version 26 software. Nominal data, i.e., some demographic characteristics, were analyzed using frequencies and percentages. For each item in rounds two and three, the frequency distribution validity percentage was used to determine if consensus had been reached, the item should be retained for further consideration, or removed from the study (Buriak & Shinn, 1989; Jenkins & Kitchel, 2009). I achieved this by presenting four open-ended questions in round one. Therefore, the panelists were asked to explain their perspectives on the *strengths, weaknesses, opportunities, and threats* of egg producers to raise laying hens intended for niche markets by current industry definitions for respective alternative housing operations. The four questions that guided data collection in the first round were:

1. Please list or describe what you believe to be the *strengths* of traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic the defining characteristic(s) of a Cage-Free operation.

2. Please list or describe what you believe to be the *weaknesses* of traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic the defining characteristic(s) of a Cage-Free operation.

3. Please list or describe what you believe to be the *opportunities* of traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic the defining characteristic(s) of a Cage-Free operation.

4. Please list or describe what you believe to be the *threats* of traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic the defining characteristic(s) of a Cage-Free operation.

The Delphi approach has been a well-suited process of reaching consensus among a panel of experts (Dalkey, 1969; Dalkey & Helmer, 1963; Linstone & Turoff, 1975). As a result of round one of the Delphi approach, there were 64 items presented via six-point, Likert-type scale in round two by the expert panel (n = 12; 100% response rate) for which more than two-thirds (>66.00%) of the participants selected either *Strongly Agree* or *Somewhat Agree* were considered items that reached consensus (Buriak & Shinn, 1989; Hsu & Sandford, 2007). Additionally, nine items for which less than one-half (50.00%) of the participants selected either *Strongly Agree* or *Somewhat Agree* were removed from the study.

Round three of the study included items presented by the expert panel for which more than one-half (>50.00%) but less than two-thirds (<66.00%) of the panelists selected *Extremely*

Important or *Slightly Important* during round two. In round three, there were 14 items that were presented for reconsideration by the panelists (n = 12; 100% response rate). Panelists were asked to either *Agree* or *Disagree* to the items. As a result, nine items (64.28%) reached a consensus.

The Delphi Panelists

This study's participants were identified using a combination of purposive and snowball sampling. For example, faculty at Louisiana State University first nominated individuals whom they considered to be experts in the poultry industry. Then, we asked the initial participants to nominate additional individuals who fit this investigation's parameters for experts. This approach has been common for Delphi studies because it allows the researcher to approach panelist selection deliberately to gather a richer understanding of the phenomenon (Creswell, 2003; Sedgwick, 2013). The group of panelists who participated in this study included industry professionals in the laying hen sector of the poultry industry. Many of this study's participants fell into one or more of the following categories: university faculty, extension educators, animal welfare specialists, and leaders in professional poultry organizations. For example, one expert represented Cargill, two represented United Egg Producers, and two held positions within the USDA. Additionally, three participants (25%) specified being full-time extension educators within the University of Arkansas extension system, two were full-time university faculty at Purdue University, and one participant reported being an animal welfare consultant. The data was summarized and reported to provide a profile of the study's participants (see Table 4.1).

Table 4.1. The Experts' Personal and Professional Characteristics (n = 12)

Characteristics	*f*	%
Gender		
Male	10	83.33
Female	2	16.67
Age		
25-31	1	8.34
32-40	3	25
41-48	4	33.33
57+	4	33.33
Race/Ethnicity		
White	11	91.67
Black or African American	1	8.33
Highest Educational Degree Earned		
Doctorate	2	16.67
Master's	4	33.33
Bachelor's	6	50
Years of Work Experience		
16 to 20	3	25
21 or more	9	75

Findings

By applying a SWOT analysis framework to capture experts' perceptions of the SWOT of raising laying hens for niche markets, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production, this study collected 25 Strengths, 30 Weaknesses, 21 Opportunities, and 13 Threats during Round one; and 74 (83.15%) items reached consensus after round two (see Table 4.2).

Table 4.2. Items (N = 89) that Emerged from Experts' SWOT Analysis Regarding Producing Laying Hens for Niche Markets, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production

Item	*M*	*SD*	% Agreement
Strengths (*n* = 25)			
Product differentiation.	5.18	0.751	86.3
Non-Traditional/Niche producers (pasture-raised, cage-free, etc.) can target specific market concerns.	5.09	0.944	84.8
Non-Traditional/Niche markets benefit from positive consumer perceptions.	5.00	0.775	83.3
Packaging for non-traditional/Niche eggs is more appealing.	4.91	0.701	81.8
Flexibility to produce variety.	4.91	1.446	81.8
More options for retailers.	4.82	0.874	80.3
Birds can exercise and move more in cage-free systems.	4.82	1.328	80.3
Traditional production allows for daily health and wellbeing inspections.	4.82	0.982	80.3
Animal welfare certifications.	4.73	0.905	78.8
Traditional production methods allow for consistent access to food and water.	4.73	1.421	78.8
Consumer perceptions of the industry are enhanced.	4.64	0.674	77.3
Technical support is improving and increasing.	4.55	0.934	75.8
Markets are growing to meet consumer needs.	4.36	1.433	72.7
Non-traditional/Niche markets provide consumers with more appealing product choices.	4.27	0.905	71.2
Non-Traditional/Niche production allows for higher profit margins.	3.91	1.700	65.1
Marketing claims provide a shield from volatility within commodity markets.	3.82	1.471	63.7
Regional food security of independent farms.	3.64	1.206	60.6
Smaller flock sizes translate to less risk when depopulation and disease are considered.	3.64	2.063	60.6
Non-Traditional/Niche production results in higher job satisfaction of employees.	3.09	1.300	51.5
Non-Traditional/Niche markets have animal welfare standards that could improve welfare standards across the industry.	3.00	1.673	50

(table cont'd)

Item	*M*	*SD*	% Agreement
Non-Traditional/Niche production allows for more environmentally conscious methods.	2.91	1.700	48.5
Less competition in non-traditional/Niche markets than in traditional or conventional markets.	2.91	1.221	48.5
Non-Traditional/Niche production allows less room for consumer criticisms.	2.91	1.514	48.5
Non-Traditional/Niche production methods increase Return on Investment.	2.91	1.044	48.5
Pastured poultry producers can meet consumer needs and demands quicker because of smaller scale production.	2.73	1.618	45.6
Weaknesses (*n* = 30)			
Non-traditional/Niche production requires higher input costs.	5.40	0.843	90
Non-Traditional/Niche production allows for a higher chance for internal parasites.	5.40	0.699	90
Non-traditional/niche housing may expose poultry to more predation.	5.40	0.699	90
Consumers are confused by the terms that are used to identify housing systems and methods of production.	5.40	0.843	90
Non-Traditional/Niche operations use more land but produce less.	5.20	0.789	86.7
Poultry in non-traditional/niche housing systems may experience unintended welfare issues that producers were not aware of.	5.10	1.101	85
Disease mitigation in non-traditional/niche housing is difficult.	5.10	1.287	85
Animal welfare certifications (e.g. Certified Humane) are costly.	5.00	1.247	83.3
Non-Traditional/Niche housing requires a longer payback period on land mortgage.	5.00	1.054	83.3
Non-Traditional/Niche operations produce less but sell for higher prices.	5.00	0.816	83.3
Non-traditional/Niche methods incur higher mortality rates.	4.90	0.876	81.7
Efficiency and environmental controls (e.g. temperature) are more fluid in non-traditional/niche operations.	4.80	1.229	80
Marketing Non-Traditional/Niche eggs can sometimes become too complicated and confusing.	4.70	0.823	78.3

(table cont'd)

Item	*M*	*SD*	% Agreement
Costs often exceed profits for Non-traditional/Niche production.	4.70	0.823	78.3
Non-Traditional/Niche production does not allow for tools and resources (e.g. antibiotics) to help fight disease.	4.70	1.337	78.3
Technical needs are abundant but necessary to improve efficiency of non-traditional/niche production.	4.60	0.843	76.7
Land for pasture is expensive and not easily attainable.	4.60	1.578	76.7
Non-Traditional/Niche production can experience difficulty attaining a viable volume.	4.50	1.716	75
Non-Traditional/Niche production allows consumers to believe that higher welfare standards are in place but if standards are not adhered to, consumers could become disenfranchised.	4.50	0.707	75
Non-Traditional/Niche production poses greater risks than conventional methods.	4.40	1.776	73.3
Egg quality may be compromised in non-traditional/niche operations.	4.40	1.838	73.3
Sourcing materials for non-traditional/niche production is more difficult and more volatile than sourcing for conventional production.	4.20	1.229	70
There is limited control of biosecurity in non-traditional/niche housing.	4.20	1.398	70
There is minimal guidance on non-traditional/niche housing system specifications and their impacts on animal welfare.	4.00	1.247	66.7
Producers of conventional eggs who raise high welfare flocks often incur more expenses.	3.80	1.549	63.3
Non-Traditional/Niche operations experience more poor air quality.	3.70	1.337	61.7
Producer education is minimal and producers of non-traditional/niche eggs have less knowledge about how to properly implement niche production methods.	3.60	1.265	60
There are significant space restrictions for non-traditional/niche operations.	3.50	1.650	58.3
Larger scale non-traditional/niche operations are not feasible because of restrictions and limiting factors.	3.30	1.160	55
Non-Traditional/Niche production allows room for consumers to be unsatisfied with welfare standards because welfare standards vary across production methods.	3.20	1.229	53.3

(table cont'd)

Item	*M*	*SD*	% Agreement
Opportunities (*n* = 21)			
Production and marketing expectations from animal welfare groups should be clear.	5.50	0.707	91.7
Opportunities for distinct marketing can allow for product differentiation.	5.40	0.516	90
Consumer education.	5.30	0.675	88.3
Production and marketing expectations from volume food buyers should be clear.	5.30	0.823	88.3
Production and marketing expectations from consumers of marketing claims should be clear.	5.30	0.823	88.3
Non-traditional/Niche production methods allow for more variety.	5.20	0.789	86.7
Production and marketing expectations from the egg industry should be clear.	5.10	1.287	85
Consumer demands grow niche markets.	4.80	0.789	80
Opportunities for transparency are increasing in traditional production.	4.80	1.033	80
Consumers have higher expectations for producers to "live up to" their marketing claims.	4.80	0.632	80
Traditional production methods create equal access to high quality protein for lower socioeconomic households.	4.80	1.687	80
Industry collaboration to create universal standards for all methods of raising.	4.70	1.829	78.3
Locally grown and marketed eggs increase sales at farmers markets.	4.60	0.843	76.7
Opportunities for producers to increase moral integrity.	4.40	0.966	73.3
Professional development for producers.	4.30	0.949	71.7
Niche egg products meet consumer demands.	4.20	1.135	70
Small-scale operations increase profitability.	3.60	1.265	60
Organic and pasture-raised markets are less restrictive and easier to enter.	3.20	1.687	53.3
Non-traditional/Niche market eggs increase opportunities for global sales.	3.00	1.054	50
Label claims should be exclusive to individual production methods (i.e. labels should include what a product "does not" consist of).	2.70	1.252	45
Cage-free mandates allow for more interstate commerce.	2.60	1.43	43

(table cont'd)

Item	*M*	*SD*	% Agreement
Threats (*n* = 13)			
Biosecurity and disease outbreaks.	5.50	0.707	91.7
Production costs to maintain label integrity are increasing (e.g. costs of organic grain, costs of land to ensure outdoor access).	5.20	0.632	86.7
Market oversaturation decrease profitability.	5.20	0.632	86.7
Fluctuations in the economy (e.g. prices of feed).	5.20	0.632	86.7
Negative impacts on animal wellbeing if alternative housing systems are not implemented correctly.	5.10	0.738	85
Label accuracy.	5.00	0.667	83.3
Demands and expectations of animal welfare and animal rights organizations.	5.00	1.247	83.3
Industrialization of agriculture will increase consolidation.	4.90	1.197	81.7
Financial insecurity for producers.	4.90	1.197	81.7
Negative consumer perceptions affect acceptability of current raising standards.	4.70	1.252	78.3
Decreasing consumer trust.	4.60	1.174	76.7
Niche marketing does not advertise nutrition.	2.80	1.398	46.7
Industrialization of agriculture is a threat to human health, access to food, and animal welfare.	2.20	1.476	36.7

In round two, at least one-half (50.00%) but less than two-thirds (<66.00%) of experts *Agreed* or *Strongly Agreed* with 14 of the 89 items they were asked to consider (see Table 4.3). In other words, these items did not reach a *consensus of agreement* during round two but met the criteria for reconsideration in round three. To reach a consensus in round three, at least three-fourths (75.00%) of panelists selected *Agree* for each item.

Table 4.3. Items (N = 14) that did not reach Consensus During Round Two and Were Retained for Reconsideration During Round Three Regarding Experts' SWOT Analysis of Producing Laying Hens for Niche Markets, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production

Item	*M*	*SD*	% Agreement in Round Three
Strengths (*n* = 5)			
Marketing claims provide a shield from volatility within commodity markets.	1.83	0.389	91.5
Non-Traditional/Niche production allows for higher profit margins.	1.75	0.452	87.5
Smaller flock sizes translate to less risk when depopulation and disease are considered.	1.67	0.492	83.5
Non-Traditional/Niche markets have animal welfare standards that could improve welfare standards across the industry.	1.58	0.515	79
Non-Traditional/Niche production results in higher job satisfaction of employees.	1.42	0.515	71
Weaknesses (*n* = 6)			
Producers of conventional eggs who raise high welfare flocks often incur more expenses.	1.83	0.389	91.5
Producer education is minimal and producers of non-traditional/niche eggs have less knowledge about how to properly implement niche production methods.	1.83	0.389	91.5
Larger scale non-traditional/niche operations are not feasible because of restrictions and limiting factors.	1.83	0.389	91.5
Non-Traditional/Niche production allows room for consumers to be unsatisfied with welfare standards because welfare standards vary across production methods.	1.67	0.492	83.5
There are significant space restrictions for non-traditional/niche operations.	1.58	0.515	79
Non-Traditional/Niche operations experience more poor air quality.	1.25	0.452	62.5
Opportunities (*n* = 3)			
Small-scale operations increase profitability.	1.42	0.515	71

(table cont'd)

Item	*M*	*SD*	% Agreement in Round Three
Non-traditional/Niche market eggs increase opportunities for global sales.	1.33	0.492	66.5
Organic and pasture-raised markets are less restrictive and easier to enter.	1.25	0.452	62.5

Note: All Threats either reached a consensus in round two or were discarded.

Conclusions

In recent years, the terms used to market shell eggs have confused and overwhelmed consumers (Powers et al., 2020). For example, research has indicated that consumers have become more disconnected from the food they purchase now more than ever before (Doerfert, 2011; Thompson et al., 2011; Zhao et al., 2015). As a result of this disconnect, consumers have been making ill-informed purchasing decisions (Ochs et al., 2018). Therefore, this investigation sought to compare the perspectives of industry experts regarding the strengths, weaknesses, opportunities, and threats for producers raising laying hens for niche markets, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production.

In this study, the experts achieved a consensus on 83 items. Therefore, I concluded that there were multiple strengths, weaknesses, opportunities, and threats for producers to achieve a competitive advantage. These factors could be essential to creating strategies for product labels and the marketing of niche egg products. I also concluded that based upon the expert panelists' perceptions, the potential existed for egg producers to raise laying hens intended for niche markets based on current alternative housing options such as Cage-Free, Free-Range, Pasture-Raised, or Organic Egg Production. Despite this, it should be noted that although strengths and opportunities existed for producers, there were also important weaknesses and threats that should be evaluated and addressed prior to pursuing an alternative egg production approach.

To this point, the experts in this study agreed that 30 weaknesses existed to niche egg production, which was the highest number of items in any category to reach consensus. Therefore, I conclude that if analyzing and comparing the opinions of expert panelists, the SWOT category of *weaknesses* should be critically analyzed prior to strategic planning (Chernov et al., 2016; Párraga et al., 2014). Because the experts reached a consensus that producers of niche eggs generally have less knowledge about how to implement niche production methods properly, I conclude that producer education should be prioritized. Further, because ambiguous definitions of alternative housing terms have persisted as well as a lack of producer education, the experts reached a consensus that marketing niche eggs have become too complicated and confusing. Therefore, I conclude that marketing efforts for niche eggs should be transparent while employing effective product differentiation approaches.

Regarding the emergent *strengths* identified by the expert panelists, I conclude that producers of niche eggs have not effectively targeted consumers' concerns when marketing their products. For example, consumers have become increasingly concerned about the environmental impacts, sustainability efforts, animal welfare-related claims, and other ethically-based product attributes (Nayga, 1999). Despite this, the expert panelist suggested that producers of niche eggs have not effectively addressed these concerns in practice. I also conclude that because niche market eggs typically have packaging that has been considered more appealing, the conventional egg market has become disadvantaged. The primary external factors (Görener et al., 2012; Li et al., 2016; Walsh & Lipinski, 2009; Whittington & Cailluet, 2008) were *opportunities* for niche egg producers, such as flexibility to produce a variety of different products and the ability to provide more options for retailers (e.g., Cage-Free, antibiotic-free, non-GMO). Finally, I conclude that the *threats* that niche egg producers should consider the accuracy of their

information on product labels, financial insecurity, and increasing production costs to maintain label integrity.

Discussion, Implications, and Recommendations

Understanding industry expert perceptions of the experiences of niche market egg producers has become vital. Future efforts to address the *weaknesses* that panelists reached a consensus on should be targeted and specific. Therefore, I recommend that egg companies and brands create formal educational strategies for producers prior to establishing contractual agreements. The majority (70.00%) of experts agreed that producer education has been minimal and producers of niche eggs have less knowledge about how to implement niche production methods properly. Based on this, I recommend that producer education efforts be prioritized. Advocates in the egg industry should also champion the adoption of new legislation and policy to meet the needs of the consumer better as their demands continue to evolve. The experts also agreed (78.3%) that negative consumer perceptions have affected the acceptance of current raising standards. Therefore, I recommend that industry professionals and marketing leadership in poultry organizations develop consumer education strategies that are sophisticated and considerate of consumer distrust.

I also recommend that the poultry industry develop refined strategies for developing and maintaining positive relationships with animal welfare-based organizations. For example, the experts reached a consensus (83.3%) that the demands and expectations of animal welfare and animal rights organizations were a significant *threat*. Therefore, I recommend that the conventional and niche production sectors of the poultry industry collaborate to develop a cohesive and stringent set of regulations and standards for each method of niche egg production. This could aid in the enhancement and development of food labeling policy. Consequently, I

recommend that the poultry industry seek counsel and insight from legislators and policymakers when creating such standards.

The experts suggested that niche eggs' marketing potential and product differentiation were strengths, opportunities, and weaknesses. Therefore, future research should prioritize data collection approaches to support marketing and product differentiation decisions in the niche egg industry. Because marketing has become vital to sales, the tactics used by the niche egg industry should be transparent and concise. Further, I recommend that future research regarding the marketing and branding of niche egg products aim to develop a more profound understanding of consumer preferences.

Another recommendation is that future research use the findings of this investigation to examine these issues with a larger sample size and different populations. Many sectors of the poultry industry could benefit from implementing the Delphi technique to gain insight into experts' perspectives. Therefore, I recommend that future research seek to understand industry, producer, and consumer perspectives on animal welfare-related topics and issues using a Delphi approach. I also recommend that future research evaluate and critique the current producer and consumer education efforts employed by leading organizations in the poultry industry. Conducting research in this manner could allow industry professionals and leaders to determine mutual concerns, needs, and interests. This approach to collaboration and determination of mutuality could lead to the development of education and training efforts, which could help them capitalize on their competitive advantages while also determining the level of transparency that consumers desire.

CHAPTER 5
SUMMARY AND CONCLUSION

Consumers of agricultural products in the U.S. have been frequently faced with deciphering complex food labels. Considering that the average consumer in the U.S. will make roughly 200 to 300 decisions regarding food consumption throughout a week (Wansink & Sobal, 2007), it has become critical to ensure the clarity and transparency of food labels. Previous research has reported a vast array of factors that inspire purchasing decisions (Koutsimanis et al., 2012; Powers et al., 2020). However, in recent years, there has been a significant influx of consumer concerns regarding farm animal welfare (Frewer et al., 2005). Although consumers have indicated high levels of interest and concern, the level of involvement in and knowledge about agriculture has decreased (Doerfert, 2011). Duncan and Broyles (2006) argued that this phenomenon resulted because the general public has had little to no direct involvement in agriculture. Further, members of the non-agriculture population often form opinions and perceptions about agriculture from issues they have seen in the media or past life experiences, such as negative experiences within agritourism (Duncan & Broyles, 2006). As such, consumers have been reported to prefer product packing and food labels that indicate high welfare environments or that suggest their products aim to improve sustainability (Powers et al., 2020).

As a result of consumer demands coupled with an increased desire of consumers to understand food production, processing, and manufacturing processes (Ares et al., 2011; Woodall & Shannon, 2018), a competitive food labeling market has emerged. However, the literature has demonstrated that although some consumers have favored extensive food labeling, most believe that deciphering food labels has become too difficult and confusing (Ares et al., 2011; Borra, 2006; Parker et al., 2019). Capitalizing on consumers' lack of knowledge and uncertainty, third-party organizations have increased marketing and brand development efforts to

emphasize product differentiation to charge a premium for their products. Further, existing food labeling policies have loopholes that allow food manufacturers to mislead U.S. consumers (Nestle, 2018). For the laying hen sector of the poultry industry, this problem has fueled confusion regarding terms such as cage-free, free-range, pasture-raised, and organic egg production. Consequently, this investigation sought to develop operational definitions for standard egg labeling terms that have been perceived as confusing and ambiguous in the marketing of eggs.

Summary

Chapter 3, *Experts' Views on Poorly-Understood Terms used to Market Poultry Eggs: Defining Cage-Free, Free-Range, Pasture-Raised, and Organic Egg Production***,** analyzed experts' perceptions regarding confusing terms used to describe alternative egg production using consensus-building theory (CBT). As a result of my analysis of the experts' views, I found that they reported that significant variance existed regarding the use terms and definitions that have been designed to inform consumers of the standards in place for cage-free, free-range, pasture-raised, and organic eggs. The experts also reported varying degrees of competition by conventional and niche sectors of the egg market that have stifled critical progress. Additionally, I found that the experts perceived that the labels that have been used in recent years have demonstrated embellished nutritional information, appear ambiguous, and can be interpreted in multiple ways. Nevertheless, through a modified Delphi approach, I was able to determine that a *consensus of agreement* emerged regarding the definition of common egg labeling terms.

In recent years, animal welfare-related product attributes have been a point of contention among consumers (Lusk & Norwood, 2018). This issue has surfaced due to a lack of industry-wide consensus for common egg labeling terms. Therefore, third-party labeling organizations

have capitalized on consumers' declining knowledge and increasing investment in farm animal welfare (Powers et al., 2020). Consequently, the results from this investigation provided operational definitions for commonly misunderstood egg labeling terms and demonstrated that industry professionals could reach a *consensus of agreement* on polarizing topics. Although this analysis rendered positive results, it was also critical to note that varying degrees of consensus was reached on a broad spectrum of items.

Chapter 4, *An Evaluation of U.S. Egg Industry Experts' Perceptions of Alternative Poultry Egg Production: A SWOT Analysis*, provided a description of how the roots of the present egg labeling problem can be traced to corporate and legal responsibility. To accomplish this, I used a modified Delphi approach while also employing a SWOT analysis as a decision-making framework. As a result, panelists (n = 12) reached a *consensus of agreement* on 74.71% of the items. However, more than one-half of the 87 items that reached a consensus were listed as *weaknesses* or *threats*. This finding was a significant indication of the egg industry's challenges and the factors that prevent the conventional egg market from progressing. In particular, the experts suggested that the U.S. egg industry was divided in regard to the conventional egg market and alternative egg market. For example, the experts suggested that significant differences existed concerning housing techniques, production methods, and animal welfare standards. As such, the marketing and labeling of eggs have become complex.

Regarding consumers, experts agreed that although marketing claims provide a shield from volatility in commodity markets and that product differentiation benefitted some producers' sales. However, they also perceived that consumers had been confused about the terms used to market egg production. Additionally, consensus revealed that consumer and producer education efforts in niche egg markets provided no advantages to the U.S. poultry industry. I also found

that strategies to differentiate products and brands in the egg market should be addressed and revised to better suit consumers' needs.

Chapter 5, *Concerns about Hen Welfare in Poultry Egg Production: Experts' Views on the Unsatisfied Consumer Demands that Could Affect The Marking and Sales of Egg Products*, revealed a substantial list of biological, environmental, and animal welfare-related concerns that the experts perceived contributed to consumers becoming unsatisfied with the laying hen sector of the poultry industry. The list of factors yielded implications for not only the U.S. poultry industry but also egg labeling policy. Historically, food labels have been developed as a result of deficiency. For example, the Meat Inspection Act (1906) and the Pure Food and Drug Act (1906) were both passed and enacted as a result of public outrage regarding unsanitary conditions of meatpacking plants and fears about the contamination of food products.

Although the agricultural industry has made significant technological developments and progress toward improved sustainability, consumer demands drive industry standards. Previous research has indicated that consumers have an increasingly complicated relationship with the food they purchase (Jeong & Lundy, 2017). Further, consumers have reported they are no longer only interested in the taste of food they consume but also in ensuring the product does not negatively impact the environment or society (Briggeman & Lusk, 2011; Unnevehr et al., 2010; Zander & Hamm, 2010). Therefore, the results of this investigation provided evidence that industry and consumer concerns have more parallels than previous literature indicates.

Meta Conclusions and Recommendations

Substantiated by three separate research articles, this study generated three meta-conclusions. The first meta-conclusion was that consensus could be reached among egg industry experts about common labeling-related issues. Consumers have consistently indicated high levels

of concern and distrust for food labels. As such, the results of this investigation revealed that if conducted anonymously and efficiently, industry experts could negotiate controversial issues for the benefit of consumers. For example, I found that although there have been a vast array of terms and standards used to describe niche market eggs, a cohesive and operational definition emerged when the experts were asked to simplify each term's meaning. Perhaps, this notion may not be exclusive to egg production. Therefore, I recommend that this study be replicated within other agricultural industry sectors.

The second major conclusion was a need for greater communication and education about the egg industry. This concept was especially true regarding (1) egg product marketing and branding, (2) producer education, and (3) consumer education. The marketing of food products has historically been difficult and often spurred by health-related issues (e.g., Heart Healthy cereal claims) and dietary restrictions (e.g., Gluten Free). However, modern consumers have indicated more concern for animal welfare and products that contribute positively to the environment and society. As consumer concerns become more targeted, the agricultural industry must approach controversy and criticism with a unified and clear message.

From this analysis, I found that the experts perceived that product differentiation was a *strength* for product marketing and branding. However, many panelists (90%) indicated that consumers had been confused by the terms used to identify housing systems and methods of production. This finding was significant and has not been reported in the existing literature. I also found that because of the perceived quality that niche eggs present to consumers, these markets have the opportunity to meet or exceed consumer expectations. Further, I found that the niche egg market also could capitalize on the opportunity to increase transparency and inspire more confidence in the conventional egg market. Moving forward, I recommend that marketing

firms critically examine product differentiation tactics that could stimulate skepticism among consumers. I also recommend that egg branding strategies include more transparent verbiage, slogans, and graphics.

Finally, I found that the experts perceived that producer and consumer education was minimal in the egg industry. Therefore, I recommend that industry professionals and marketing leadership develop consumer education strategies to overcome consumer distrust. I also found that producers of niche eggs have less knowledge about how to implement niche production methods properly. Based on this finding, I recommend prioritizing producer education efforts as consumer demands evolve.

APPENDIX A
IRB APPROVAL

TO:	Rexanna Powers LSUAG | Admin | Communications
FROM:	Michael Keenan Chair, Institutional Review Board
DATE:	29-Sep-2021
RE:	IRBAG-21-0116
TITLE:	Expert's Consensus of Egg Labeling Terms in the U.S.: A Double Panel Delphi Study
SUBMISSION TYPE:	Initial Application
Review Type:	Exempt
Risk Factor:	Minimal
Review Date:	29-Sep-2021
Status:	Approved
Approval Date:	29-Sep-2021
Approval Expiration Date:	28-Sep-2024
Re-review frequency:	(three years unless otherwise stated)
Number of subjects approved:	60
LSU Proposal Number:	

By: Michael Keenan, Chair

Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.

6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. **SPECIAL NOTE: When emailing more than one recipient, make sure you use bcc. Approvals will automatically be closed by the IRB on the expiration date unless the PI requests a continuation.**

** All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents.*

Mike Keenan O 225-578-1708
209 Knapp Hall
Baton Rouge, LA 70803

O 225-578-1708
F 225-578-4443

APPENDIX B
INFORMED CONSENT

Louisiana State University

J.C. Miller Hall

Baton Rouge, LA 70803

(936) 462 - 3277

rpowers@agcenter.lsu.edu

Expert's Consensus of Egg Labeling Terms in the U.S.: A Double Panel Delphi Study

Directions: Please read this completely. This document is intended to provide you with an overview of the research study, your rights as a participant, and what is expected of you. You may agree or disagree to participate in this research after reading this document. If you have any questions regarding this study, please submit your questions via e-mail to rpowers@agcenter.lsu.edu or contact me by telephone at 936-462-3277.

You are being asked to participate in a Double-Panel Delphi Study which is a systematic approach to a decision-making group, using specific questions in numerous rounds interposed with the respondents' feedback to reach group consensus on a specific theme or themes (Dalkey, 1969). The goal of this study is to establish definitions for common egg labeling terms that are currently marketed in U.S. grocery stores. The specific terms that will be operationally defined by this study have historically been rooted in concerns for on-farm laying hen welfare. However, as food manufacturers continue to attempt to differentiate their products to attract a more label-savvy consumer with increasingly specialized and targeted labeling claims, the risk of crossing the line into misbranding or unlawful deception under any one of the numerous state consumer protection statutes correspondingly increases (Endres & Johnson, 2011). The terms that are sought to be defined in this study are: (a) Cage-Free, (b) Free-Range, (c) Pasture-Raised, and (d) Organic.

You were nominated as a possible participant in this study because you are identified as an experienced professional interested in the on-farm welfare of laying hens and consumer education efforts who fit one (or more) of the following criteria: 1) A producer of either traditional, e.g., battery cages, or non-traditional, e.g., Cage-Free, egg production; 2) A researcher, extension educator, or other professional who has been investigating and/or providing education services to communities, consumers, or corporations regarding on-farm welfare of laying hens; 3) A policy maker, attorney, lobbyist, USDA representative of the laying hen sector of the market, or any government official who has experience with either the traditional or non-traditional sectors of the laying hen industry in the U.S.

PURPOSE:
This study of defining common terms found on egg packages in the U.S. is being conducted through Louisiana State University. The purposes of this study are 1) to describe the perceptions of a select group of U.S. egg and laying hen (traditional or non-traditional production) producers, researchers, extension educators, government officials or other industry professionals regarding the current definitions of common terms that are currently found on egg packing, e.g., (a) Cage-Free, (b) Free-Range, (c) Pasture-Raised, and (d) Organic; 2) to describe similarities and differences that may exist between the perceptions of the participating panelists; and 3) to provide a set of definitions that more accurately represent the respective housing environment of laying hens in order to more effectively inform consumers. Data collection from both panels will be gathered using the Delphi technique.

STUDY PROCEDURES:

What your voluntary involvement requires:
This study will be completed through three online questionnaires. Your participation will take no more than three hours total over a period of about six weeks. You will receive three study links via email, as well as a final summary of the results of the study for your information at conclusion of the study.

How will the study proceed?
The study's starting date is _____. On this day, you will receive an introductory email containing two links, from which you will choose the panel that fits you best based on your experience, e.g., producer, researcher, extension educator, attorney, government official, etc.). After choosing your most suitable panel you will be ready to begin Round One. **We recognize you may have experience suitable for both panels, but ask you to choose the panel most appropriate regarding your past interests and work.**

Round One will include:
1. Terms of participation
2. A summary of topic information
3. Questions about you
4. Four open-ended questions

Round One should take you no more than one hour to complete. The online questionnaire will allow you to save your answers and complete your response later, enabling you to respond without having to address all questions at once. This design will also give you time to think about your answers. The first questionnaire will ask for information such as your sex, age, ethnicity, formal education, current occupation and position, area(s) of specialization within the related industries, and experience in producing, researching, or providing extension services, as appropriate for you.

You will have 10 days to complete Round One. Approximately one week after all Round One answers are analyzed, you will receive a link for Round Two.

Round Two will include:

1. Panelists' responses from Round One
2. This summary of the responses from panelists will be presented in a manner that does not identify or link any answers to individual participants.
3. A set of questions derived from the responses of all panelists for which you will be asked to rate your *level of agreement* using a 6-point Likert type scale: Strongly disagree, Disagree, Slightly disagree, Slightly agree, Agree, and Strongly agree.

You will be asked to return your comments and ratings within 10 days. The estimated completion time for this round is also about one hour.

Approximately one week after the Round Two responses are analyzed, you will be emailed the link for Round Three, as that may be needed.

Round Three will include:

Round Three will emphasize on achieving *consensus of agreement* among the respondents for each panel by requesting you to rate your level of agreement using a 6-point Likert type scale for those items that did not reach consensus of agreement in Round Two.

The estimated completion time for this round is also one hour. There will also be an opportunity to provide any additional comments you may have during this final round of the study.

The entire study period for collection of panelists' responses is likely to last about 45 days.

RISKS OF PARTICIPATION:

This study represents no risk for the participants i.e., psychological, social, legal, or stress risks, greater than what one encounters in everyday life. If at any time you do not wish to continue with the study, you may end your participation without explanation.

BENEFITS OF PARTICIPATION:

Personal benefits are not expected based on your participation in this research study. However, your disposition toward and commitment to offering your expertise for achieving the study's objectives are significant. Your thoughts and comments will provide an important foundation for further clarification of alternative laying hen housing environments and welfare standards. Further, your input regarding the definitions that are established by this study will help guide additional research to shed more light on the animal product food labeling issues in the U.S.

CONFIDENTIALITY:

Your responses and comments for this research study will not include any recognizable information and will be analyzed and summarized as the panels' responses. This

confidential design is meant to assure the participants' anonymity and encourage the sharing of perspectives and opinions.

Participants' information will not be released and will be kept private. As long as the information gathered in this study is useful in a scientific context it will be saved on a password-protected computer kept under lock and key in the researcher's office. The study data will be kept for five years and thereafter destroyed. **This study's results may** be presented in peer-refereed publications and/or at professional meetings. You will not be **individually identified under any circumstances.**

COMPENSATION:

There is no monetary compensation for participating in this research study.

CONTACTS:

If you want to contact any of the researchers, or if you desire to request information about the results of the study and/or discuss your participation, please contact Ms. Rexanna Powers, Ph.D. Candidate, (936) 462-3277, rpowers@agcenter.lsu.edu; or contact Dr. Richie Roberts, 130 J.C. Miller Hall, Department of Agricultural and Extension Education and Evaluation, Louisiana State University, Baton Rouge, LA 70803, (225) 578-7892, roberts3@lsu.edu.

If you have questions about your rights as a research volunteer, you may contact Michael Keenan, LSU AgCenter IRB; 225-578-1708; mkeenan@agcenter.lsu.edu

PARTICIPANTS' RIGHTS:

Your contribution in this research is **voluntary**. There is no consequence for denial to contribute, and you are free to withdraw your participation in the study at any time, without penalty.

If you are willing to participate, the next step is to signify your voluntary agreement by providing the information requested below and providing your responses via the Round One online questionnaire. **Thank you again for participating**. If you have questions, please email me at rpowers@agcenter.lsu.edu.

Thank you very much!

Sincerely,

Rexanna E. Powers
Doctoral Candidate
Louisiana State University

APPENDIX C
INDUSTRY PROFESSIONAL PARTICIPANT RECRUITMENT (PRE-NOTICE) EMAIL MESSAGE

Hello, my name is Rexanna Powers. I am currently a doctoral candidate in agricultural and extension education and evaluation at Louisiana State University.

The reason for this correspondence is to ask you to participate in a study I am conducting involving perceptions of a select group of U.S. egg and laying hen (traditional or non-traditional production) producers, researchers, extension educators, government officials or other industry professionals regarding the current definitions of common terms that are currently found on egg packaging, e.g., (a) Cage-Free, (b) Free-Range, (c) Pasture-Raised, and (d) Organic. Ultimately, the goal of this study is to determine what differences exist between producer and industry perspectives and to establish operational definitions for the aforementioned egg labeling terms.

You have been identified as a potential **Industry Professional** panelist because of your experience and that you are interested in the on-farm welfare of laying hens and consumer education efforts. Further, you are one or more of the following: 1) A researcher, extension educator, or other professional who has been investigating and/or providing education services to communities, consumers, or corporations regarding on-farm welfare of laying hens; 2) A policy maker, attorney, lobbyist, USDA representative of the laying hen sector of the market; 3) Any government official who has experience with either the traditional or non-traditional sectors of the laying hen industry in the U.S.

While strictly voluntary, your participation in this study will require you to complete three questionnaires over the next 45 days. Your responses will be kept anonymous but will be used to understand the industry perspectives of egg production and on-farm welfare standards. Therefore, you will be asked to identify strengths, weaknesses, opportunities, and threats within the U.S. egg industry with regard to on-farm welfare. When laying hens and shell eggs are considered, there are a variety of alternative housing systems that currently lack concrete definition that is industry-accepted. Therefore, your participation and perspectives will allow the researcher to compare responses of producers and industry professionals for the purpose of coming to consensus.

Thank you for considering this invitation. Will you agree to serve as panelist for this study? If you are willing to participate, you will receive an email message from me with instructions regarding the study's Round One questionnaire. Even if you choose to not participate in the study, I thank you sincerely for reading my email message and for your support of the U.S. egg sector of the agriculture industry.

Thank you for your time!
Rexanna Powers
Doctoral candidate
Louisiana State University

APPENDIX D
INDUSTRY PROFESSIONAL ROUND ONE INSTRUMENT

Industry Delphi Round 1

Start of Block: Block 1

Background/Context
Title: Expert's Consensus of Egg Labeling Terms in the U.S.: A Double Panel Delphi Study

Investigators: Rexanna Powers, Ph.D. Student; Dr. Richie Roberts, Assistant Professor.

The purpose of this investigation is to determine differences among an array of industry and producer perspectives within the laying hen sector of the poultry industry as they relate to on-farm raising standards of conventional and alternative housing methods. In addition, this study aims to conjoin industry and producer perspectives for the following purposes: Establishing operational definitions for the following terms: (a) Cage-Free, (b) Free-Range, (c) Pasture-Raised, and (d) Organic; 2) to describe similarities and differences that may exist between the perceptions of the participating panelists; and 3) to provide a set of definitions that more accurately represent the respective housing environment of laying hens in order to more effectively inform consumers.

By participating in this study, you are providing your consent and allowing the researchers to examine your views. There are no more than minimal risks associated with this research study. There is no penalty for not participating, and there will be no compensation for your participation. For any general questions concerning this research study, please contact Rexanna Powers via email at: rpowers@agcenter.lsu.edu. If you have questions about subjects' rights or other concerns, you may contact Michael Keenan, LSU AgCenter Institutional Review Board, at MKeenan@agcenter.lsu.edu. Thank you, again.

Your time is very much appreciated!

Operational Terms and Definitions
Traditional Egg Production – For the purpose of this study, traditional egg production is defined as the use of battery cages as the primary housing system.

Non-Traditional – For the purpose of this study, non-traditional egg production is defined as any alternative housing environment that does not involve the use of battery cages. For example, cage-free, free-range, pasture-raised, aviary, etc.

Q4 The researcher has identified no apparent risk to participants beyond that experienced in daily life. Responses will remain anonymous throughout the study. Do you agree to participate in the following study?

- ○ Yes. (1)
- ○ No. (2)

End of Block: Block 1

Start of Block: Block 6

Q22 Please type the 4-digit participant ID number that you have been provided by the researcher:

_____

End of Block: Block 6

Start of Block: Default Question Block

Please provide your response to the following questions.

Q5 Which traditional or non-traditional egg production methods may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns for laying hen welfare?

Please list as many laying hen welfare concerns and their production methods as you deem necessary for the context of this study.

_____

_____

_____

_____

_____

End of Block: Default Question Block

Start of Block: Block 2

Q11 This section of the survey will include the S.W.O.T analysis. As they relate to the following question, please list Strengths, Weaknesses, Opportunities, and Threats in their respective boxes.

Q6 What is the potential for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic?

Please include any strengths, weaknesses, opportunities, and threats to producing for niche markets that should be considered by aspiring producers, especially non-traditional egg producers, such as resource input needs, technical needs including education and training, innovation concerns, animal welfare standards, etc.

Q7 Please list Strengths here:

_____

_____

_____

_____

_____

Q8 Please list Weaknesses here:

_____

_____

_____

_____

_____

Q9 Please list Opportunities here:

_____

_____

_____

_____

_____

Q10 Please list Threats here:

_____

_____

_____

_____

_____

End of Block: Block 2

Start of Block: Block 3

Q12 Concerning current egg branding, marketing and labeling criteria in the U.S., what is needed by producers of traditional or non-traditional eggs to properly adhere to laying hen welfare standards of respective alternative housing environments, e.g. Cage-Free, Free-Range, Pasture-Raised, or Organic?

Please include as many ideas as you may have or deem appropriate.

_____

_____

_____

_____

_____

End of Block: Block 3

Start of Block: Block 7

Q23 Regardless of your production preferences or experience, we are interested in your perspectives and insight on the defining characteristics of laying hen housing environments.

For each of the following prompts, please list or describe the defining characteristics of each housing environment as they pertain to laying hens.

Q24 Please list or describe what you believe to be the defining characteristic(s) of a Cage-Free operation:

_____

Q25 Please list or describe what you believe to be the defining characteristic(s) of a Free-Range operation:

_____

Q26 Please list or describe what you believe to be the defining characteristic(s) of a Pasture-Raised operation:

_____

Q27 Please list or describe what you believe to be the defining characteristic(s) of an Organic operation:

_____

End of Block: Block 7

Start of Block: Block 4

Q13 Please list any other thoughts, concerns, or ideas you may have about traditional or non-traditional egg production, current on-farm welfare topics, or egg labeling regulations.

_____

_____

_____

_____

_____

End of Block: Block 4

Start of Block: Block 5

Q15 What is your age?

- 18-24 (6)
- 25-31 (7)
- 32-40 (8)
- 41-48 (9)
- 49-56 (10)
- 57+ (11)

Q16 What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Other (3)

Q17 What is your racial or ethnic background?

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

Q18 In which state do you currently reside?

▼ Alabama (1) ... I do not reside in the United States (53)

Q19 What is the population of your community of residence?

- Less than 5,000 (1)
- Greater than 5,000 (2)
- Less than 20,000 (3)
- Greater than 20,000 (4)

End of Block: Block 5

APPENDIX E
INDUSTRY PROFESSIONAL ROUND TWO INSTRUMENT

Industry Delphi Round 2

Start of Block: Default Question Block

Directions: In Round One, you were asked to (1) identify traditional or non-traditional egg production methods may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns for laying hen welfare; (2) identify the strengths, weaknesses, opportunities, and threats (SWOT) for the potential for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic; and (3) identify what is needed by producers of traditional or non-traditional eggs to properly adhere to laying hen welfare standards of respective alternative housing environments, e.g. Cage-Free, Free-Range, Pasture-Raised, or Organic when current egg branding, marketing and labeling criteria in the U.S. are concerned.

Below is a list of 170 items (statements) *representing your views and that of other experts regarding egg production and labeling in the U.S.* Please read the statements and indicate your level of agreement for each. Note. The statements are in no particular order.

A 6-point, Likert-type scale is provided for you to indicate your level of agreement with each statement: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree 5 = Agree, 6 = Strongly Agree.

Please use the final section to offer any additional thoughts or comments you may have about a particular item or statement. Space is also provided at the end of the instrument for you to share any additional thoughts, ideas, and/or concerns that may have been overlooked in Round One.

After you have responded to all the statements, please click the submit button located at the end of the questionnaire. If you have any questions regarding this study, please e-mail me at rpowers@agcenter.lsu.edu

End of Block: Default Question Block

Start of Block: Block 2

Q4 The researcher has identified no apparent risk to participants beyond that experienced in daily life. Responses will remain anonymous throughout the study. Do you agree to participate in the following study?

- ○ Yes. (1)
- ○ No. (2)

Skip To: End of Survey If The researcher has identified no apparent risk to participants beyond that experienced in daily l... = No.

Q22 Please type the 4-digit participant ID number that you have been provided by the researcher:

_____

End of Block: Block 2

Start of Block: Block 2

Q6 The following statements are a collective representation of panelist responses from survey #1 of this study.

Please indicate your level of agreement or disagreement with each of the statements below.

Q5 Which traditional or non-traditional egg production methods may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns for laying hen welfare?

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Intense Confinement. (1)	○	○	○	○	○	○
Battery Cages. (2)	○	○	○	○	○	○
Beak Trimming. (3)	○	○	○	○	○	○
Interflock Cannibalism. (4)	○	○	○	○	○	○
Organic Egg Production. (5)	○	○	○	○	○	○
Vegetarian Poultry Diets. (6)	○	○	○	○	○	○
Depopulation. (7)	○	○	○	○	○	○
Painful Procedures. (8)	○	○	○	○	○	○
Feed Withdrawals. (9)	○	○	○	○	○	○
Molting. (10)	○	○	○	○	○	○
Male Chick Culling. (11)	○	○	○	○	○	○
No Access to the Outdoors. (12)	○	○	○	○	○	○
Aviary Housing. (13)	○	○	○	○	○	○
Inability to Express Normal Behaviors. (14)	○	○	○	○	○	○
Unnatural Environments. (15)	○	○	○	○	○	○
Disease Control. (16)	○	○	○	○	○	○

Lack of Empathy from Producers. (17)	○	○	○	○	○	○
Environmental Comfort. (18)	○	○	○	○	○	○
Cage-Free Housing Systems. (19)	○	○	○	○	○	○
Feather Pecking. (20)	○	○	○	○	○	○
Physical Alterations to Poultry. (21)	○	○	○	○	○	○
Air Quality/Ventilation (e.g. dust, ammonia, etc.) (22)	○	○	○	○	○	○
Foot Health of Poultry (23)	○	○	○	○	○	○
Limited Retreat from Predators. (24)	○	○	○	○	○	○
Higher Levels of Stress. (25)	○	○	○	○	○	○
Unstable Social Interactions within a Flock. (26)	○	○	○	○	○	○
Insect and Pest Maintenance. (27)	○	○	○	○	○	○
Respiratory Health of a Flock. (28)	○	○	○	○	○	○

End of Block: Block 2

Start of Block: Block 3

Q10 The following items are a collective representation of panelist responses from survey #1 to the following prompt:

"What is the potential for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic.

Please indicate your level of agreement or disagreement with each of the following items as they are listed as **Strengths, Weaknesses, Opportunities, and Threats."**

Q11 The following statements were indicated in the previous survey's responses as strengths for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic. Please indicate your level of agreement or disagreement to each of the following items.

Q12 **Strengths:**

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Regional food security of independent farms. (1)	○	○	○	○	○	○
Pastured poultry producers can meet consumer needs and demands quicker because of smaller scale production. (2)	○	○	○	○	○	○
Non-traditional/niche producers (pasture-raised, cage-free, etc.) can target specific market concerns. (3)	○	○	○	○	○	○
Product differentiation. (4)	○	○	○	○	○	○
Packaging for non-traditional/niche eggs is more appealing. (5)	○	○	○	○	○	○
More options for retailers. (6)	○	○	○	○	○	○
Marketing claims provide a shield from volatility within commodity markets. (7)	○	○	○	○	○	○
Consumer perceptions of the industry are enhanced. (8)	○	○	○	○	○	○
Animal welfare certifications. (9)	○	○	○	○	○	○

Smaller flock sizes translate to less risk when depopulation and disease are considered. (10)	○	○	○	○	○	○
Flexibility to produce variety. (11)	○	○	○	○	○	○
Non-Traditional/niche production allows for more environmentally conscious methods. (12)	○	○	○	○	○	○
Non-Traditional/niche production allows for higher profit margins. (13)	○	○	○	○	○	○
Non-Traditional/niche production results in higher job satisfaction of employees. (14)	○	○	○	○	○	○
Less competition in non-traditional/niche markets than in traditional or conventional markets. (15)	○	○	○	○	○	○
Non-traditional/niche markets provide consumers with more appealing product choices. (16)	○	○	○	○	○	○

Non-Traditional/niche markets have animal welfare standards that could improve welfare standards across the industry. (17)	○	○	○	○	○	○
Non-Traditional/niche production allows less room for consumer criticisms. (18)	○	○	○	○	○	○
Birds can exercise and move more in cage-free systems. (19)	○	○	○	○	○	○
Non-Traditional/niche production methods increase Return on Investment. (20)	○	○	○	○	○	○
Traditional production methods allow for consistent access to food and water. (21)	○	○	○	○	○	○
Traditional production allows for daily health and well-being inspections. (22)	○	○	○	○	○	○
Technical support is improving and increasing. (23)	○	○	○	○	○	○
Markets are growing to meet consumer needs. (24)	○	○	○	○	○	○

Non-Traditional/niche markets benefit from positive consumer perceptions. (25)	○	○	○	○	○	○

Page Break

Q13 The following statements were indicated in the previous survey's responses as weaknesses regarding traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic. . Please indicate your level of agreement or disagreement to each of the following items.

Q14 **Weaknesses:**

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Producers of conventional eggs who raise high welfare flocks often incur more expenses. (1)	○	○	○	○	○	○
Animal welfare certifications (e.g. Certified Humane) are costly. (2)	○	○	○	○	○	○
Marketing Non-Traditional/niche eggs can sometimes become too complicated and confusing. (3)	○	○	○	○	○	○
Non-Traditional/niche production can experience difficulty attaining a viable volume. (4)	○	○	○	○	○	○
Costs often exceed profits for Non-traditional/Niche production. (5)	○	○	○	○	○	○
Technical needs are abundant but necessary to improve efficiency of non-traditional/niche production. (6)	○	○	○	○	○	○
Non-traditional/niche production requires higher input costs. (7)	○	○	○	○	○	○

Non-Traditional/niche housing requires a longer payback period on land mortgage. (8)	○	○	○	○	○	○
Non-Traditional/niche production does not allow for tools and resources (e.g. antibiotics) to help fight disease. (9)	○	○	○	○	○	○
Land for pasture is expensive and not easily attainable. (10)	○	○	○	○	○	○
Non-Traditional/niche production allows for a higher chance for internal parasites. (11)	○	○	○	○	○	○
Non-Traditional/niche production poses greater risks than conventional methods. (12)	○	○	○	○	○	○
Non-Traditional/niche production allows consumers to be unsatisfied with welfare standards because welfare standards vary across production methods. (13)	○	○	○	○	○	○

Non-Traditional/niche production allows consumers to believe that higher welfare standards are in place but if standards are not adhered to, consumers could become disenfranchised. (14)	○	○	○	○	○	○
Producer education is minimal and producers of non-traditional/niche eggs have less knowledge about how to properly implement niche production methods. (15)	○	○	○	○	○	○
Sourcing materials for non-traditional/niche production is more difficult and volatile than sourcing for conventional production. (16)	○	○	○	○	○	○
There is minimal guidance on non-traditional/niche housing system specifications and their impacts on animal welfare. (17)	○	○	○	○	○	○

Poultry in non-traditional/niche housing systems may experience unintended welfare issues that producers were not aware of. (18)	○	○	○	○	○	○
There are significant space restrictions for non-traditional/niche poultry housing operations. (19)	○	○	○	○	○	○
Larger scale non-traditional/niche housing operations are not feasible because of restrictions and limiting factors. (20)	○	○	○	○	○	○
There is limited control of biosecurity in non-traditional/niche housing. (21)	○	○	○	○	○	○
Disease mitigation in non-traditional/niche housing is difficult. (22)	○	○	○	○	○	○
Non-traditional/niche housing may expose poultry to more predation. (23)	○	○	○	○	○	○
Egg quality may be compromised in non-traditional/niche operations. (24)	○	○	○	○	○	○

Efficiency and environmental controls (e.g. temperature) are more fluid in non-traditional/niche operations. (25)	○	○	○	○	○	○
Consumers are confused by the terms that are used to identify housing systems and methods of production. (26)	○	○	○	○	○	○
Non-traditional/niche methods incur higher mortality rates. (27)	○	○	○	○	○	○
Non-Traditional/niche operations experience more poor air quality. (28)	○	○	○	○	○	○
Non-Traditional/niche operations use more land but produce less. (29)	○	○	○	○	○	○
Non-Traditional/niche operations produce less but sell for higher prices. (30)	○	○	○	○	○	○

Page Break

Q15 The following statements were indicated in the previous survey's responses as Opportunities for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic.

Please indicate your level of agreement or disagreement to each of the following items.

Page Break

Q16 **Opportunities:**

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Consumer education. (1)	○	○	○	○	○	○
Consumer demands grow niche markets. (2)	○	○	○	○	○	○
Opportunities for transparency are increasing in traditional production. (3)	○	○	○	○	○	○
Consumers have higher expectations for producers to "live up to" their marketing claims. (4)	○	○	○	○	○	○
Opportunities for distinct marketing can allow for product differentiation. (5)	○	○	○	○	○	○
Opportunities for producers to increase moral integrity. (6)	○	○	○	○	○	○
Professional development for producers. (7)	○	○	○	○	○	○
Small-scale operations increase profitability. (8)	○	○	○	○	○	○
Organic and pasture-raised markets are less restrictive and easier to enter. (9)	○	○	○	○	○	○

Cage-free mandates allow for more interstate commerce. (10)	○	○	○	○	○	○
Niche egg products meet consumer demands. (11)	○	○	○	○	○	○
Non-traditional/niche market eggs increase opportunities for global sales. (12)	○	○	○	○	○	○
Locally grown and marketed eggs increase sales at farmers markets. (13)	○	○	○	○	○	○
Production and marketing expectations from the egg industry should be clear. (14)	○	○	○	○	○	○
Production and marketing expectations from animal welfare groups should be clear. (15)	○	○	○	○	○	○
Production and marketing expectations from volume food buyers should be clear. (16)	○	○	○	○	○	○
Production and marketing expectations from consumers of marketing claims should be clear. (17)	○	○	○	○	○	○

Label claims should be exclusive to individual production methods (i.e., labels should include what a product "does not" consist of). (18)	○	○	○	○	○	○
Non-traditional/niche production methods allow for more variety. (19)	○	○	○	○	○	○
Traditional production methods create equal access to high quality protein for lower socioeconomic households. (20)	○	○	○	○	○	○
Industry collaboration to create universal standards for all methods of raising. (21)	○	○	○	○	○	○

Q17 The following statements were indicated in the previous survey's responses as threats regarding traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic. Please indicate your level of agreement or disagreement to each of the following items.

Q18 **Threats:**

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Industrialization of agriculture is a threat to human health, access to food, and animal welfare. (1)	○	○	○	○	○	○
Industrialization of agriculture will increase consolidation. (2)	○	○	○	○	○	○
Niche marketing does not advertise nutrition. (3)	○	○	○	○	○	○
Label accuracy. (4)	○	○	○	○	○	○
Financial insecurity for producers. (5)	○	○	○	○	○	○
Negative impacts on animal wellbeing if alternative housing systems are not implemented correctly. (6)	○	○	○	○	○	○
Production costs to maintain label integrity are increasing (e.g. costs of organic grain, costs of land to ensure outdoor access). (7)	○	○	○	○	○	○

Negative consumer perceptions affect acceptability of current egg production standards. (8)	○	○	○	○	○	○
Market oversaturation could decrease profitability. (9)	○	○	○	○	○	○
Demands and expectations of animal welfare and animal rights organizations. (10)	○	○	○	○	○	○
Fluctuations in the economy (e.g., prices of feed). (11)	○	○	○	○	○	○
Biosecurity and disease outbreaks. (12)	○	○	○	○	○	○
Decreasing consumer trust. (13)	○	○	○	○	○	○

End of Block: Block 3

Start of Block: Block 4

Q19 The following items are a collective representation of panelist responses to the following prompt from survey #1:

"Concerning current egg branding, marketing and labeling criteria in the U.S., what is needed by producers of traditional or non-traditional eggs to properly adhere to laying hen welfare standards of respective alternative housing environments, e.g. Cage-Free, Free-Range, Pasture-Raised, or Organic?"

Q20 Please indicate your level of agreement or disagreement with each of the following statements:

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Quality producer education leads to more effective consumer education. (1)	○	○	○	○	○	○
More clear definitions of alternative housing systems. (2)	○	○	○	○	○	○
Less overlap amongst alternative production systems. (3)	○	○	○	○	○	○
Provide clear outlines of inputs, labor, and standards. (4)	○	○	○	○	○	○
Producers need the motivation to produce according to the standards of the housing system of their choice. (5)	○	○	○	○	○	○
Comprehensive and consistent audits. (6)	○	○	○	○	○	○
Verification of label claims. (7)	○	○	○	○	○	○
Third-party (e.g. Certified Humane) certification to prevent fraudulent label claims. (8)	○	○	○	○	○	○

Proper labeling that clearly indicates production methods. (9)	○	○	○	○	○	○
Packaging and graphic design that appeals to younger consumers. (10)	○	○	○	○	○	○
Packaging should indicate add-ons (e.g. square footage, outdoor access, nutritional additives). (11)	○	○	○	○	○	○
Producers and industry leaders should approach labeling their eggs with more honesty and use less misleading claims (e.g. hormones are not given to chickens, therefore, eggs should not be labeled are hormone-free). (12)	○	○	○	○	○	○
Producers need knowledge of differing production systems. (13)	○	○	○	○	○	○
Producers need knowledge of certifier standards. (14)	○	○	○	○	○	○
Producers need knowledge of market needs. (15)	○	○	○	○	○	○

End of Block: Block 4

Start of Block: Block 5

Q21 The following items are a collective representation of panelist responses from survey #1 and the following prompt:

"Regardless of your production preferences or experience, we are interested in your perspectives and insight on the defining characteristics of laying hen housing environments. Please list or describe what you believe to be the defining characteristic(s) of _____ housing system."

Q22 The following items were identified as defining characteristics for a **Cage-Free housing system**.

Please indicate levels of importance for each of the following items:

	Not Important at All (1)	Slightly Important (2)	Extremely Important (3)
Raised floor. (1)	○	○	○
Confinement. (2)	○	○	○
No Cages. (3)	○	○	○
Conventional Feed. (4)	○	○	○
No Access to Outdoors. (5)	○	○	○
Hens can roam vertically and horizontally. (6)	○	○	○
Environment allows for natural behaviors. (7)	○	○	○
Freedom of movement within a barn. (8)	○	○	○
Nest Boxes. (9)	○	○	○
Scratch Pads. (10)	○	○	○
Laying hens should be confined similarly to broilers. (11)	○	○	○

Page Break

Q23 The following items were identified as defining characteristics for a **Free-Range housing system**.

Please indicate levels of importance for each of the following items:

	Not Important at All (1)	Slightly Important (2)	Extremely Important (3)
Confinement. (1)	○	○	○
Minimal access to range. (2)	○	○	○
Free access to outdoors with no confinement. (3)	○	○	○
Birds have access to indoors and outdoors. (4)	○	○	○
Eggs laid by hens that have some access to the outdoors. (5)	○	○	○
Limited outdoor access. (6)	○	○	○
Freedom to roam in a spacious housing system. (7)	○	○	○
Hens have access to pasture. (8)	○	○	○

Page Break

Q24 The following items were identified as defining characteristics for a **Pasture-Raised housing system**.

Please indicate levels of importance for each of the following items:

	Not Important at All (1)	Slightly Important (2)	Extremely Important (3)
Hens are raised on pasture for majority of their life. (1)	○	○	○
Pasture is rooted vegetation (e.g. plants, not just grass). (2)	○	○	○
Flock is rotated so pasture remains fresh. (3)	○	○	○
Access to pasture area. (4)	○	○	○
Pasture must have huts to act as shelter. (5)	○	○	○
Hens are not fed grains (i.e. feed) and forage on grass and bugs. (6)	○	○	○
Eggs laid by hens with access to the outdoors. (7)	○	○	○
Freedom of movement within a confined outdoor area. (8)	○	○	○
Mobile houses on an outdoor range. (9)	○	○	○
Hens have access to pasture where grass is available. (10)	○	○	○
The same characteristics as Free-Range. (11)	○	○	○
Access to pasture year-round. (12)	○	○	○
Grass. (13)	○	○	○

Q25 The following items were identified as defining characteristics for a **Organic housing system**.

Please indicate levels of importance for each of the following items:

	Not Important at All (1)	Slightly Important (2)	Extremely Important (3)
Non-GMO feed ingredients. (1)	○	○	○
No exposure to chemicals of any kind. (2)	○	○	○
Organic standards for feed are followed. (3)	○	○	○
Access to the outdoors. (4)	○	○	○
Organic standards for raising are followed after two days of life. (5)	○	○	○
Adherence to the USDA's National Organic Program standards. (6)	○	○	○
Hens are fed a grain-only diet. (7)	○	○	○

End of Block: Block 5

Start of Block: Block 6

Q26 Please list any additional concerns or comments here:

_____

_____

_____

_____

_____

End of Block: Block 6

APPENDIX F
INDUSTRY PROFESSIONAL ROUND THREE INSTRUMENT

Delphi Survey 3

Start of Block: Default Question Block

Thank you again for your time and involvement in this study!

Directions: In Round Two, your level of agreement was indicated for 170 items related to laying hen welfare standards of respective alternative housing environments, e.g. Cage-Free, Free-Range, Pasture-Raised, or Organic when current egg branding, marketing and labeling criteria in the U.S. are concerned.

Based on your feedback, 115 items reached consensus of agreement: More than three-fourths of the panel chose Agree (5) or Strongly Agree (6) for these items.

In Round Three, we are asking you to indicate your level of agreement for the 35 items that less than two-thirds (66%) of the panel selected Agree (5) or Strongly Agree (6) during Round Two. The percentages of panelists who indicated Agree (5) or Strongly Agree (6) for the 55 items are provided for your consideration.

In this third round, please indicate either Agree or Disagree regarding whether the item should be added to the list of those reaching consensus of agreement in Round Two. The opportunity to offer comments explaining your view is available for each item in the far righthand column, and space for additional comments overall is provided at the end of the questionnaire.

After you have responded to all the statements, please click the submit button located at the end of the questionnaire. If you have any questions regarding this study, please e-mail me at rpowers@agcenter.lsu.edu

Page Break

Q4 The researcher has identified no apparent risk to participants beyond that experienced in daily life. Responses will remain anonymous throughout the study. Do you agree to participate in the following study?

- ○ Yes. (1)
- ○ No. (2)

Q22 Please type the 4-digit participant ID number that you have been provided by the researcher:

_____

End of Block: Default Question Block

Start of Block: Block 1

Q6 The following statements are a collective representation of panelist responses from survey #2 of this study that less than two-thirds (66%) but more than one half of the panel selected Agree (5) or Strongly Agree (6) during Round Two. The percentages of panelists who indicated Agree (5) or Strongly Agree (6) for the 15 items are provided for your consideration.

Please indicate either Agree or Disagree regarding whether the item should be added to the list of those reaching consensus of agreement in Round Two.

The opportunity to offer comments explaining your view is available for each item, and space for additional comments overall is provided at the end of the questionnaire.

Q5 Which traditional or non-traditional egg production methods may reflect an unsatisfied consumer demand and have the potential for contributing to consumer concerns for laying hen welfare?

	Disagree (1)	Agree (2)	Click to write Scale Point 3 (3)
Molting. (1)	○	○	○
No Access to the Outdoors. (2)	○	○	○
Disease Control. (3)	○	○	○
Environmental Comfort. (4)	○	○	○
Feather Pecking. (5)	○	○	○
Air Quality/Ventilation (e.g. dust, ammonia, etc.) (6)	○	○	○
Foot Health of Poultry (7)	○	○	○
Limited Retreat from Predators. (8)	○	○	○
Unstable Social Interactions within a Flock. (9)	○	○	○
Insect and Pest Maintenance. (10)	○	○	○
Respiratory Health of a Flock. (11)	○	○	○

Q24 For any of the items you Disagree with above, please feel free to list any concerns or justifications for your response:

_____

_____

_____

_____

_____

End of Block: Block 1

Start of Block: Block 2

Q10 The following statements are a collective representation of panelist responses from survey #2 of this study that less than two-thirds (66%) but more than one half of the panel selected Agree (5) or Strongly Agree (6) during Round Two. The percentages of panelists who indicated Agree (5) or Strongly Agree (6) for the 25 items are provided for your consideration.

Please indicate either Agree or Disagree regarding whether the item should be added to the list of those reaching consensus of agreement in Round Two.

The opportunity to offer comments explaining your view is available for each item, and space for additional comments overall is provided at the end of the questionnaire.

Q11 The following statements were indicated in the previous survey's responses as **strengths** for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic.

Q12 **Strengths:**

	Disagree (1)	Agree (2)
Marketing claims provide a shield from volatility within commodity markets. (1)	○	○
Smaller flock sizes translate to less risk when depopulation and disease are considered. (2)	○	○
Non-Traditional/niche production allows for higher profit margins. (3)	○	○
Non-Traditional/niche production results in higher job satisfaction of employees. (4)	○	○
Non-Traditional/niche markets have animal welfare standards that could improve welfare standards across the industry. (5)	○	○

Q25 For any of the items you Disagree with above, please feel free to list any concerns or justifications for your response:

_____

_____

_____

_____

_____

End of Block: Block 2

Start of Block: Block 3

Q13 The following statements were indicated in the previous survey's responses as **weaknesses** regarding traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic.

Please indicate your agreement or disagreement to each of the following items.

Q14 **Weaknesses:**

	Disagree (1)	Agree (2)
Producers of conventional eggs who raise high welfare flocks often incur more expenses. (1)	○	○
Non-Traditional/niche production allows consumers to be unsatisfied with welfare standards because welfare standards vary across production methods. (2)	○	○
Producer education is minimal and producers of non-traditional/niche eggs have less knowledge about how to properly implement niche production methods. (3)	○	○
There are significant space restrictions for non-traditional/niche poultry housing operations. (4)	○	○
Larger scale non-traditional/niche housing operations are not feasible because of restrictions and limiting factors. (5)	○	○
Non-Traditional/niche operations experience more poor air quality. (6)	○	○

Q26 For any of the items you Disagree with above, please feel free to list any concerns or justifications for your response:

_____

_____

_____

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_____

End of Block: Block 3

Start of Block: Block 4

Q15 The following statements were indicated in the previous survey's responses as **Opportunities** for traditional or non-traditional egg producers to raise laying hens intended for niche markets by current industry definitions of respective alternative housing, e.g., Cage-Free, Free-Range, Pasture-Raised, or Organic, **but did not reach consensus of agreement**.

Please indicate your agreement or disagreement to each of the following items.

Q16 **Opportunities:**

	Disagree (1)	Agree (2)
Small-scale operations increase profitability. (1)	○	○
Organic and pasture-raised markets are less restrictive and easier to enter. (2)	○	○
Non-traditional/niche market eggs increase opportunities for global sales. (3)	○	○

Q27 For any of the items you Disagree with above, please feel free to list any concerns or justifications for your response:

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_____

_____

_____

End of Block: Block 4

Start of Block: Block 6

Q19 The following statements are a collective representation of panelist responses from survey #2 of this study that less than two-thirds (66%) but more than one half of the panel selected Agree (5) or Strongly Agree (6) during Round Two. The percentages of panelists who indicated Agree (5) or Strongly Agree (6) for the 3 items are provided for your consideration.

Please indicate either Agree or Disagree regarding whether the item should be added to the list of those reaching consensus of agreement in Round Two.

The opportunity to offer comments explaining your view is available for each item, and space for additional comments overall is provided at the end of the questionnaire.

Q20
Concerning current egg branding, marketing and labeling criteria in the U.S., what is needed by producers of traditional or non-traditional eggs to properly adhere to laying hen welfare standards of respective alternative housing environments, e.g. Cage-Free, Free-Range, Pasture-Raised, or Organic?

Please indicate your agreement or disagreement with each of the following statements:

	Disagree (1)	Agree (2)
Quality producer education leads to more effective consumer education. (1)	○	○
Provide clear outlines of inputs, labor, and standards. (2)	○	○
Packaging should indicate add-ons (e.g. square footage, outdoor access, nutritional additives). (3)	○	○

Page Break

Q21 The following statements are a collective representation of panelist responses from survey #2 of this study that less than two-thirds (66%) but more than one half of the panel selected Agree (5) or Strongly Agree (6) during Round Two. The percentages of panelists who indicated Agree (5) or Strongly Agree (6) for the 6 items are provided for your consideration.

Please indicate either Agree or Disagree regarding whether the item should be added to the list of those reaching consensus of agreement in Round Two.

The opportunity to offer comments explaining your view is available for each item, and space for additional comments overall is provided at the end of the questionnaire.

Q22 The following items were identified as defining characteristics for a **Cage-Free housing system**.

Please indicate agreement or disagreement for each of the following items being Important to a Cage-Free housing system:

	Disagree (1)	Agree (2)
Confinement. (1)	○	○
No Access to Outdoors. (2)	○	○
Scratch Pads. (3)	○	○

Q23 The following items were identified as defining characteristics for a **Free-Range housing system**.

Please indicate agreement or disagreement for each of the following items being Important to a Free-Range housing system:

	Disagree (1)	Agree (2)
Confinement. (1)	○	○
Limited outdoor access. (2)	○	○

Q24 The following items were identified as defining characteristics for a **Pasture-Raised housing system**.

Please indicate agreement or disagreement for each of the following items being Important to a Pasture-Raised housing system:

	Disagree (1)	Agee (2)
The same characteristics as Free-Range. (1)	○	○

Q25 The following items were identified as defining characteristics for a **Organic housing system**.

Please indicate agreement or disagreement for each of the following items being Important to a Organic housing system:

	Disagree (1)	Agree (2)
Hens are fed a grain-only diet. (1)	○	○

Q28 For any of the items you Disagree with above, please feel free to list any concerns or justifications for your response:

_____

End of Block: Block 6

Start of Block: Block 6

Q29 Thank you again for your time, commitment, and effort in completing each survey for this study. Your responses will provide valuable insight and perspectives that will allow the poultry industry to continue to improve and evolve.

In the box below, please feel free to list any additional comments about the study or about the topics covered in this study.

_____

_____

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End of Block: Block 6

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VITA

Rexanna Elizabeth Powers was born and raised in Nacogdoches, Texas. She received her Bachelor of Science in Agricultural Communications and a minor in Poultry Science from Texas A&M University in College Station, Texas in December of 2016. In August of 2017, she began a Master of Science in Agricultural Communications at Texas Tech University in Lubbock, Texas and graduated in December of 2018. After graduation, she worked in the commercial produce industry in Texas and specialized in marketing, sales, and logistics before returning to school. She is a candidate to receive her Doctor of Philosophy in May 2022. She plans to seek a faculty position in agricultural communications or a related field and hopes to continue her research on food labeling in the U.S. for the purpose of influencing policy change.