

# Narrowing the Farm-to-Plate Knowledge Gap through Semiotics and the Study of Consumer Responses Regarding Livestock Images

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## **Abstract**

It has been suggested that a farm-to-plate knowledge gap exists between farmers and consumers. In addition, previous studies have concluded that U.S. citizens do not have accurate knowledge or perceptions about agriculture. It is thought that this absence of knowledge and existing misconceptions may be due to the images consumers see regularly through the media. In this research study, researchers used a directly administered questionnaire to evaluate consumers' responses regarding the comparison of two livestock images. The study was conducted at the 2009 Ohio State Fair. Through voluntary participation, research participants answered questions regarding their perceptions of traditional and conventional livestock housing methods by viewing two images. In addition, participants were asked to justify each of their responses through oral reasoning. Questionnaires were completed by 508 participants, of which 502 were deemed usable. Results indicate participants are somewhat knowledgeable about livestock housing methods, but the perceptions and justifications of the respondents are not always accurate. The results also indicate agricultural images, as well as images regularly seen in the media, may influence such perceptions. In order to narrow the farm-to-plate knowledge gap, it is important for the agriculture industry to effectively improve the knowledge and perceptions of agriculture amongst consumers.

## **Keywords**

semiotics, directly administered questionnaire, agricultural knowledge, agricultural perceptions, images, knowledge gap theory

## **Introduction**

“Just because you live in a rural area with a small town close by, don't assume the people on Main Street in that small town know what's happening out there in the fields,” said Orion Samuelson a veteran farm broadcaster (American Farm Bureau, 2001, para. 2). The disconnect between farmers and non-farmers was further emphasized by Mayer and Mayer (1974) who said “...an enormous majority, even among well-educated Americans, are totally ignorant of an area of knowledge basic to their daily style of life, to their family economics, and indeed their survival” (p. 84). There is a need to explore the gap between agricultural consumers and producers (Higgins, 1991).

Today less than a fourth of the population lives on a farm, compared to more than half of the population in the early 20th century (Dimitri, Efland, & Conklin, 2005). Technology is the driv-

ing force behind these shrinking numbers. Advanced technology has increased U.S. farm output, allowing more individuals to leave the farm for an alternate occupation (Dimitri et al., 2005; Smart, 2009). The majority of consumers are now generations removed from the farm (American Farm Bureau, 2001; American Farm Bureau, 2007). As a result, the public's perception of agriculture no longer corresponds with the realities of agriculture (American Farm Bureau, 2007). Rob Smart from the Huffington Post has recognized this occurrence and has titled it the "farm-to-plate knowledge gap" (2009). In order to explore this farm-to-plate knowledge gap, this study sought to evaluate the perceptions and knowledge of livestock housing methods held by a sample of citizens attending the Ohio State Fair.

## **Literature Review**

### **Agriculture Literacy**

Agriculture literacy is a term given to address the knowledge and perceptions of agriculture held by the general public (Wright, Stewart, & Birkenholz, 1994). The National Research Council (1988) indicates that being agriculturally literate means an individual understands the history of agriculture as well as its current economic, social, and environmental impact. However, many research studies have shown the general public does not possess accurate knowledge and perceptions of agriculture (Frick, Birkenholz, & Machtmes, 1995; Duncan & Broyles, 2006; National Research Council, 1988). It is important for individuals to have some knowledge of agriculture since their survival depends on it (Frick et al., 1995). As the U.S. population becomes more suburbanized, it has been suggested that individuals are becoming less knowledgeable about agriculture (Duncan & Broyles, 2006). Additionally, the influences of media (Rhoades & Irani, 2008), acquaintances, and involvement in various organizations are impacting the knowledge and perceptions individuals, specifically those in younger generations, have about agriculture (Duncan & Broyles, 2006).

### **Livestock housing in Ohio**

During 2009, Ohio was home to 74,900 farms (National Agricultural Statistics Service, 2010). Of the common livestock raised in Ohio, there are approximately 293,757 beef cattle; 271,938 dairy cattle; 1.8 million hogs; 27 million laying hens; and 49.6 million broilers (National Agricultural Statistics Service, 2009). The majority of these animals are raised conventionally. For the purpose of this research, conventional livestock housing was defined as any operation where a large number of animals are confined and raised in a localized area (indoors or out), where food is brought to them (U.S. Environmental Protection Agency, 2010). Traditional housing was defined, in this research, as housing where livestock are not confined and have the ability to graze and obtain their own food. The American Veterinary Medical Association (AVMA) indicates the best livestock housing environments include: "freedom of movement; expression of normal behaviors; protection from disease, injury, and predators; adequate food and water; and proper handling" (AVMA, 2008, para. 2). Neither conventional nor traditional livestock housing adequately address all of these requirements.

In the Midwestern United States, the swine and poultry industries have seen a dramatic increase in the number of conventional farms over the last several years (Sharp, Roe, & Irwin, 2002). A gap exists in the literature providing both a clear definition of, and the precise number of animals raised using conventional production methods. Although it is not precisely known how many animals are raised in conventional housing in the state of Ohio, estimates can be drawn based on numbers provided by several sources. Ohio's average hog farm has approximately 492 hogs. Additionally, the

average laying hen farm has approximately 5,151 laying hens, while the broiler farms have an average of 62,776 broiler chickens (National Agricultural Statistics Service, 2009). Due to the large numbers of individual animals on these farms, it has been estimated that the majority of these farms are conventional in nature, since housing this many animals in a traditional housing setting would require an inordinate amount of acreage.

In addition, the average number of dairy cattle per farm in Ohio is 74.5. The dairy industry has been moving toward more conventional or partially conventional housing (Sharp et al., 2002). However, it is estimated that a smaller proportion of the dairy farms in Ohio are conventional compared to the swine and poultry facilities. The beef industry in Ohio has not seen a large increase in conventional housing (Sharp et al., 2002). Thus, it is estimated that more beef farms consist of traditional housing rather than conventional housing.

### **Theoretical Framework**

Semiotics and knowledge gap theory guided this study and provided a theoretical foundation for this research.

#### **Semiotics and Images**

Semiotics is a theory of signs and codes (Blaney & Wolfe, 2004; Eco, 1979). Visual signs help one interpret a message, while a code helps an individual understand what the message means (Moriarty, 2005). This theory suggests that signs and codes are closely related to language and everyday communication of a culture (Blaney & Wolfe, 2004). Thus, words and visual images promote a cultural ideology. Each visual image or word is composed of a combination of cultural ideologies, creating a sign system. A sign system is a group of signs that imply meaning for one sign or image (Blaney & Wolfe, 2004). Therefore, one image may contain several visual elements that contribute to the interpretation of the image.

When an individual views an image, there are many ways the image can engage the individual (Messaris & Moriarty, 2005). Images can produce a representation to everyday life. If an individual is able to relate an image to their life, the individual is likely to have an emotional connection with that image. The composition of an image has the ability to manipulate an individual's point of view, thus influencing their perceptions. These principles of image power seek to address how people learn from the images they see (Messaris & Moriarty, 2005).

In the study of semiotics, signs are defined as anything that represents another entity. Thus, the meaning of a sign is determined by a following thought or action (Hoopes, 1991; Moriarty, 2005). According to Saussure, a sign may also be referred to as a signifier (Moriarty, 2005). The signifier then promotes the content that the sign stands for, which is also known as the signified. Peirce created a model similar to Saussure's idea of the signifier and the signified, but he added the concept of the interpretant (Moriarty, 2005). The interpretant, or effect of a sign, is established when a sign generates a mental idea in one's mind (Moriarty, 2005).

A subject that becomes imperative is the relationship between the sign and the object or the signifier and the signified. These relationships include iconic, indexical, and symbolic relationships. An iconic relationship is when the sign and the object look alike or similar, like a photograph and a portrait (Moriarty, 2005). Peirce's examples of smoke to fire or symptom to disease are examples of the indexical relationship; this is when the sign and object are indicators of each other. Lastly, the symbolic relationship describes when the sign is a symbol for the object, like a flag as a sign and its

corresponding country as the object (Moriarty, 2005). Understanding the relationship between the sign and the object allows researchers to analyze the resulting mental image that is likely to occur among viewers.

An additional point for analysis between the sign and the object was extended by researchers Barthes and Hall (Moriarty, 2005). Their analyses included connotation and denotation. Connotation is referred to as the meaning that is established by the object; the meaning of an object is generally cultural. Denotation is defined as "...the direct, specific, or literal meaning we get from a sign" (Moriarty, 2005, p. 231). An example that demonstrates the functionality of connotation and denotation is as follows. A magazine advertisement shows a picture of a tractor, the tractor is at the denotative level. The connotative level of the advertisement might associate the tractor with terms such as farm, farmer, country, and crops. Connotation and denotation become especially important when studying visual communication and the influence of visual images in advertising (Moriarty, 2005).

### **Knowledge Gap Theory**

Knowledge Gap Theory suggests that information is obtained more efficiently by those who have a higher socioeconomic status rather than those who have a low socioeconomic status (Tichenor, Donohue, & Olien, 1970). Mass media infusion is absorbed at different rates across different socioeconomic groups, thus impacting the rate of information obtained by individuals (Tichenor et al., 1970). As home computer ownership and Internet access has increased, it has been suggested that knowledge gaps have decreased (Hindman, 2000). However, despite access to computers and the Internet, knowledge gaps continue to exist because people continue to lack comprehension of information and/or the technology (Chadwick, 2006). A lack of motivation to cognitively digest certain information has also been discussed as contributing to knowledge gaps (Weenig & Midden, 1997).

Knowledge gap is closely related to the digital divide, suggesting those who have lower incomes and reside in rural areas have less access to media outlets (Rainie et al., 2003). Alternatively, those with higher levels of education, higher income, and residence within an urban or suburban location, generally have abundant media access (Rainie et al., 2003). When discussing the knowledge gap in agriculture, those who have experience with agriculture have traditionally not had resources available to share their knowledge within media outlets. In addition, the agricultural information present in the media often tends to be misguided (Whitaker & Dyer, 2000). Due to the lack of comprehension of agriculture information, inaccurate media coverage, the lack of motivation of some to process agriculture information, and the struggles of those in the industry to communicate to the public and media about agriculture a knowledge gap exists between those who produce and consume agricultural products.

### **Purpose and Objectives**

It is important for agricultural educators and communicators to regularly assess the knowledge and perceptions individuals have about agriculture. The purpose of this study was to evaluate the perceptions and knowledge of livestock housing methods held by a sample of citizens attending the Ohio State Fair. In addition, this study sought to explore the thought process of consumers when viewing agriculture images by analyzing their qualitative responses. This information should provide beneficial insight for agricultural professionals. The information may be used to improve educational and communication mechanisms, as well as creative image advertisements.

Three objectives guided this study:

1. Evaluate consumers' perceptions of conventional and traditional livestock housing in Ohio.
2. Evaluate consumers' perceptions of animal health and disease as related to livestock housing methods.
3. Evaluate consumers' perceptions of safe and wholesome food products and consumer friendly prices as related to livestock housing methods.

## Methods

In order to fulfill the purpose and objectives of this study, researchers conducted a directly administered questionnaire to individuals attending the Ohio State Fair. Directly administered questionnaires are referenced by Ary, Jacobs, Razavieh, and Sorensen (2006) as a research tool that enables researchers to gather information from an array of individuals who have gathered at common place for a common purpose. The benefits of directly administered questionnaires include the ability to guide participants through the questionnaire and answer any questions (Ary et al., 2006).

A convenience sample was used for this study. Convenience sampling involves using readily available subjects as the study sample, thus making it a weak sampling procedure (Ary et al., 2006). Convenience sampling was used in this study because it was difficult to predict the population elements that the study would encounter, thus limiting enumeration required for probability sampling (Ary et al., 2006). The convenience sample was comprised of volunteers who attended the 2009 Ohio State Fair. Data collection occurred at a booth in the Agriculture and Horticulture building. Participants volunteered for the study and were recruited by a sign above the research booth that read "Are you 18 years or older? Are you an Ohio resident? Do you want Free Ice Cream?" Six individuals administered questionnaires over a period of eight days. Each participant was given a coupon for a free single-dip ice cream cone from the Ohio Dairy Producers booth at the fair. The Ohio Farm Bureau provided funding and support for this research. A sample of 508 questionnaires was collected, of which 502 questionnaires were deemed usable and were evaluated. The six questionnaires dismissed from the research were unusable due to lack of responses or Ohio citizenship. In addition to the 508 participants who participated in the study, 57 other individuals declined participation after inquiring about the study.

Training was required for all questionnaire administrators prior to data collection. The training allowed the administrators to practice and become familiar with the questions, learn how to listen carefully and pick out important details, as well as eliminate personal bias when talking with participants. Two prescreening questions were asked at the beginning of the questionnaire to establish that the participants were adults and Ohio citizens. In addition to demographic questions, questions regarding a comparison of two images were asked. One image contained several smaller images of conventional livestock housing while the other contained several smaller images of traditional livestock housing. A panel of researchers familiar with livestock production selected these images. The participants were asked to determine which picture represented how most livestock were raised in Ohio, showed the healthiest animals, showed the most humane treatment, showed animals most protected from disease, would produce the most safe and wholesome food product, and would produce the most consumer-friendly food prices. Participants were then asked to provide justification for each of their responses. Each questionnaire took approximately 5-10 minutes to administer. A panel of researchers and Ohio Farm Bureau staff evaluated the questionnaire instrument to ensure validity.

Upon the completion of the data collection, data were entered into SPSS© and basic quantitative descriptive statistics were calculated. Qualitative information was evaluated through the use of open-coding and identification of common responses within the data.

## Results

Researchers collected demographic information on age, ethnicity, gender, and highest level of education. The average age of participants was 44.35 (SD = 15.89), with a median of 46, and a mode of 50. Various ethnicities were represented among the participants; however, the Caucasian ethnicity was most abundant with 412 (82.1%) participants. Gender was not asked, but was identified by the researchers. More females participated in the research than males, as the sample was composed of 315 (62.7%) females. The most abundant level of education among the participants was a bachelor's degree, held by 181 (36.1%) respondents.

### **Objective 1: To evaluate consumers' perceptions of conventional and traditional livestock housing in Ohio.**

#### **Most abundant housing method.**

The first research objective was to evaluate consumers' perceptions of conventional and traditional livestock housing in Ohio (see Figure 1). Of those responding, 329 (65.5%) participants indicated that conventional housing (Image A) was used to raise the majority of livestock in Ohio. A summary of the response frequencies can be seen in Table 1.

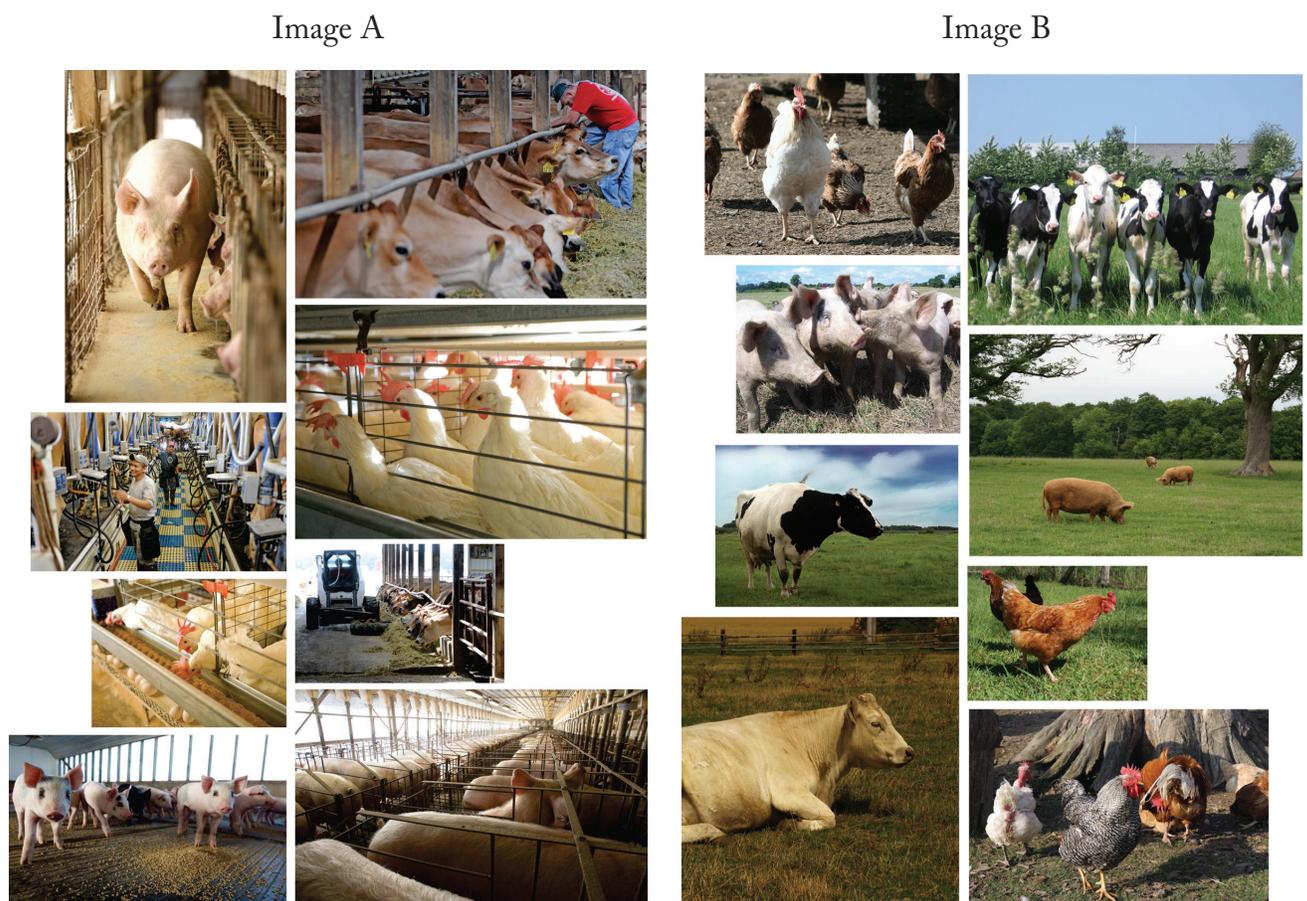


Figure 1. Image A was shown to participants to represent conventional livestock housing. Image B represented traditional livestock housing.

Table 1

*Consumers' Perceptions of Most Abundant Livestock Housing Method*

Image Selection	<i>f</i>	%
Image A	329	65.5
Image B	123	24.5
Both Images	45	9.0

When the participants were asked why they felt livestock were raised one way versus another, several responses were given. Of those responding, the most common reasons for selecting conventional livestock housing were mass production, economic feasibility, technology, and media influence. Some notable responses included: “image A because B looks like how my grandparents would have done it,” and “A, because I assume they’re all inhumane.”

The common themes that arose by those who selected traditional livestock housing as most abundant included: there are more small farms than large farms, participants had seen animals raised this way, and participants had not seen farms like image A. Many participants referenced seeing images like image B while driving down the road. Unlike those who chose image A, only one person directly referenced the media as justification for choosing image B. It is important to note that some of the respondents commented on the aesthetic nature of image B by using words like “looks nice,” “free/comfortable,” and “happy.” One respondent said “they look happy, outdoors, grassy ‘happy cows come from California.’” While another participant said “cows on a hill equals America.”

Of the 9% of participants who indicated that both images were prevalent in the state, most indicated that image A and image B were equally distributed. However, some chose both because of specie difference (i.e., chickens and pigs are housed like A, cows are housed like B). In addition, some respondents suggested that neither picture was representative of livestock housing methods in the state. These participants indicated that a combination of methods were used and that the method depended the season.

**Most humane housing method.**

Although the majority of respondents thought image A was most abundant in the state, the majority did not think it was humane. When asked what housing method was more humane, 322 (64.1%) participants selected traditional housing as being more humane, while 68 (13.5%) selected conventional housing.

Those who indicated traditional housing was more humane justified their responses with the common themes of: less crowded/not caged, natural setting, room to roam/free, and better physical and mental health. One participant referred to image B as a “natural setting and not crowded like prison.” Additional responses included “they can breathe air not each other’s smells, they can stretch, and live naturally.” Some respondents referenced the livestock’s health. One respondent chose image B because image A looked “like they are on life support.” Two notable references to the media were made. These references were, “looks like the ones in the commercials ‘happy cows,’” and “when you pack animals together we are shown in media they are less humane.”

Participants who thought that both pictures showed humane treatment indicated that they did so because the animals looked “healthy and happy” in both images, humane treatment was not indicated by the housing method but rather the operator, and neither picture showed “inhumane” treatment. Some quotes from these responses included: “nothing inhumane, each is better in its own way;”

and “in image A people are caring for them, in image B they are out in nature.”

Those who selected image A as the most humane, referenced “health and happiness”, “environmental control”, people taking care of the animals, and the presence of “technology”. Responses that represented these themes include the following: “animals are protected from each other,” “production based on science and research,” and “environmentally controlled animals that are happy will produce more.”

**Objective 2: To evaluate consumers’ perceptions of animal health and disease as related to livestock housing methods.**

**Housing method with the healthiest animals.**

The second objective was to determine if consumers think animals are healthier and more protected from disease in one housing method versus another. Of those responding, 242 (48.2%) participants selected image B. A summary of the responses in regard to what image showed the healthiest animals can be found in Table 2.

Table 2

*Consumers’ Perceptions of the Image that Showed the Healthiest Animals.*

Image Selection	<i>f</i>	%
Image A	104	20.7
Image B	242	48.2
Both Images	153	30.5

Participants who selected image B justified their selection by saying the animals were happy, out in the open, in their natural green environment with room to roam. Some examples of specific responses to this question included: “the animals actually have room to breathe and live comfortably,” “more control over their freedom,” “coloring better green and pretty,” and “reading and exposure to media says that animals that are separated are healthier.”

The respondents who chose both images said they chose both because the animals in both images looked healthy. Some specific responses included: the animals look “comfortable, heads up, and ears are perky,” “nobody looks sick, underweight, or without hair,” and “cannot see any ribs, lost feathers, or rotten flesh.” Additionally, a few respondents justified selecting both images through comparison. For example, one participant said “in image B they are less likely to spread disease, in image A there are preventative measures, it’s controlled.” Lastly, a small number of participants selected both images. These participants stated that they could not choose one image over another because an assessment of health could not be established through a picture.

Of the 30.5% of individuals who indicated that the healthiest animals were in image A, several discussed that the environment in image A was controlled, clean, and sanitary. Additionally, respondents selected image A as having the healthiest animals because they said the animals were being closely monitored and cared for. Lastly, some respondents chose image A because they said the animals in image B “look skinny,” “not very healthy,” and “sick.”

**Housing method with animals most protected from disease.**

After selecting the image with the healthiest animals, respondents were asked in what image the animals would be most protected from disease. Of those responding, 230 (45.8%) participants selected image A, and 222 (44.2%) participants selected image B. A complete summary of these responses can be seen in Table 3.

Table 3

*Consumers' Perceptions of what Image Showed Animals Most Protected from Disease.*

Image Selection	<i>f</i>	%
Image A	230	45.8
Image B	222	44.2
Both Images	38	7.6

Responses from individuals selecting image A fell into four common themes: a controlled environment, close monitoring of animals, clean and sanitary conditions, and the prevalence of vaccination programs. Some notable responses for the selection of image A included, “more controlled environment, but one bad apple could infect the rest” and “animals provided antibiotics and vaccines along with other medicines.”

Of those respondents who chose image B, many did so because the animals were not confined or overcrowded. One respondent referenced image A as spreading disease more rapidly, “like kids in school.” Other respondents referenced “natural habitat” and “freedom” as their reasons for selecting image B.

Those who chose both images did so because they said the protection from disease depended on other factors besides housing method, such as proper care. Other respondents justified selecting both images by making an argument for each image. For example, one respondent said in image A farmers are “very precautionous, they shower in shower out” and in image B if farmers are “rotating pastures and doing it right the livestock won’t have worms.”

**Objective 3: To evaluate consumers’ perceptions of safe and wholesome food products and consumer friendly prices as related to livestock housing methods.**

**Safe and wholesome food products.**

The final objective of this study was to evaluate consumers’ perceptions of safe and wholesome food products and consumer-friendly prices as related to livestock housing methods. When participants were asked what image would produce the safest and most wholesome food product, 224 (44.6%) participants selected image B. A summary of all the responses to this question can be found in Table 4.

Those who selected image B gave several justifications. The common themes included: the animals were not confined and thus would have less disease, the animals were outside in a natural free-range environment, fewer chemicals (hormones, antibiotics, steroids) were used while the animals were being raised, and the animals were happier and healthier. A participant said “range animals have no chemicals pumped into them.” Additionally, some specific responses relating to health and happiness included: “the healthier the animal the healthier the food” and “happy animals make happy meals.” Some of the participants who selected image B referenced reading scientific studies and

Table 4

*Consumers' Perceptions of Safe & Wholesome Food According to Housing Method.*

Image Selection	<i>f</i>	%
Image A	165	32.9
Image B	224	44.6
Both Images	97	19.3

indicated that free range was healthier. One participant stated, “the spin media puts on it tells us to want free range.”

Image A was selected by respondents who reasoned that the animals were being taken care of, were in a controlled environment and receiving controlled nutrition, and appeared clean and in good health. “Someone’s taking care of them and monitoring them,” said one respondent. In addition, another respondent concluded that the animals in image A were “more protected and not exposed to elements.”

Participants who chose “both images” provided justification that both images appeared to show healthy and safe animals, the safety of food could not be determined from the pictures, the safety and wholesomeness of food would depend on the management, and both methods are inspected and have laws to follow. One respondent indicated that it “doesn’t have to do with living conditions, just how animals are cared for.”

### **Consumer friendly prices.**

When the research participants were asked what picture would produce the most consumer friendly food prices, image A was selected by 352 (70.1%) of respondents, while 102 (20.3%) selected image B. Image A was frequently selected as participants were able to identify that this housing method was cost efficient, involved mass production, was controlled, and required less labor and less land. Some examples of participant responses included: “assembly line, more efficient” and “if we go back to a pasture system we’ll increase the price of food by five fold.” Additionally, one participant stated “one guy can do a lot more; the animals are less labor intensive in this system.”

Participants chose image B for reasons such as less overhead costs, less disease, and cost justified by consumer values. Two statements included, “it’s natural you don’t have to spend money on machines and buildings” and “farmers don’t have to pay for grass.” In addition, another participant stated “people are looking for healthier foods, we are a sick nation because we have crap in our food,” while another reasoned “if we’re going to eat animals it’s worth the price.”

The respondents who selected both for this question reasoned that they just thought it was both. Examples of responses were it is a “toss up,” there is “no wrong answer,” and “more likely A, but probably both.”

### **Discussion/Conclusions**

Although this study is not generalizable past those who attended the [State] State Fair and volunteered for this study, it still provides valuable data for agricultural communicators. Much can be gained in regard to the perceptions consumers have about livestock housing methods, the conclusions they draw from images, and how the images in media affect those perceptions. Due to the animal welfare issues occurring in Ohio at the time of this study, it is suspected that participants may have been more familiar with the research topics than they would have been if animal welfare had not been a current issue. However, Ohio’s Livestock Care Board ballot initiative had not been officially placed on the ballot or released to the public at the time of this study.

The results of the study show more participants believed that the majority of livestock were raised in conventional livestock housing. Although this is accurate, the concern becomes the 24.5% (n = 123) of individuals who believed that traditional housing was more abundant. Agricultural communicators should take note of the reference to the images consumers see driving down the road, as well as the images they see on television. The observations of this research support the theory of

semiotics suggesting that visual images promote a cultural ideology (Blaney & Wolfe, 2004). The quote “Cows on a hill equals America” is one example of the cultural ideologies discussed by participants when viewing the livestock images.

The results also show that most participants did not perceive conventional livestock housing to be the most humane. Neither traditional nor conventional livestock housing meets all of the requirements of the best livestock-housing environment as suggested by the AVMA. However, based on participants’ responses it can be concluded that consumers may associate humane treatment with factors other than environmental requirements. Additionally, an indexical relationship may be causing consumers to associate conventional livestock housing with inhumane treatment (Moriarty, 2005). On more than one occasion, respondents provided justification for their response by indicating the animals were happier in one image vs. another. Some of these responses referenced the “Happy cows come from California” commercial campaign. Although this is a positive advertisement in regard to agriculture, communicators should evaluate if commercials such as this are creating idealistic views about agriculture rather than showing reality.

The results of objective two indicated that most respondents believed traditional livestock housing produced the healthiest animals, but most participants also believed conventional housing was more adequate in protecting livestock from disease. When participants discussed image B as producing the healthiest animals they used emotionally laden terms such as natural, happy, free, and green. Participants exhibited positive emotions when using these terms. It can be concluded that many participants may have made an emotional connection with image B because they felt more familiar with image B (Messaris & Moriarty, 2005). When determining which housing method would protect animals from disease the most, participants referenced more logical terms such as, control, people taking care of the animals, and vaccination programs. Thus, it seems participants may have been less familiar with image A and did not develop the same emotional connections to the image as they did with image B. As related to semiotics, the participants’ responses in this study illustrated that they regularly saw images of traditional livestock housing, thus they are likely able to relate cultural meanings to the image at the connotative level (Moriarty, 2005). The average consumer has not regularly seen conventional livestock housing and cultural meanings are less associated with this image, thus one may conclude that this image was assessed at the denotative level (Moriarty, 2005). By using this information, communicators could create advertising campaigns that would allow the consumer to make a positive cultural connection with conventional livestock housing as well.

The farm-to-plate knowledge gap seemed to be observed in the participants’ responses when asked what method produced the most safe and wholesome food. Most respondents selected traditional housing as being the most safe and wholesome, with the common reasoning that various chemicals were not used in traditional livestock housing. This finding may indicate that participants were not aware that pasture-raised animals may receive supplemental feeding besides grass and that pesticides may be present in the grass pasture-raised animals consume. Also, the results illustrated that some participants assumed hormones, antibiotics, and steroids were only used in conventional housing methods. Although in reality, hormones, antibiotics, and steroids may be used in both or neither of the housing methods. One could attribute this apparent misunderstanding to mass media influence or a lack of motivation gain this knowledge (Tichenor et al., 1970; Weenig & Midden, 1997).

The majority of respondents correctly understood that conventional housing produced more consumer-friendly prices. However, an important observation from these responses was that many

of those respondents who answered image B did so not because they thought it was cheaper, but because they were willing to pay extra for products from a traditional housing situation.

Agricultural communicators should use this information to produce effective advertising campaigns for agriculture, as well as to effectively educate consumers about agriculture, specifically livestock production, in order to narrow the farm-to-plate knowledge gap. The findings show that respondents were somewhat knowledgeable about agriculture, but the perceptions and justifications provided were not always accurate. This is somewhat surprising as the participants demonstrated an interest in agriculture by walking through the agricultural building at the state fair and choosing to participate in the study. However, this finding aligns with previous research that has indicated consumers' knowledge and perceptions of agriculture are often inaccurate (Frick, Birkenholz, & Machtmes, 1995; Duncan & Broyles, 2006; National Research Council, 1988). In addition, it provides valuable information about what consumers are interpreting through agricultural images.

The results of this study are not generalizable beyond those who participated in this study and provided useable responses. Additionally, the location and incentive used in this study may have biased this research and discouraged those who do not support the consumption of animal-based products from participating. Participants may have been influenced by the volunteer nature of the participants, individuals in the building, the survey administrators, other participants, or the exhibits in the building. Further analysis should be conducted on this data to evaluate if the demographics of the participants are related to their responses. This study should be replicated at a different venue and through random sampling in order to get a wider selection of the population. Further replication should also include sampling in a rural venue as well as an urban venue. A chi-square analysis of these geographical samples and image responses would provide valuable results in regard to the relationship between geographical region and knowledge and perceptions of agriculture, thus indicating if the farm-to-plate knowledge gap is widespread.

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