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Communicating with Diverse Audiences about Sustainable Farming: Does Rurality Matter?

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Abstract

There has been a dramatic shift in how people engage with agriculture over the past 50 years in the United States, leading to little interaction between consumers and the farm. Despite extension initiatives to communicate with urban consumers about agriculture, the disconnect between consumers and agricultural producers continues to grow. Research has shown consumers rely primarily on the media for information about agriculture resulting in misconceptions about its impact on the environment. Consumers' negative views about agriculture's impact on the environment may lead to support for and implementation of environmental policies that create issues for agricultural producers rather than policies that support both production agriculture and the environment. This study, guided by audience segmentation and framing theory, sought to explore differences in public perspectives regarding agriculture's impact on the natural environment, specifically with rural, urban, and suburban residents. Data were collected from 797 Georgia residents living in rural, urban and suburban areas using an online survey instrument. The results found perspectives on agriculture's impact on the environment were moderately high and bimodal; both positive and negative. Statistically significant differences were found between urban and suburban residents' positive perspectives on agriculture's impact on the environment and between urban, suburban, and rural residents' negative perspectives on agriculture's impact on the environment. The findings imply extension educators need to tailor outreach programs based on the rurality of residents in order to effectively communicate with audiences, particularly when combatting negative framing with urban audiences.

Keywords: audience segmentation; best management practices; environmental policy; framing theory; rurality

Introduction

Agriculture in the United States (U.S.) has dramatically changed over the past 50 years (Kassel, 2020; McGuire et al., 2013; National Research Council, 2010) with shifts in farm structure impacting public connections to the farm. Agricultural production has largely shifted from small farms to large farms and, although there are a large number of small farms throughout the U.S., most agricultural products are produced on a small number of large farms (MacDonald et al., 2018). For example, 31% of the value of U.S. farm production in 1991 was from farms with at least $1 million in sales. In 2015, that number increased to 51% of the value of U.S. farm production being from farms with at least $1

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million in sales (MacDonald et al., 2018). Moreover, within the U.S., the majority of consumers are disconnected from agriculture by three generations (Beattie et al., 2018). In the early 1900s, more than one in three individuals lived on a farm (Lobao & Meyer, 2001). By the end of the century, that number shifted to a farm population of less than two percent (Lobao & Meyer, 2001; U.S. Department of Agriculture [USDA], 2019). Many consumers' only interaction with their food supply chain is at the supermarket and other food retailers (Morgan et al., 2017).

The vital role agriculture plays in providing food and other products is well recognized (McGuire et al., 2013; Schulte et al., 2010); however, opinions on agriculture's impact on the environment (such as soil erosion, water pollution, and environmental damage) are overwhelmingly negative (McGuire et al., 2013). For example, both Harris and Bailey (2002) and McGuire et al. (2013) found the U.S. public perceived farmers have the most direct role in environmental damage. The tension between environmental goals and agriculture are largely prevalent in the media (McGuire et al., 2013), causing consumer misconceptions about agriculture. For example, the agricultural industry has made progressive changes in practice to intentionally protect water resources, including the use of research-based best management practices (BMPs; Schaible & Aillery, 2012). BMPs are researcher-developed practices which have been shown to reduce agricultural impact on the environment via conservation practices, such as increased fertilizer efficiency (He et al., 2019) and targeted pesticide application that reduces run off. However, the media portrays agriculture as a large-scale water user that does not consider environmental safety, causing a negative association for consumers (Gaines, 2014). As a result, decision makers may believe the public has strong negative views about agriculture (Lamm et al., 2016) leading to support of new environmental management policies that create issues for farmers, even when sustainable environmental solutions that benefit both agriculture and the environment are available.

It is vital for decision makers and consumers to be knowledgeable about agriculture and its impact on the environment when discussing local, state, and federal environmental law and policy (Archer et al., 2008). However, agricultural communications professionals tend to be reactive when communicating rather than proactive (Kurtzo et al., 2016), allowing the gap in knowledge to worsen. The diversity among consumer audiences creates further challenges as people may not understand and react to messages about the use of agricultural BMPs in the same way, making it difficult to effectively educate and communicate about food systems that do not detract from, and may be beneficial to, the natural environment. Thus, identifying meaningful differences within an audience may allow for more strategic communication messages that could alter public perception of agriculture's impact on the natural environment to one that is fact based. Extension educators, who provide non-formal education throughout the U.S. (USDA, n.d.), have been encouraged to use more strategic communication messages with differing audiences (Warner et al., 2017), as they work in rural, urban, and suburban settings (USDA, n.d.). Distinct subgroups that comprise the public may be more receptive of agricultural information if extension educators use an approach that targets their audiences' differences and corresponding needs, thereby driving a fact-based public perception of agriculture.

Frick et al. (1995) conducted a study to assess rural and urban adults' perceptions of agriculture in midwestern states and found respondents who had one or more of the following demographics were less positive in their perception of agriculture: (a) lived in a town / city, (b) did not live on a farm, (c) had relatives who lived or worked on a farm, and/or (d) lived near or in a town with a population ranging from 2,500 to 10,000. Additionally, Boogaard et al. (2011) examined Dutch social opinions about dairy farming and found knowledge and experience of farming first hand, such as farm visits or rural residency, had a positive impact on respondents' satisfaction with dairy farming.

Despite current studies that have examined perceptions of agriculture, little is known about how geographic differences impact public perceptions of agriculture. Geographic differences were identified as residents living in urban, suburban, and rural areas. The present study directly aligns with research priority area one of the 2016 - 2020 American Association for Agricultural Education (AAAE)

National Research Agenda (Roberts et al., 2016), specifically, "what methods, models, and programs are effective for informing public opinions about agricultural and natural resources issues?" (Enns et al., 2016, p. 15). A more robust understanding of the antecedent conditions, or contexts, affecting public opinions will help improve educational strategies and may ultimately influence policy maker decisions regarding agricultural and environmental policy.

Conceptual Framework

Audience Segmentation

Social and political factors largely influence people's perceptions and ultimately how they develop law and policy on agricultural practices (Archer et al., 2008), including how to best manage environmental concerns. Yet, many social factors surrounding agriculture are influenced by the media (Archer et al., 2008), which may cause misconceptions among the public. When law and policy on agricultural practices are formed under these misconceptions, they may cause more harm than good. Such occurrences create challenges and opportunities for extension educators to deliver salient information based on the needs of audience members. Archer et al. (2008) suggested "for social scientists and policymakers, understanding social and political influences on agricultural systems may mean the difference between policies and social structures that improve social, economic and environmental sustainability, and those leading to disastrous consequences for agriculture and the environment" (p. 272). Notably, when perceptions and misperceptions exist, they are not likely to be held consistently throughout a potential audience. This means an informational message intended to correct a misperception could be irrelevant or even off-putting to many recipients in the absence of audience segmentation. Therefore, it is important for communication efforts to engage consumers in a meaningful and tailored way when disseminating information about agriculture and the environment.

Audience segmentation is a technique used in social marketing to subdivide audiences within the population based on shared characteristics, including geographic (e.g. region, population density, and climate), socio-demographic (e.g. income, age, and class), psychological (e.g. values, attitudes, and personality traits), and behavioral characteristics (e.g. behavior patterns or decision making; Andreasen, 2006; Kotler & Roberto, 1989). Audience segmentation enables effective communication and education strategies because it allows messages to be tailored to a homogeneous group's needs, which may increase the likelihood of the group's behavior change (Andreasen, 2006; Kotler & Roberto, 1989).

People within distinct audience segments used in an educational initiative should share characteristics that make them likely to respond in similar ways to a program or message (Lee & Kotler, 2011). Based on a study of agricultural opinion leaders, Lamm et al. (2019) noted "using audience segmentation can be an effective way to deliver tailored content to specific audiences" (p. 13). Huang et al. (2016) suggested "the resources and efforts put into a program can be organized more efficiently with audience segmentation by basing them on an audience's specific needs and interests" (p. 62). Thus, audience segmentation may assist in overcoming communication difficulties by guiding how specific audiences should be educated about agriculture. Of special interest to extension educators working in today's reality of limited resources, audience segmentation can inform a structured decision-making process for whom to prioritize and how when delivering programs to an essentially limitless target audience such as the public. When applying audience segmentation, extension educators should consider prioritizing the segment or segments that most support (Lee & Kotler, 2011).

Previous studies have used audience segmentation to benefit environmental and agricultural communication and education (e.g. Huang et al., 2016; Kim & Weiler, 2013; Warner et al., 2017). Warner et al. (2017) examined water issues via audience segmentation and found three groups of residential irrigation users (water savvy conservationists, water considerate majority, and unconcerned water users) who would benefit from tailored communication and education programs. Huang et al. (2016) used audience segmentation to target the general public and high-water users and found "high water users reported a higher frequency of engagement in water use behaviors, and were less likely to

engage in water conservation and related societal behaviors" (p. 60). Kim and Weiler (2013) conducted a study on environmentally responsible fossil collection among park visitors and found two groups of park visitors, individuals with high environmental attitudes and low environmental attitudes, implying a need for tailored communication strategies. A lack of adequate audience research to inform segmentation can act as a major barrier to extension education efforts (Warner et al., 2016), but having access to detailed information about an audience and promising segments can increase the impact of an extension educator's programming (Huang et al., 2016). Warner et al. (2018) examined engagement in household water conservation practices among more and less urban audience segments, finding those living in the most urban areas were less engaged in water conservation. While audience segmentation has targeted environmental and agricultural efforts previously, little is known about the influence geographic location and, therefore, the level of rurality, has on perceptions of agriculture as it relates to the environment.

Framing Theory

Frames are communication channels that assist the public in constructing meanings of social reality (Ortega & Feagin, 2016). The media may include or omit pieces of information from a story, thereby framing the story through the salient information. Although frames play a large role in how the public constructs reality, their influence may be completely unknown to the public (Ortega & Feagin, 2016). According to Meyers and Adams (2010), "news frames have significant impact on audience members' interpretation of issues and resulting attitudes by emphasizing certain elements of a controversial topic to shape readers' opinions and policy preferences." (p. 3 - 4). Thus, the public may interpret issues depending on the way the media presents the issue (Price et al., 1995).

Ruth et al. (2005) used framing theory to evaluate what emphasis major newspapers had on mad cow disease and found the news coverage was overwhelmingly negative, suggesting the coverage caused fear and uncertainty throughout the U.S. Similarly, Ashlock et al. (2006) used framing theory to evaluate how the media framed mad cow disease and found the beef industry was portrayed negatively through industry headlines, suggesting the negative and persistent tone of the media shaped public perception of the beef industry as negative. Thus, identifying frames in media may provide important insight into understanding social biases (Ortega & Feagin, 2016), such as the negative and positive perspectives of agriculture's impact on the natural environment. In addition to collecting needed audience segmentation data on Georgia residents, this study sought to apply framing theory to examine differences and draw practical recommendations for extension educators.

Purpose and Objectives

The purpose of this study was to explore differences in public perspectives regarding agriculture's impact on the natural environment based on the rurality of residential location to inform more effective extension education initiatives. The objectives were to:

1. Identify overall public positive and negative perspectives regarding agriculture's impact on the natural environment.
2. Identify public positive and negative perspectives regarding agriculture's impact on the natural environment among audience segments based on the rurality of residential location.
3. Determine if public positive and negative perspectives regarding agriculture's impact on the natural environment differed among audience segments based on the rurality of residential location.

Methods

The study utilized a quantitative survey research design. The research was part of a larger project designed to identify public perceptions within the nexus between environmental sustainability and agriculture to inform future agricultural communication and extension educational practice.

Instrumentation

The research described here utilized three sections of the survey instrument. Sections included (1) the strength of respondents' positive perspectives on agriculture's impact on the natural environment, (2) the strength of respondents' negative perspectives on agriculture's impact on the natural environment, and (3) respondents' rurality (identified as rural, suburban or urban). In order to determine rurality, survey respondents were asked to select the area that best describes where they live, including: "rural", "suburban", "urban", and "other". Respondents who selected "other" were removed from the dataset. In addition, demographic items were used to describe the sample.

Eight questions were used to establish a respondent's positive perspective on agriculture's impact on the natural environment using a five-point Likert-type scale (1 = *Strongly Disagree*; 2 = *Disagree*; 3 = *Neither Agree nor Disagree*; 4 = *Agree*; 5 = *Strongly Agree*). The questions asked respondents if they know farmers will be concerned about water resources when they make important decisions about farming, if farmers can be relied upon to keep their promises and if sound principles seem to guide farmers' behavior when it comes to water use, if farmers conserve water, if farming protects our natural environment, if farm lands or privately-owned agricultural lands allow water to return to and recharge groundwater resources, and if farmers only use as much fertilizer and pesticides as necessary on their fields and crops. Responses to the eight items were averaged to create an overall positive perspective on agriculture's impact on the environment index (Cronbach's $\alpha = .88$).

Six questions were used to establish a respondent's negative perspective on agriculture's impact on the natural environment using a five-point Likert-type scale (1 = *Strongly Disagree*; 2 = *Disagree*; 3 = *Neither Agree nor Disagree*; 4 = *Agree*; 5 = *Strongly Agree*). The questions asked respondents if they think it is important to watch farmers closely so they do not take advantage of water resources, if farming causes soil erosion and water runoff, if fertilizers and pesticides used on farms pollute natural water sources, and if animal waste produced on farms pollute natural water sources. Responses for the six items were averaged to create an overall negative perspective on agriculture's impact on the environment index (Cronbach's $\alpha = .87$). Items used in the positive and negative perspective scales were previously developed and tested by McKee et al. (2017).

The instrument was reviewed by an expert panel to ensure face and content validity including a professor specializing in survey research design, the Director of the UF/IFAS Center for Public Issues Education who is a known agricultural communication expert, and an assistant professor specializing in audience segmentation research. The University of Georgia Institutional Review Board approved the research. The survey instrument was then pilot tested with 50 representatives of the population of interest before being distributed broadly. Reliability was calculated *ex post facto* confirming the reliability of the scales used.

Data Collection

Data were collected online in December 2019 from Georgia residents. Respondents were recruited via Qualtrics. The target population was Georgia residents who were representative of the population based on gender, age, and race/ethnicity. Georgia residents were the population of interest because there are diverse groups of audiences in the state, such as those from generational family farms and individuals living in urban Atlanta, all of whom represent important audiences for extension. Additionally, Atlanta's population has grown quickly since 1970, rapidly increasing urbanization in Georgia (Liu & Yang, 2015). Respondents were required to be 18 years of age or older and a Georgia resident. Data were collected using non-probability opt-in sampling (Baker et al., 2013), which has been commonly accepted and used in agricultural communications research (Lamm & Lamm, 2019). For example, Beattie et al. (2018) used non-probability sampling to collect data on public opinion of natural resource and agricultural technologies. McKee et al. (2017) used non-probability opt-in sampling techniques to gather data on U.S. consumers' willingness to pay for water conserving agricultural products and level of trust in farmers. Epstein et al. (2017) collected data on perceptions of

water use associated with visual images of agriculture with non-probability opt-in sampling techniques. An attention filter was used to protect data quality (Lavrakas, 2008). The attention filter requested participants to select a prompted response to an embedded item. If the respondent did not accurately respond to the attention filter question they were dismissed from the process. In addition, respondents found to be speeding (operationalized as taking less than half the time of the average respondent) were also dismissed from the process.

A total of 797 useable responses were collected. The data were weighted based on the 2010 U.S. Census, to ensure it was representative of the Georgia population during inferential data analysis (Baker et al., 2013; U.S. Census Bureau, 2010). Using SPSS 25 (Chicago, IL), data were then analyzed descriptively for objective one and objective two. Inferential statistics were used to address the third objective including an ANOVA analysis with effect sizes presented as *partial eta squared* values.

A demographic profile of the 797 respondents can be viewed in Table 1. Respondents were distributed evenly between genders and most of the respondents had some form of college experience (78.0%). Rurality was not equally distributed with fewer respondents from urban areas than suburban and rural areas. There was a range of ages from 18 to over 55 with fewer respondents representing the 18 - 34 age category. Finally, 57% of the respondents had a total family income (before taxes) of less than $60,000.

Table 1
Demographics of Respondents (N = 797)

	F	*%*
Sex		
Male	403	50.6
Female	394	49.4
Age		
18-34 years	226	28.4
35-54 years	285	35.8
55+ years	286	35.9
Race*		
White	445	55.8
Black	255	32.0
Asian	69	8.7
American Indian or Alaska Native	24	3.0
Other	29	3.6
Ethnicity		
Hispanic	100	12.7
Non-Hispanic	688	87.3
Education		
Less than 12th grade	22	2.8
High school diploma	153	19.2
Some college	198	24.8

Table 1
Demographics of Respondents (N = 797), Continued…

2-year college degree	76	9.5
4-year college degree	215	27.0
Graduate or Professional degree	133	16.7
Family Income		
Less than $19,999	112	14.1
$20,000 - $39,999	190	24.0
$40,000 - $59,999	150	18.9
$60,000 - $79,999	112	14.1
$80,000 - $99,999	76	9.6
$100,000 - $119,999	54	6.8
$120,000 or more	99	12.5
Rurality		
Urban	129	16.2
Suburban	323	40.5
Rural	345	43.3

Note. *Respondents were allowed to select more than one race therefore the total does not equal 100

Results

Public Perspectives Regarding Agriculture's Impact on the Natural Environment

Survey respondents were asked to indicate their level of agreement or disagreement with eight statements designed to capture respondents' positive perspectives regarding agriculture's impact on the natural environment (Table 2). Respondents agreed or strongly agreed farmers will be concerned about water resources when they make important decisions about farming (79.3%), farming protects our natural environment (62.2%), sound principles seem to guide farmers' behavior when it comes to water use (59.8%), farmers can be relied upon to keep their promises when it comes to water use (57.2%), and farm lands or privately-owned agricultural lands allow water to return to and recharge groundwater resources (56.7%).

Table 2
Respondents' Positive Perspectives Regarding Agriculture's Impact on the Natural Environment (N = 797)

	Strongly Disagree *(%)*	**Disagree** *(%)*	**Neither Agree nor Disagree** *(%)*	**Agree** *(%)*	**Strongly Agree** *(%)*
I know farmers will be concerned about water resources when they make important decisions about farming	3.3	2.1	15.3	34.6	44.7
Farmers can be relied upon to keep their promises when it comes to water use	2.8	5.8	34.3	38.8	18.4
Sound principles seem to guide farmers' behavior when it comes to water use	2.6	3.4	34.1	38.6	21.2
Farmers conserve water	2.0	6.5	43.0	32.7	15.7
Farming protects our natural environment	2.3	5.3	30.2	40.0	22.2
Farmlands or privately-owned agricultural lands allow water to return to and recharge groundwater resources	1.8	4.9	36.6	37.4	19.3
Farmers only use as much fertilizer as necessary on their fields and crops	3.0	10.8	39.0	31.4	15.8
Farmers only use as much pesticides as necessary on their fields and crops	3.3	11.2	41.4	30.7	13.4

Survey respondents were asked to indicate their level of agreement or disagreement on their negative perspectives regarding agriculture's impact on the natural environment (Table 3). Over half agreed or strongly agreed pesticides used on farms pollute natural water sources. At least 30% of all survey respondents neither agreed nor disagreed with all six items.

Table 3
Respondents' Negative Perspectives Regarding Agriculture's Impact on the Natural Environment (N = 797)

	Strongly Disagree *(%)*	**Disagree** *(%)*	**Neither Agree nor Disagree** *(%)*	**Agree** *(%)*	**Strongly Agree** *(%)*
I think it is important to watch farmers closely so they do not take advantage of water resources	3.9	13.0	38.4	28.6	16.1
Farming causes soil erosion	5.6	22.8	41.1	20.3	9.8
Farming causes water runoff	5.6	19.9	42.4	21.8	10.2
Fertilizers used on farms pollute natural water sources	3.8	9.2	40.2	31.9	15.1
Pesticides used on farms pollute natural water sources	3.1	6.6	34.9	35.3	20.1
Animal waste produced on farms pollute natural water sources	4.3	13.4	38.5	29.9	13.9

Public Perspective Regarding Agriculture's Impact on the Natural Environment Based on Rurality of Residential Location

Survey respondents' level of agreement or disagreement with eight statements designed to capture respondents' positive perspectives regarding agriculture's impact on the natural environment were analyzed descriptively based on rurality of residential location (Table 4). The majority of rural, urban, and suburban respondents agreed or strongly agreed farmers will be concerned about water resources when they make important decisions about farming (rural = 80.6%, urban = 76.7%, and suburban = 79.0%), farming protects our natural environment (rural = 63.7%, urban = 65.9%, and suburban = 59.1%), sound principles seem to guide farmers' behavior when it comes to water use (rural = 60.5%, urban = 62.8%, and suburban = 57.8%), and farmers can be relied upon to keep their promises when it comes to water use (rural = 57.7%, urban = 65.2%, and suburban = 79.0%). While the majority of rural (61.7%) and urban (62.1%) respondents agreed or strongly agreed farmlands or privately-owned agricultural lands allow water to return to and recharge groundwater resources, less than half of suburban (49.2%) respondents agreed or strongly agreed.

Table 4

Respondents' Positive Perspectives Regarding Agriculture's Impact on the Natural Environment Based on the Rurality of Residential Location (N = 797)

	Strongly Disagree *(%)*	**Disagree** *(%)*	**Neither Agree nor Disagree** ***(%)***	**Agree** *(%)*	**Strongly Agree** ***(%)***
I know farmers will be concerned about water resources when they make important decisions about farming					
Rural (*n* = 345)	4.3	3.2	11.9	35.7	44.9
Urban (*n* = 129)	2.3	1.6	19.4	30.2	46.5
Suburban (*n* = 323)	2.5	1.2	17.3	35.3	43.7
Farmers can be relied upon to keep their promises when it comes to water use					
Rural (*n* = 345)	4.1	6.1	32.2	38.3	19.4
Urban (*n* = 129)	0.8	5.4	28.7	41.9	23.3
Suburban (*n* = 323)	2.2	5.6	38.7	38.1	15.5
Sound principles seem to guide farmers' behavior when it comes to water use					
Rural (*n* = 345)	4.1	2.6	32.8	35.9	24.6
Urban (*n* = 129)	1.6	2.3	33.3	41.9	20.9
Suburban (*n* = 323)	1.5	4.6	35.9	40.2	17.6
Farmers conserve water					
Rural (*n* = 345)	2.9	7.2	40.0	33.3	16.5
Urban (*n* = 129)	2.3	3.9	38.8	30.2	24.8
Suburban (*n* = 323)	0.9	6.8	48.0	33.1	11.1
Farming protects our natural environment					
Rural (*n* = 345)	2.6	4.6	29.0	36.5	27.2
Urban (*n* = 129)	2.3	3.1	28.7	41.1	24.8

Table 4
Respondents' Positive Perspectives Regarding Agriculture's Impact on the Natural Environment Based on the Rurality of Residential Location (N = 797), Continued…

Suburban (*n* = 323)	1.9	6.8	32.2	43.3	15.8
Farmlands or privately-owned agricultural lands allow water to return to and recharge groundwater resources					
Rural (*n* = 345)	2.0	4.6	31.6	39.7	22.0
Urban (*n* = 129)	1.6	4.7	31.8	35.7	26.4
Suburban (*n* = 323)	1.5	5.3	44.0	35.6	13.6
Farmers only use as much fertilizer as necessary on their fields and crops					
Rural (*n* = 345)	3.5	10.1	38.0	32.8	15.7
Urban (*n* = 129)	1.6	11.6	31.0	33.3	22.5
Suburban (*n* = 323)	3.1	11.1	43.3	29.1	13.3
Farmers only use as much pesticides as necessary on their fields and crops					
Rural (*n* = 345)	4.1	12.2	39.4	31.0	13.3
Urban (*n* = 129)	1.6	7.0	38.0	32.6	20.9
Suburban (*n* = 323)	3.1	11.8	44.9	29.7	10.5

Survey respondents' level of agreement or disagreement with six statements designed to capture respondents' negative perspectives regarding agriculture's impact on the natural environment were analyzed descriptively based on rurality of residential location (Table 5). Less than half of the rural respondents agreed or strongly agreed with each of the six items. Conversely, urban respondents agreed or strongly agreed it was important to watch farmers closely so they do not take advantage of water resources (55.8%), fertilizers (58.1%) and pesticides (62.0%) used on farms pollute natural water sources, and animal waste produced on farms pollute natural water sources (52.8%).

Table 5
Respondents' Negative Perspectives Regarding Agriculture's Impact on the Natural Environment Based on the Rurality of Residential Location (N = 797)

	Strongly Disagree (%)	Disagree (%)	Neither Agree nor Disagree (%)	Agree (%)	Strongly Agree (%)
I think it is important to watch farmers closely so they do not take advantage of water resources					
Rural (n = 345)	5.8	14.2	39.1	25.5	15.4
Urban (n = 129)	3.1	7.0	34.1	36.4	19.4
Suburban (n = 323)	2.2	14.2	39.3	28.8	15.5
Farming causes soil erosion					
Rural (n = 345)	8.7	28.1	39.4	13.9	9.9
Urban (n = 129)	1.6	14.7	39.5	29.5	14.7
Suburban (n = 323)	4.0	20.4	44.3	23.5	7.7
Farming causes water runoff					
Rural (n = 345)	8.7	23.8	41.7	15.1	10.7
Urban (n = 129)	3.9	10.9	38.8	31.8	14.7
Suburban (n = 323)	3.1	19.5	44.6	25.1	7.7
Fertilizers used on farms pollute natural water sources					
Rural (n = 345)	5.8	12.2	40.0	28.4	13.6
Urban (n = 129)	3.1	5.4	33.3	36.4	21.7
Suburban (n = 323)	1.9	7.4	43.0	33.7	13.9
Pesticides used on farms pollute natural water sources					
Rural (n = 345)	4.3	9.3	37.4	30.1	18.8
Urban (n = 129)	3.1	5.4	29.5	40.3	21.7
Suburban (n = 323)	1.9	4.3	34.4	38.7	20.7
Animal waste produced on farms pollute natural water sources					
Rural (n = 345)	7.0	17.7	36.5	26.1	12.8
Urban (n = 129)	1.6	7.8	38.0	32.6	20.2
Suburban (n = 323)	2.5	11.1	40.9	32.8	12.7

Respondents' overall positive perspectives on agriculture's impact on the environment, which was the average of the responses of the eight items, was moderately high (M = 3.67, SD = 0.69). Respondents' overall negative perspectives on agriculture's impact on the environment, which was the average of the responses of the six items, was fairly high (M = 3.33, SD = 0.79). When split out, urban respondents had the most positive perspectives on agriculture's impact on the environment (M = 3.80, SD = 0.71), followed by rural respondents (M = 3.68, SD = 0.73) and suburban respondents (M = 3.60, SD = 0.63). Urban respondents had the most negative perspectives on agriculture's impact on the environment (M = 3.58, SD = 0.77), followed by suburban respondents (M = 3.39, SD = 0.68) and rural respondents (M = 3.19, SD = 0.86). The full series of results can be seen in Table 6.

Table 6
Comparison of Respondents' Perspectives on Agriculture's Impact on the Environment

	M	*SD*
Respondent's positive perspectives on agriculture's impact on the environment (*N* = 797)	3.67	.69
Rural (*n* = 345)	3.68	.73
Urban (*n* = 129)	3.80	.71
Suburban (*n* = 323)	3.60	.63
*Respondent's negative perspectives on agriculture's impact on the environment (*N* = 797)	3.33	.79
Rural (*n* = 345)	3.19	.86
Urban (*n* = 129)	3.58	.77
Suburban (*n* = 323)	3.39	.68

Note. *A larger mean indicates a more negative perspective.

Determine if Public Perspectives Regarding Agriculture's Impact on the Natural Environment Differed Based on Rurality

An ANOVA was used to determine if respondents' positive and negative perspectives of agriculture's impact on the natural environment was statistically significantly different between rural, urban, and suburban groups. The results indicated the rurality of where individuals reside was statistically significant in determining respondents' positive ($F = 3.97$, $p = .01$) and negative ($F = 12.99$, $p = .00$) perspectives of agriculture's impact on the natural environment (Table 7). The observed effect sizes for both analyses were greater than .01 and therefore classified as small (Cohen, 1988).

Table 7
Differences in Perspectives on Agriculture's Impact on the Environment Based on Rurality

	df	*F*	*p*	n_p^2
Respondent's positive Perception of Agriculture's Impact on the Natural Environment	2	3.97*	.01	.01
Respondent's negative Perception of Agriculture's Impact on the Natural Environment	2	12.99*	.00	.03

Note. *$p < .05$

Using a Bonferroni *post hoc* test, differences between the three groups' positive perspectives were further analyzed (Table 8). The test indicated urban respondents have a more positive perspective on agriculture's impact on the natural environment than suburban respondents. There was not a statistically significant difference between urban and rural or rural and suburban respondents.

Table 8
Bonferroni Test Results of the Differences in Respondents' Positive Perspectives on Agriculture's Impact on the Natural Environment

(I) Classification	(J) Classification	Δ*M* (I - J)	*SE*	*p*
Rural	Suburban	.08	.05	.39
	Urban	-.12	.07	.29
Suburban	Rural	-.08	.05	.39
	Urban	-.20*	.07	.02
Urban	Rural	.12	.07	.29
	Suburban	.20*	.07	.02

Note. *$p < .05$

Differences between the three groups' negative perspectives were also explored using a Bonferroni *post hoc* test (Table 9). The test indicated urban respondents had a more negative perspective on agriculture's impact on the natural environment than rural and suburban respondents. Additionally, suburban respondents had a more negative perspective on agriculture's impact on the natural environment than rural respondents.

Table 9
Bonferroni Test Results of the Differences in Respondents' Negative Perspectives on Agriculture's Impact on the Natural Environment

(I) Classification	(J) Classification	Δ*M* (I - J)	*SE*	*p*
Rural	Suburban	-.19*	.06	.00
	Urban	-.39*	.08	.00
Suburban	Rural	.19*	.06	.00
	Urban	-.19*	.08	.05
Urban	Rural	.39*	.08	.00
	Suburban	.19*	.08	.05

Note. *$p < .05$

Conclusion, Implications and Recommendations

Agricultural BMPs offer numerous environmental advantages (He et al., 2019); however, many members of the U.S. public are unaware of the changes the agricultural industry has made to protect the environment. Previous research has found differences between agricultural opinion leaders and the general public as it relates to environmental conditions, such as water conservation and quality issues (Lamm et al., 2015); however, the potential differences between general public groups based on urban, suburban, or rural conditions remained unexamined. This study explored differences in public perspectives regarding agriculture's impact on the natural environment based on rurality. It should be acknowledged there were limitations to this study, including the unequal sample sizes between groups. The urban group ($n = 129$) was smaller than the rural ($n = 345$) and suburban ($n = 323$) group. Variance among samples may be caused from unequal sample sizes, potentially influencing the ANOVA results (Rusticus & Lovato, 2014). Additionally, this study included generalizations for rurality as residents self-indicated their current rurality and amount of time living in Georgia; however, the fluidity of their rurality is unknown. Future studies would benefit from asking respondents to indicate their current rurality status as well as the rurality they identify with the most. Finally, Georgia residents were specific to this study; thus, the study may not be generalizable beyond this population due to the unique landscape in the state of Georgia.

The key findings revealed statistically significant differences in respondents' perspectives regarding agriculture's impact on the natural environment. Specifically, urban respondents had a more positive perspective on agriculture's impact on the natural environment than suburban respondents. Additionally, urban respondents had a more negative perspective on agriculture's impact on the natural environment than suburban respondents, and urban and suburban respondents had a more negative perspective on agriculture's impact on the natural environment than rural respondents. Therefore, as suggested by previous studies (Huang et al., 2016; Kim & Weiler, 2013; Warner et al., 2017), extension educators need to tailor outreach programs in order to effectively communicate with audiences of differing rurality.

The findings imply extension educators need to address urban and suburban residents with tailored messages when discussing positive perspectives on agriculture's impact on the natural environment. For example, extension educators who work predominately with urban audiences may benefit from existing positive perceptions and may educate audiences with in-person or virtual experiences at a farm, such as talking with a farmer (Boogaard et al., 2011), whereas extension

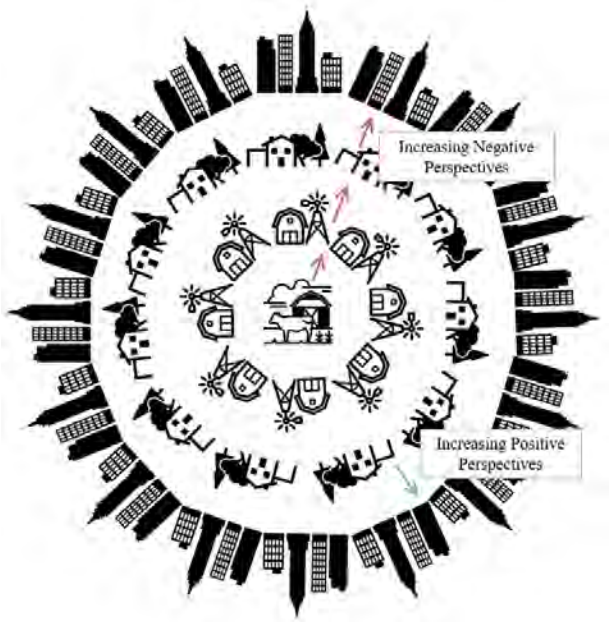
educators who work predominately with suburban residents may work to develop more positive perceptions by educating about baseline information on agriculture.

Contradictory to respondents' positive perspectives on agriculture, urban residents were more negative than both suburban and rural residents and suburban residents were more negative than rural residents when discussing negative perspectives on agriculture's impact on the natural environment. The stronger negative perspectives among the urban and suburban audience segment may be influenced by how removed urban residents are from agriculture, causing them to learn more about agriculture from the media than their own personal interactions. This finding aligns with that of Warner et al. (2018), who discussed a disconnect from natural resources among more urban residents. Thus, it is important that extension educators use tailored education messages based on rurality that also consider the tone of information when deciding how the message is tailored. For example, Busch and Spiller (2018) found livestock farming pictures and videos are a good starting point for a discussion about agriculture. Thus, using negatively framed photos or videos, such as a comparison between water pollutants from a farm using and not using BMPs, may be a good starting point for extension educators to communicate with urban and suburban audiences. Moreover, extension education for rural audiences may enable individuals to teach others about agriculture through everyday conversations and advocacy (Warner et al., 2017).

The results of respondents' negative perspectives regarding agriculture's impact on the natural environment suggest negative framing may have the greatest influence on respondents' perspectives. As the public is further removed from agriculture, their perspective regarding agriculture's impact on the environment becomes more negative (Figure 1). For example, rural residents who reside near production agriculture have the least negative perspective regarding agriculture's impact on the environment. As the population shifts from rural to urban areas, perspectives regarding agriculture's impact on the environment become more negative. This is similar to the findings from Ashlock et al. (2006) and Ruth et al. (2005) suggesting the negative frames used by the media largely influence public perception of agriculture. Based on the study results, differences in the audience segments' positive perspectives regarding agriculture's impact on the natural environment were not as evident as negative perspectives. For example, urban residents were more positive than suburban residents; however, there were no statistically significant differences with rural residents. Thus, extension educators may not benefit from focusing on positive messages but rather need to target public emotional response to negative messages that are consistent with mainstream media. Following principles of audience segmentation, extension educators can use these findings to prioritize programming resources to deliver appropriate information as needed by specific audience segments (Lee & Kotler, 2011).

Figure 1

Concentric Barriers to Agricultural Communication Messages to Non-Agricultural Audiences



For example, urban audiences may benefit the most from education that focuses on the negative impact of not incorporating BMPs into agriculture via storytelling, which elicits emotion and alters perceptions (Sulpovar, 2011). Stories may include personal experiences by farmers, consumer encounters with farmers, and other experiences that reflect the negative impact of farming without BMPs. Grace and Kaufman (2013) found storytelling promoted positive change in the public's attitude toward sustainable agriculture as compared to information only messages. Thus, incorporating negative frames into storytelling may elicit the most emotions from audiences; ultimately having the greatest potential to alter agricultural perceptions. If extension educators do not adhere to the same negative framing standards as the media, they may forgo an opportunity to educate urban residents about agriculture. Therefore, a focus on negative framing via audience segmentation may be the most effective education approach when reaching out to urban audiences.

Considering the continuous shifts in agriculture throughout the U.S., the need to effectively communicate with the public about agricultural BMPs cannot be avoided. If the public remains unaware of the steps agriculture is taking to protect the environment, new environmental management policies may continue to be introduced that create issues for producers rather than utilizing policies that benefit both producers and the environment. Based on the findings of this study, extension educators must educate audiences based on their differing educational needs, including those defined by rurality, in order to effectively educate the public. Additionally, urban and suburban audiences may benefit from education messages framed in a more negative context by extension educators. There is an opportunity for agricultural communication professionals to partner with extension educators to develop these types of messages integrating negative frames and informed by framing theory.

Future studies should be conducted throughout the U.S. to determine if perspectives consistently differ depending on geographic location. It is important to acknowledge different regions of the U.S. may have different encounters with agriculture because one urban area may be more secluded than another. Extreme environmental events and other types of crises are often location specific and the extent and type of media influence may be extremely diverse across the country.

Collecting zip codes in a national survey may allow researchers to evaluate the geographic landscape where respondents reside. Future studies are also recommended to assess the impact of negatively-framed agricultural messages on public sentiment to determine if they benefit extension educators in their education efforts as predicted. A quantitative pretest-posttest survey design administered to extension program participants to initially understand the impact of the negatively-framed agricultural messages, such as stories or pictures, will allow for further refinement of these messages. Depending on the ambiguity of the results, a qualitative focus group may be needed to further explore public perspectives.

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