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Abstract
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Keywords
Agriculture, Messaging, Source Credibility, Video, Water

RESEARCH

Influence of Source Credibility on Agricultural Water Use Communication

Alexa J. Lamm, , Courtney T. Owens, Ricky W. Telg, and Kevan W. Lamm

ABSTRACT

As the agriculture industry strives to communicate with the public about its role in protecting natural resources such as water, it struggles to provide messages from sources the public trusts. The purpose of this quasi-experimental study explored public perception of agricultural water use and how perception was influenced by a video message delivered from four different sources including 1) an environmental scientist from the Nature Conservancy, 2) a farmer, 3) a regulator from a Florida water management district, and 4) a water scientist from the University of Florida. The findings revealed that overall the general public had a positive view of how the agriculture industry used water, regardless of message source. Differences between groups were evident when message source expertise and trustworthiness was dependent on domain area. Results indicated the respondents receiving the Nature Conservancy video treatment exhibited a significantly higher level of agreement with negatively framed items related to agriculture's relationship with the natural environment than the respondents receiving the farmer video treatment. Based on the findings from this study, agricultural communicators should consider the trustworthiness and perceived expertise of sources, such as representatives from regulatory agencies, educational institutions, members of the agriculture sector, or environmental organizations, when developing messages about water use targeted at the general public.

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KEY WORDS

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INTRODUCTION

Human existence is based on the belief that water will remain accessible and obtainable in people's everyday lives (Oki, 2006). On average 13.2 gallons of water a day is adequate to sustain a single person and approximately 400 billion gallons of water are used in the United States each day (United States Environmental Protection Agency, 2015). Most Americans view water as a never-ending resource (Leal, Rumble, & Lamm, 2015), forgetting that only 2.5% of earth's water is drinkable (Postel, Daily, & Ehrlich, 1996). The reality is that water is a shared natural resource used extensively by people in their homes and landscapes, by businesses and industry broadly, while also being an essential part of agricultural industries (Ercin & Hoekstra, 2014; Schaible & Aillery, 2012).

According to the United States Department of Agriculture (USDA), agriculture is a significant user of ground and surface water, accounting for 80% of the nation's consumption (Schaible & Aillery, 2012). New policies and regulations have been implemented over the last several years to conserve water for agricultural purposes (United States Environmental Protection Agency, 2012). In recent years, the agriculture industry, as a whole, has made changes to conserve and protect water

resources, including farmers implementing best management irrigation practices to conserve water on farms (Schaible & Aillery, 2012), and applying only the minimal amount needed for crops (United States Environmental Protection Agency, 2012). Through improved best management practices, more water is being conserved without sacrifice to crops and livestock production (United States Environmental Protection Agency, 2012).

However, because the public is largely unaware of these proactive efforts, there continues to be many misconceptions surrounding the impact of agricultural water use (United States Department of Agriculture Natural Resources Conservation Service, 2006) which may be attributed to negative media coverage (Gaines, 2014; Whitaker & Dryer, 2000). According to Eyck (2000), media coverage of the agricultural industry is more likely to include stories involving disasters, such as food poisoning, and other general food safety issues, further eliciting fear about the agriculture industry and encouraging a negative public attitude towards agriculture (Laros & Steenkamp, 2004). This enhanced negative environment only increases the gap in understanding between agricultural producers and consumers that make up the general public (Goodwin & Rhoades, 2011; Taylor, 2013). Lundy, Ruth, and Park (2008) found consumers rely on different sources of media to stay informed about agricultural issues, indicating there is an opportunity for agriculture to have a voice in alleviating some of the public's concern. However, if agriculture in general is not trusted, the question remains of who is best suited to deliver positive messages the public will listen to about agricultural water use.

Source credibility theory (Hovland, Janis, & Kelley, 1953) describes the influence of perceived expertise and trustworthiness on how people process information and create attitudes. According to Hovland et al. (1953), source expertise is "the extent to which a communicator is perceived to be a source of valid assertions" (p. 21), while source trustworthiness is "the degree of confidence in the communicator's intent to communicate assertions he considers most valid" (p. 21). Therefore, individuals are more likely to be swayed if the source is alleged to be credible (Hovland et al., 1953). A communicator's expertise, trustworthiness, attractiveness, and power represent the psychological construct associated with source credibility. In particular, the perception of a messenger will influence how a message is perceived and whether it will change attitudes and behavior (Petty & Cacioppo, 1981; Underwood, 2003).

Source credibility theory also examines the level to which people accept information from a person they perceive to have expert status, when compared to a person perceived as less qualified (O'Keefe, 1990). For example, information that is delivered from a person who is well known and considered to be an expert should have more influence (Telg, Irani, Monaghan, Chiarelli, Scicchitano, & Johns, 2012). Therefore, a message delivered by an individual perceived as a credible source about a particular topic – agricultural water usage, for example – may have a more meaningful effect than the same message delivered by someone not seen as credible (Telg et al., 2012).

Ayeh (2015) examined whether source credibility factors and technology acceptance factors were predictors of online travelers' attitude and intention to use consumer-generated media for travel planning. The findings indicated that source credibility factors captured variations in perceived usefulness and attitudes not be accounted for by a model that only included technology acceptance (Ayeh, 2015). The study findings were consistent with earlier studies that confirmed the important effects of source trustworthiness on numerous consumer outcomes, such as attitudes towards a message, source credibility, and disposition towards information (Jin, Cheung, Lee, & Chen, 2009; Kerstetter & Cho, 2004; Lafferty & Goldsmith, 1999).

Barr, Irlbeck, Meyers, and Chambers (2011) interviewed Texas television journalists to determine factors they used to select interview sources for stories on agriculture topics. Results indicated that government sources were considered to be credible, with commodity groups and corporations seen as less credible. Interest groups were regarded as biased. Researchers noted that the television journalists would use sources from special interest groups, even though they were viewed as being more biased, when these groups were perceived to have factual information to support a story. Lundy et al. (2007) studied the effects of a reality television show, to determine whether viewers' observations of individuals working in the agricultural field could alter perceptions of agriculture. Results indicated the reality television show did influence viewers' opinions and behavior. These findings were supported by Meyers, Irlbeck, and Fletcher (2011), who also found the public relied on the media, in general, to acquire information about current events related to the agricultural industry.

PURPOSE AND OBJECTIVES

The research presented in this paper is from a larger study examining the general public's attitudes and perceptions of how the agriculture industry in Florida uses water. The purpose of the study presented in this paper, therefore, was to identify the role source credibility plays in public attitude formation and perceptions regarding agricultural water use. The study was driven by the following research objectives:

1. Identify public attitude towards and perceptions of agricultural water use.
2. Determine if the source of a message influences public attitude towards and perceptions of agricultural water use.

METHODS

This study used a quasi-experimental design delivered through an online survey to answer the research questions. The population of interest was residents of Florida, age 18 or older. The study was limited to this state because water has been recurrently identified as the number one issue facing the state, both from an agricultural and natural resources perspective (Odera, Lamm, Irani, Dukes, Carter, & Galindo-Gonzalez, 2013).

As noted, the research presented here was part of a larger study with two sections of the survey instrument germane to the findings in this study: attitude towards agricultural water use and perceptions of agricultural water use. The study was funded by three major statewide agriculture organizations: Florida Farm Bureau, Florida Dairy Farmers, and the Florida Department of Agriculture and Consumer Services. Prior to answering any questions about their attitudes and perceptions about agricultural water use, the respondents were randomly assigned one of four videos to watch that described how farmers use best management practices to reduce agricultural water use and how the public uses more water than farmers, on average. The videos can be viewed at:

https://www.youtube.com/watch?v=OTLkyAemxEM

https://www.youtube.com/watch?v=5BIHTwk-In4

https://www.youtube.com/watch?v=ba3XV0AtyuM

https://www.youtube.com/watch?v=-ku5-mLEFeI

The four videos were identical except for the source treatment. When the speaker was on screen, a different title (lower third, below the speaker's face) was presented. In addition, a logo and Web address was presented at the conclusion of the video, aligning with the title presented when the speaker was on screen. These four sources were 1) an environmental scientist from the Nature Conservancy, 2) a farmer from CostaFarms, 3) a regulator from the Florida Water Management District, and 4) a water scientist from the University of Florida. Screen shots of where the differences existed within the video can be seen in Figure 1.

Timing was set on the videos to ensure the respondents watched the video in its entirety and a check was put in place asking the respondents if they were able to watch the video upon its conclusion. If the respondents did not spend enough time on the video or check that they were able to watch the video, they were exited out of the survey.

Figure 1. Screenshots of the sources displayed in the video treatments. Top to bottom source was identified as farmer, a water management district regulator, a water scientist from a university, and an environmental scientist from the Nature Conservancy.

After watching the randomly assigned video, respondents were asked to indicate their attitude towards agricultural water use on a six-item semantic differential scale. Respondents were given the sentence: "When it comes to protecting water in Florida, farmers are…." Respondents then chose where on a five-point scale between two words their attitude most closely aligned. The word pairings were *good/bad, positive/negative, careful/careless, thoughtful/thoughtfulness, cautious/reckless, innovative/old-fashioned.* A score of one indicated a negative attitude, while a five indicated a positive attitude. Responses to the six word pairings were averaged to create an overall attitude towards agricultural water use score. Reliability was calculated ex post facto and was found to be sufficient with an observed Cronbach's α of .95.

Respondents were then asked to indicate their level of agreement with a variety of statements about agriculture and farming practices to determine their perceptions of agricultural water use. Key concepts examined included trust in agricultural water use and protection, agricultural use of resources, agriculture's relationship with the natural environment (positive and negative frames), and the impact of agriculture on open space and wildlife. All questions were asked using a 5-point Likert-type agreement scale with 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*.

An example of the four items making up the trust of agricultural water use and protection concept is: *Farmers can be relied upon to keep their promises when it comes to water use*. An example of the three items making up the agricultural use of resources concept is: *Farmers should save as much water as possible when irrigating crops even if it means I have to pay more for the food I purchase*. An example of the five items making up the agriculture's relationship with the natural environment - positive frame concept is: *Farming protects our natural environment*. An example of the four items making up the agriculture's relationship with the natural environment - negative frame concept is: *Farming causes water runoff*. An example of the seven items making up the impact of agriculture on open space and wildlife concept is: *Protecting farms is a way to preserve open space*.

Responses to the series of items within each key concept area were averaged to create overall index scores. Reliability of the five indexes were calculated *ex post facto* resulting in Cronbach's α coefficients of .73 or higher. Lastly, respondents were asked a series of demographic questions.

An expert panel with expertise in water quality and quantity issues, agricultural water issues, and public opinion research reviewed the instrument for content, face validity, and survey design and Institutional Review Board approval was obtained. The panel of experts included the Associate Director of the University of Florida Center for Public Issues Education for Agriculture and Natural Resources, the Associate Director of the Office of Agricultural Water Policy at the Florida Department of Agriculture and Consumer Services, the Director of Government and Community Affairs at the Florida Farm Bureau, the Chief Executive Officer of the Florida Dairy Farmers, and an evaluation specialist with a background in survey design and construction.

To collect public opinion, a non-probability opt-in sample was obtained from a public opinion survey research company. Non-probability samples are often used in public opinion research to make population estimates (Baker et al., 2013). While non-probability samples require adjustments for nonrandom selection and nonresponse, previous literature has shown non-probability samples have yielded results that are as good as or even better than probability-based samples (Abate, 1998; Twyman, 2008; Vavreck & Rivers, 2008).

The public opinion survey research company sent a link to the developed survey to Florida residents representative of the state population based on the 2010 Census data. A response rate of 89% (N = 525) was obtained. Non-probability samples require adjustments for nonrandom selection and the potential for non-response (Baker et al., 2013). Weighting was conducted *post hoc* using post-stratification methods (Kalton & Flores-Cervantes, 2003) based on the 2010 Florida census data to ensure the sample reflected the adult Florida population and to provide results intended to approximate the population of interest. When using non-probability opt-in samples post-stratification weighting methods have been found to yield results that are as good as those obtained using probability-based samples (Abate, 1998; Twyman, 2008). Data was analyzed using SPSS statistical software including descriptive statistics and ANOVAs.

RESULTS

Demographics

Demographic data indicated the respondents were 51.6% female and 48.4% male (Table 1). The majority (75.6%) of respondents were Caucasian/White (Non-Hispanic), with Hispanics representing 17% of the respondents, and African Americans representing 15.8% of the respondents. Over half of the respondents were less than 50 years of age (54%). The number of years respondents had lived in the state were fairly equally distributed.

Table 1

Demographics

Characteristic	*n*	%
Sex		
Female	271	51.6
Male	254	48.4
Race		
African American	83	15.8
Asian	34	6.5
Caucasian/White (Non–Hispanic)	397	75.6
Native American	0	0
Other	11	2.1
Hispanic Ethnicity	89	17.0
Age		
18 – 29	112	21.5
30-39	89	17.0
40-49	81	15.5
50-59	107	20.5
60-69	95	18.2
70-79	31	5.9
80 and older	7	1.3
Years Living in Florida		
0-9	115	21.9
10-19	131	25.0
20-29	133	25.3
30 and above	146	27.8

Note. Percentages have been rounded and may not total to 100.

Attitude towards and perceptions of agricultural water use

The overall descriptive results were calculated prior to accounting for treatment effects. Results indicated respondents had a generally positive attitude about agricultural water use (Table 2). Respondents agreed agricultural producers should minimize their use of resources even if it means they would have to pay more for products. Respondents also agreed agriculture has a positive relationship with the natural environment, and agriculture has a positive impact on protecting open space and wildlife. Respondents indicated they trusted agriculture's use and protection of water resources. Respondents indicated a neutral response to the set of questions negatively framed around agriculture's relationship with the natural environment.

Table 2

Attitudes and perceptions of agricultural water use based on indexes

	M	*SD*	α
Attitude towards agricultural water use	4.28	.83	.94
Agricultural use of resources	3.82	.89	.85
Agriculture's relationship with the natural environment – positive frame	3.80	.67	.84
Impact of agriculture on open space and wildlife	3.75	.64	.81
Trust in agricultural water use and protection	3.69	.66	.73
Agriculture's relationship with the natural environment – negative frame	3.50	.76	.85

Influence of message source on attitude towards and perceptions of agricultural water use

A series of ANOVAs were run to determine if statistically significant differences existed, based on respondent treatment group (Table 3). The results indicated there were statistically significant differences in responses based on treatment group to the *agriculture's relationship with the natural environment* concept when the items were negatively framed ($F = 2.85$, $p = .04$) and *impact of agriculture on open space and wildlife* concept ($F = 4.71$, $p = .00$). Even though these results were significant, the effect sizes were not very large (.02 and .03 respectively), therefore the data was explored further.

Table 3

Attitudes and perceptions of agricultural water use based on message source received

	Nature Conservancy Scientist *M (SD)*	University Scientist *M (SD)*	Water Management District Regulator *M (SD)*	Farmer *M (SD)*
Attitude towards agricultural water use	4.31 (.80)	4.34 (.77)	4.20 (.80)	4.24 (.92)
Trust in agricultural water use and protection	3.64 (.71)	3.73 (.64)	3.63 (.67)	3.72 (.63)
Agricultural use of resources	3.82 (.80)	3.77 (.94)	3.76 (.95)	3.90 (.89)
Agriculture's relationship with the natural environment – positive frame	3.72 (.68)	3.88 (.61)	3.78 (.72)	3.83 (.67)
Agriculture's relationship with the natural environment – negative frame*	3.64 (.63)	3.52 (.74)	3.47 (.79)	3.38 (.85)
Impact of agriculture on open space and wildlife**	3.60 (.69)	3.82 (.57)	3.73 (.61)	3.86 (.64)

Note. *$p < .05$ level; **$p < .01$

A Bonferroni test was run post hoc and found there were statistically significant differences between the respondents receiving the Nature Conservancy and farmer video treatments within both concept areas. The mean difference (.26) between the group receiving the Nature Conservancy treatment and the farmer treatment on the *agriculture's relationship with the natural environment* - negative frame concept was significant ($p = .03$). The results indicated the respondents receiving the Nature Conservancy video treatment exhibited a significantly higher level of agreement with negatively framed items related to agriculture's relationship with the natural environment than the respondents receiving the farmer video treatment. In addition, the mean difference (.26) between the group receiving the Nature Conservancy treatment and the farmer treatment on the *impact of agriculture on open space and wildlife* concept was significant ($p = .00$). The results indicated the respondents receiving the farmer video treatment had a significantly higher level of agreement with the items indicating agriculture has a positive impact on open space and wildlife than the respondents receiving the Nature Conservancy video treatment.

DISCUSSION

The results of this study provide an empirical analysis of the general public's attitude towards and perceptions of agricultural water use. Additionally, an analysis of the quasi-experimental research design was able to explain whether source credibility and, specifically, message source influence the general public's attitude towards and perception of agricultural water use. The use of a large and demographically representative sample supports the observations and conclusions associated with this research.

Overall, the results indicated the general public had a positive attitude towards how the agriculture industry uses water. Respondents were supportive of agriculture taking the steps necessary to conserve water, even if such actions had a financial consequence to them through increased food prices. Additionally, respondents indicated agriculture had a positive relationship with the natural environment and a positive impact on open space and wildlife. Respondents also tended to agree agriculture used water in an appropriate manner and was committed to protecting water resources. From a critical perspective, respondents were unsure whether agriculture had negative effects on the natural environ-

ment through post-agricultural water use such as run-off. Nevertheless, the general public was inclined to be supportive of agricultural water use and was largely positive across use dimensions.

An implication of these findings is that the general public may have more positive views about agricultural water use than previously thought. For example, Lamm, Lamm, and Carter (2015) found there was a statistically significant knowledge gap between the general public and agricultural opinion leaders regarding water issues in Florida. Specifically, agricultural opinion leaders were found to have a higher level of knowledge of water issues than the general public. However, findings associated with the current research may indicate that the knowledge gap is less relevant than the general public's attitude toward and perception of agricultural water use. Future research is recommended to further analyze whether the general public's attitude is influenced by their knowledge of water issues.

Based on these findings, it would appear that agriculture is well positioned to take advantage of generally favorable public perceptions of agricultural water use. Based on the concepts of agenda setting, framing, and priming within the media (Iyengar & McGrady, 2007), a recommendation would be to continue to cultivate such perceptions and to educate the general public on the current and planned actions the agricultural industry intends to undertake regarding the stewardship of Florida's water resources through available media channels. For example, the 79% reduction in phosphorous flowing agricultural lands near the Everglades was promoted within a newspaper editorial:

> To put this achievement in perspective, state law requires Everglades Agriculture Area farms to achieve an annual 25 percent reduction in phosphorous. Not only did local farmers reduce phosphorous levels by more than three times what the law required, but they continued a 20-year trend in which farmers have reduced phosphorous levels by an average of 56 percent annually (Collins, 2015, para. 2).

Efforts to proactively participate in the agenda setting process and continuing to focus on priming a positive and supportive attitude towards agricultural water use should yield beneficial results.

According to source credibility theory, to maximize the potential value associated with messaging, it is important not only to focus on what information to communicate, but also to ensure the right source is delivering the information (Hovland et al., 1953). The results of the current research support these assertions, and confirm that source credibility is germane to agricultural water use messaging (Hovland et al., 1953) however, given the small effect size, these findings should be used with caution. Acknowledging this, the mean score observed with respondents exposed to the farmer source treatment regarding the impact of agriculture on open space and wildlife was statistically significantly higher than scores associated with the Nature Conservancy treatment. Perhaps farmers are considered experts in the field and, therefore, are recognized as a credible source and listened to more closely (Erdem & Swait, 2004).

To the contrary, mean scores associated with respondents exposed to the Nature Conservancy treatment were statistically significantly higher than those in the farmer treatment related to agriculture's negative relationship with the natural environment. This finding is noteworthy as the experimental videos were constructed from a positive perspective; no negative relationships between agriculture and the environment were indicated. Therefore, the higher mean scores associated with the negative-framed questions in the Nature Conservancy condition may not be so much a consequence of delivered content as with priming associated with the information source.

An implication associated with these findings is that information source must be treated with paramount importance when delivering messages to the general public. As source credibility theory posits, messages should be delivered by individuals with expertise and trustworthiness within the content domain. For example, watershed benefits associated with agricultural actions may be best delivered by an agriculturalist from the area. However, it may also be appropriate to limit messaging to only those areas within which the source may be perceived to be an expert. The same farmer who is credible regarding the local watershed may lack the necessary credentials to be an authority on national water policy. A recommendation for future research would be to examine the boundary conditions that may exist related to domain specific source credibility from both a content and geographic perspective.

A further recommendation associated with these research findings is to engage in message coordination with individuals or organizations that have similar goals (Hahn, Greene, & Waterman, 1994; Lamm et al., 2015). Coordinating messaging should improve coverage and message salience. However, prior to engaging in a coordinated effort, a thorough review of perceived domain expertise and trustworthiness alignment is suggested. Specifically, individuals or organizations with parallel yet non-redundant expertise should result in superior message clarity and benefit relative to those that are composed of entities viewed with disparate levels of expertise. Future research is recommended to examine how audience perceptions are impacted by messages delivered by multiple parties within varying degrees of perceived expertise. Results associated with such research may better inform the flexibility with which coordinating entities are engaged.

It is also recommended that further research examine how individuals' previous experience with agriculture influences how information from a message source is received. Perhaps individuals who have grown up in a rural area, have experience with agriculture, or have family members engaged in agriculture are more likely to perceive a farmer as an expert than those who do not. In addition, perhaps political ideology plays a role in perceived source credibility. Individuals with a more conservative ideology may perceive information from a source, such as the Nature Conservancy, differently than those with a more liberal ideology. Exploring the influences of detailed demographic characteristics could further guide the best approaches to communicating about agricultural water use.

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