

It Takes Two: Public Understanding of Agricultural Science *and* Agricultural Scientists'  
Understanding of the Public

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## **ABSTRACT**

This study examined the beliefs agricultural scientists have about the public understanding of agricultural science and science, in general. A stratified random sample of members of the Southern Association of Agricultural Scientists was taken, with a response rate of 20.6%. Respondents said that the public does not understand the respondents' particular agricultural discipline or science in general. Respondents indicated that it is their responsibility to help people understand their agricultural discipline, but they indicated less responsibility for helping people understand science in general. Similarly, respondents were more willing to work with reporters and to receive media relations training if it helped people understand their agricultural discipline than if it helped people understand science in general. Respondents agreed that they would receive media relations training if they believed it would benefit them personally or their university. While respondents agreed that it is their responsibility to help people understand their agricultural discipline, they were less convinced in their colleagues' conviction of this responsibility.

**KEYWORDS:** science communication, public understanding of science, agricultural science, agricultural scientists, journalists, science literacy

## **Introduction**

### *Public Awareness and Understanding of Science*

The current relationship between science and the public has caused increased concern from the scientific community (Gregory & Miller, 2004). This concern stems from the public's lack of awareness, knowledge, and understanding toward science issues. Individuals learn about science in formal and informal settings. In each of these settings, individuals develop attitudes about and knowledge of science. Differentiating attitudes and knowledge, researchers have distinguished public awareness of science from public understanding of science.

Public awareness of science, according to Gilbert, Stocklmayer, and Garnett (1999), refers to the development of positive attitudes toward science and technology. These attitudes manifest in various skills and behavioral intentions. In contrast, Bryant (1998) defines public understanding of science as “the comprehension of scientific facts, ideas and policies, combined with a knowledge of the impact such facts, ideas and policies have on the personal, social and economic well-being of the community” (p. 2).

Previous studies on public understanding of science indicate that science literacy levels are generally low throughout the general public (Hartz & Chappell, 1997; Paisley, 1998). Much research has been conducted on the reasons for this science illiteracy, which include lack of science background or knowledge by news media, news-gathering norms, editorial pressures on journalists, the failure of scientists to communicate with the public, and the public's lack of interest in science information (Treise & Weigold, 2002). Research on the perceptions and attitudes of scientists toward the public in the science communication argument is relevant to the science literacy debate.

Shaping a science-literate public is the responsibility of many; however, information dissemination must start with the source and, in this case, the source is the scientist. Therefore, public understanding of science is directly affected by scientists' willingness to share science information. Understanding the attitudes, opinions, and perceptions of scientists toward science communication can be important for professional communicators, as they are commonly the link between scientists and the public.

Blaming the science-illiterate public on scientists alone excludes other influential players within this debate. For example, Gregory and Miller (2004) suggest that "the media do provide a forum in which the relationship between science and the public is constructed and pursued, and it is in this forum that the public makes moral judgments about science" (p. 1). Although the media often facilitate relationship-building between scientists and the public by serving as an intermediary, the inclusion of the media in the science/public relationship inevitably adds complexity to the science communication process.

Scientists, public information officers, and the media comprise a diverse group of individuals attempting to communicate scientific topics to the public. Gregory and Miller (2004) present the challenge diverse groups cause when dealing with the public understanding of science:

Each of them – science, the media, and the public sphere – represents for the inhabitants of the other two a largely unknown land. Like unworldly tourists these groups are inclined to believe that if they speak their own language slowly and loudly, they will make themselves understood; sometimes, like imperialists in an annexed land, they presume that everyone else is a savage. Just as travelers abroad have learned to understand another culture on its own terms, so might scientists, journalists and the public tread a little more lightly on each other toes if they got acquainted first (p. 5).

Despite the apparent differences of these key players – scientists, media, and the public - in the science communication discussion, they each have a significant responsibility in establishing and

maintaining a science-literate society. However, sometimes these responsibilities are hindered by the skills and even attitudes that these groups possess.

Most scientists bear the responsibility and recognize the importance of communicating their research and scientific findings to a broader audience; however, most are ill-equipped to accomplish this daunting task. Communicating to audiences outside of the scientific community can be intimidating for scientists due to their lack of media relations knowledge, skills, and experience. Relying solely on the media to disseminate science information to the public presents a problem, however, because the objective of the news media is not to improve public understanding of science (Gregory & Miller, 2004). Simply stated, journalists are not educators.

If scientists desire greater public understanding of science, the responsibility for seeking out science information cannot necessarily be shifted to the public. Research indicates that most individuals are interested in science information; however, that does not equate to their understanding or appreciation of science (Gregory & Miller, 2004; Treise & Weigold, 2002; Hartz & Chappell, 1997).

Despite the differing perceptions, knowledge, and responsibilities of these three key players, in the past it is the science communicator that has been expected to provide the link between science and the public. The term “science communicator” includes journalists, public information officers, and scientists, all of whom have a responsibility to communicate to the public about scientific topics (Treise & Weigold, 2002). “Science communication” can be defined as the use of appropriate skills, media, activities, and dialogue to produce awareness, enjoyment, interest, opinions, or understanding of science (Burns, O’Connor, & Stocklmayer, 2003). Numerous benefits result from the role science communicators play in the public understanding of science (Treise & Weigold, 2002), including increased public support,

increased funding for scientific research, enhanced decision-making about scientific topics, improved attitudes toward science, and increased excitement and interest in scientific disciplines.

### *Who is Responsible?*

Public support for science and technology has declined over the years, and this slow decline has been blamed, by some, on the media's inattention to the issues presented earlier, while some argue it is the disinclination of the scientists to communicate scientific information (Hartz & Chappell, 1997). Instead of implicating a specific group that is at fault, Hartz and Chappell (1997) suggested that "at the root of the problem – and the heart of the solution – are those who control the flow of crucial information about the value of basic scientific and technological research; the scientists themselves and the journalists who communicate their triumphs and failures to the American public" (p. xi). While the balance of responsibility between scientists and journalists is unclear, there are negative consequences that result from a science illiterate public for all parties involved.

In a national study of scientists and journalists attitudes towards each other and their views of transmitting science information to the public, Hartz and Chappell (1997) found that both scientists and journalists believe that the American public is often confused and gullible in regard to science issues because of the low levels of science literacy among the general population. This same study revealed that both groups – scientists and journalists – agree that the public does care about scientific issues; however, caring does not equal understanding (Hartz & Chappell, 1997). Additionally, journalists and reporters indicated that the public is so ill-informed on science issues that their opinions about science and technology are not significant in terms of having an effect on funding and policy.

Interestingly, when asked who was most to blame for Americans' misunderstanding of science, scientists and journalists both indicated that scientists are to blame for the low science literacy levels. However, journalists and scientists were also quick to blame the public for its own lack of science knowledge (Hartz & Chapell, 1997).

Since the news media play a significant role in communicating science information to the public, it is important that scientists recognize the importance of disseminating science information to the media as a way to reach the interested public. Nelkin (1995) suggested the following:

For most people, the reality of science is what they read in the press. They understand science less through direct experience or past education than through the filter of journalistic language and imagery. The media are their only contact with what is going on in rapidly changing scientific and technical fields, as well as a major source of information about the implication of these changes (p. 2).

“Effective science reporting is perhaps the only mechanism for most people to learn about fast-breaking events and exciting developments that affect everyone” (Treise & Weigold, 2002, p. 310). This implies the need for a strong, positive working relationship between scientists and the media in order to have an impact on science literacy.

Scientists have not denied they play an important role within the science communication debate. In 2000, Market & Opinion Research International (MORI) conducted a study of scientists on their own views and experiences on the role of scientists in public debate. Results indicated that scientists felt they are responsible for the dialogue between science and society; however, they feel ill-equipped to do so (Worcester, 2002). “They especially feel unequipped to discuss the moral and ethical issues surrounding their work, and fewer still have had the training to do so” (Worcester, 2002, p. 143). In addition, this same study revealed that nine in ten scientists advocate the communication of the social and ethical implications of science to the

public, seven in ten believe that scientists have the primary responsibility for this communication to the public, yet half of the scientists have not done any communication with the public, due to their feelings of inadequacy for communicating (Worcester, 2002). This lack of media relations knowledge and skills creates a barrier to communication and, as a result, public understanding that fundamentally exists in various fields of science, including agriculture.

### *Agriculture is Science?*

Agricultural communication is one facet of the broad discipline of science communication. Although agriculture is important to America's economic, environmental, and cultural growth, agricultural news is surprisingly a neglected topic in the mass media (Stringer & Thomson, 1999). However, some of the most prevalent science communication issues in the last decade surround agricultural issues.

Recent agricultural issues that have caused heightened public concern include mad cow disease, genetically engineered foods, biotechnology, and animal cloning. These agricultural issues impact all Americans, even those who do not have direct ties to agriculture. Nonetheless, aside from these significant health issues and technological advances in agriculture, media coverage of agricultural issues is minimal, which severely affects the public attitudes and images of agriculture. "Today, the public's image of agriculture is a kaleidoscope of leftover attitudes and images of what agriculture was in the '40s, '50s and '60s" (Coon & Cantrell, 1985, p. 22).

The changes in agriculture and its impact on the American economy make the need for communicating agriculture crucial for creating an agriculturally literate public. "Consumers, as well as policy makers, need to be 'agriculturally literate' in order to respond appropriately as issues arise" (Frick, Birkenholz, & Machtmes, 1995, p. 44). Unfortunately, creating an

agriculturally literate public is challenging; focusing on increased media coverage of agricultural issues, however, is a step in the right direction.

Given the importance of providing scientific information to the public through the news media and the lack of overall agricultural topics in the news resulting in an agriculturally illiterate public, the question of how agricultural scientists perceive the importance of an agriculturally literate public, the coverage of agricultural topics in the news media, and their role, as a scientist, in this communication process needs to be raised. Therefore, the purpose of this exploratory study was to examine the beliefs agricultural scientists have about the public understanding of science. This group of scholars can be considered the gatekeepers of scientific information in agriculture; therefore, it is important to identify their perceptions toward their role, and the importance, the current status, and the key players in the science literacy discussion. It is assumed that understanding the perceptions of this group within the broader science communication discussion will facilitate future media training initiatives as well as improved communication behaviors with this population.

The specific objectives of this study were to survey a sample of agricultural scientists located in the southern region of the U.S. regarding (1) their perceptions of public understanding of agricultural science and science in general, (2) their perceived role in increasing public understanding of agricultural science and science in general, (3) their assessment of their colleagues perceptions of public understanding of agricultural science and science in general, and (4) their assessment of their colleagues perceived role in increasing public understanding of agricultural science and science in general.

## Methods

The population for this study was the membership of the Southern Association of Agricultural Scientists (SAAS). SAAS members are academic and professional scientists in the agricultural sector of 13 Southern states in the U.S. To conduct the study, a stratified random sample (n=300) of SAAS members was drawn from the association's online member directory. In order to stratify the sample, the entire SAAS membership directory was first grouped according to scientific discipline (agricultural communications, agricultural economics, agricultural education, agronomy, animal science, biochemistry, horticulture, plant pathology, rural sociology, and soil and water conservation). Only members with complete directory information (name, discipline, and e-mail address) were accessed. Every third member from each discipline was selected to randomize the sample.

The study utilized a 17-item, researcher-developed survey instrument that was descriptive in nature. The instrument included demographics and a set of questions to measure respondents' perceptions of the public's understanding of agricultural science. All items, with the exception of demographics, asked respondents to respond to a set of statements utilizing a five-point Likert-type scale where one equaled "strongly agree" and five equaled "strongly disagree."

Respondents were also asked about the role of the news media in the public's understanding of science. The term "news media" was defined in the survey as referring to all of the communication channels through which news travels to the general public (television, newspapers, radio, magazines, and Internet).

Prior to administration, the survey was reviewed by a panel of experts (including media relations experts) to assure face and content validity. The instrument was subsequently revised to reflect panel members' suggestions. The resulting instrument was pilot-tested with a sub-

sample (n=17) of SAAS members who were not included in the final study. The results of the pilot study were used to further refine the instrument for delivery to the sample for the actual study.

The survey was developed as an online, Web-based survey, using form development and data collection procedures as outlined by Dillman (1999). To initiate the survey, respondents first received an email cover letter informing them about the Web-based survey and providing them with a respondent code to keep track of respondents and non-respondents. After the initial posting of the Web-based survey, two weeks were given for respondents to return the survey. A follow-up reminder was then sent to nonrespondents. A third and final reminder was sent one month later. Survey response date was utilized to assess reliability of the instrument, resulting in a Cronbach's alpha for the overall scale of .86.

## **Results**

Of the 300 SAAS members surveyed, 62 agricultural scientists responded, for a response rate of 20.6%. There were substantially more male respondents (85%, n=53) than female (15%, n=9). The demographics indicated a great deal of career experience. Just over 53% (n=33) of respondents were 46 years old or older. Nearly 34% (n=21) of respondents had been employed in a university setting for more than 20 years, while another 40% (n=24) had been employed in a university setting for 6 to 15 years.

Slightly more than half were at the associate professor (20%; n=12) or full professor (31%, n=19) levels. However, 28% (n=17) said their job title fell in the "other" category, with most stating their titles were "government scientist" and "Experiment Station director or

superintendent.” Just over 88% (n=54) of respondents were employed at a university at the time of the survey.

Respondents represented a variety of disciplines, adding diverse perspectives to the results. The majority of respondents represented the disciplines of agricultural economics (22%, n=13), agronomy (19%, n=11), animal science (22%, n=13), and horticulture (20%, n=12). Other disciplines represented include agricultural education (n=1), biochemistry (n=1), plant pathology (n=3), rural sociology (n=1), and soil and water conservation (n=3).

### *Scientists' Perceptions of Public Understanding*

The first objective was to gauge respondents' perceptions of public understanding of agricultural science and science in general. Perceptions were measured with a series of statements followed by a Likert scale in which respondents indicated their level of agreement (1=Strongly Agree and 5=Strongly Disagree). Overall, respondents strongly disagreed with the notion that “the public gets all of the information it needs through the news media to understand an agricultural discipline” (M=4.37, SD=.814) or “to understand science” (M=4.37, SD=.891).

When asked to gauge public understanding, respondents indicated disagreement with the idea that the public understands their particular agricultural discipline (M=4.21, SD=.859) or science in general (M=4.31, SD=.737). There were no significant differences in perceptions of public understanding based on gender or academic discipline. An independent-samples t-test showed a significant difference in perceptions of public understanding based on whether respondents had media relations training (Table 1). Respondents who had media relations training indicated less agreement (M=4.67, SD=.48) that “The public gets all of the information

it needs through the news media to understand an agriculture discipline” than did respondents who had no media relations training (M=4.20, SD=.91).

Table 1

*T-test for significant differences based on media relations training*

	Training		No Training		t Value	Pr
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>		
The public gets all of the information it needs through the news media to understand an agriculture discipline	4.67	.48	4.20	.91	-2.61	.011

\*1=Strongly Agree and 5=Strongly Disagree

There was no significant difference between respondents based on media relations training when presented with the statement, “The public gets all of the information it needs through the news media to understand science.”

### *Scientists’ Role in Public Understanding*

Respondents were questioned regarding their perceived role in increasing public understanding of agricultural science and science in general. Although respondents indicated agreement that it is their responsibility to help people understand their agricultural discipline (M=1.72, SD=.98), they indicated less responsibility for helping people understand science in general (M=2.05, SD=1.01).

Similarly, respondents were more willing to work with reporters and to receive media relations training if it helped people understand their agricultural discipline than if it helped people understand science in general (Table 2).

Table 2.

*Respondent willingness to help people understand science*

	M	SD
I would make myself more accessible to reporters if reporters' stories helped the public understand my agricultural discipline.	1.87	.96
I would receive training on how to work with the news media if I believed it would improve the public's understanding of my agriculture discipline.	1.87	.93
I would make myself more accessible to reporters if reporters' stories helped the public understand science.	2.23	1.04
I would receive training on how to interact with the news media if I believed it would improve the public's understanding of science.	2.13	.98

\*1=Strongly Agree and 5=Strongly Disagree

Respondents agreed that they would receive media relations training if they believed it would benefit them personally (M=1.98, SD=.93) or their university (M=1.83, SD=.91). When working on a topic they perceive to be newsworthy, respondents indicated more strongly that they would contact their campus news organization (M=2.00, SD=1.10) than reporters in general (M=2.53, SD=1.19).

According to independent-samples t-tests, respondents who previously received media relations training were significantly more disposed to contact their campus news organization if they had a newsworthy story, but they were not significantly more disposed to contact a reporter directly (Table 3).

Table 3.

*T-test for significant differences based on media relations training*

Training		No Training		t Value	Pr
<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>		

I will contact my campus news organization if I believe a topic I am working on is newsworthy.	1.62	.66	2.21	1.25	2.36	.022
I will contact reporters if I believe a topic I am working on is newsworthy.	2.33	1.06	2.63	1.27	.948	.348

\*1=Strongly Agree and 5=Strongly Disagree

### *Scientists' Assessment of Colleagues' Perceptions of Public Understanding*

While respondents agreed that it is their responsibility to help people understand their agricultural discipline (M=1.72, SD=.98), they were less convinced in their colleagues' conviction of this responsibility (M=2.75, SD=1.10). Respondents were also more convinced of their own responsibility to help people understand science in general (M=2.05, SD=1.01) than they were of their colleagues' perception of this responsibility (M=2.71, SD=1.13).

Respondents who previously received media relations training were significantly different, based on t-tests (Table 4), than those who had not in regards to their agreement with "My colleagues believe the public understands my agricultural discipline" and "My colleagues believe the public understands science." Respondents also differed significantly on their agreement that their colleagues believe it is their responsibility to help people understand their agricultural discipline and science in general.

Table 4.

#### *T-test for significant differences based on media relations training*

	Training		No Training		t Value	Pr
	Mean	SD	Mean	SD		
My colleagues believe the public understands my agricultural discipline.	4.57	.59	4.11	.77	-2.54	.014

My colleagues believe the public understands science.	4.52	.75	4.05	.84	-2.18	.034
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## Discussion and Implications

Respondents in this study indicated more willingness to contact their campus news organization than to contact reporters directly. Those with media relations training were more likely than those without to contact their campus news organization, but they were not more likely to contact reporters directly. More research should be done to determine if there is a need for scientists to have the skills to contact reporters or media organizations directly. If the need is revealed, it may be important to focus more on these communication skills in media relations training.

Those respondents with media relations training replied differently in response to questions about their colleagues' perceptions of public understanding of agricultural science. An obvious outcome of media relations training is a more realistic view of one's own abilities to work with the media. However, an additional outcome is a more critical view of one's colleagues' abilities to work with the media. Agricultural scientists who participate in media relations training may be convinced of the need for colleagues to receive similar training. They may actually serve as persuaders or opinion leaders in getting colleagues to receive such training.

This research presents several implications for communication practitioners. The responding scientists indicated more willingness to help the public understand their specific agricultural discipline than they did to help the public understand science in general. This may indicate that discipline-specific media relations training would be more salient to scientists. Agronomists may want to communicate different information through the media than animal scientists. As such, according to discipline, different aspects of media relations may be

highlighted in training. Forums where scientists are gathered by discipline, like the Southern Association of Agricultural Scientists (SAAS) conference, may provide an ideal setting for such training.

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