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Lisa K. Lundy

Tracy A. Irani

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Introduction

Agricultural biotechnology is believed by many researchers to hold great promise to increase global output of food and fiber systems while reducing harmful environmental effects (James, 2000), in addition to enhancing global food security in a manner that may be less harmful than traditional food production systems. Yet, despite the potential promise, consumers' trust and acceptance vary, and consumers in some parts of the world, including Great Britain, are much less accepting than those in the United States (Gaskell et al., 2000; Juanillo, 2001). In fact, public opinion research shows a sharp decline in European support of genetically modified (GM) foods from 1996 to 1999 (Gaskell et al., 2000).

One reason for decline in support may be because the "first generation" of GM foods—corn, soybeans, papayas—focused on primarily producer-driven benefits such as crop yield and insect resistance (Phillips & Isaac, 1998). Consumer knowledge and awareness took time to establish, and GM

food products have subsequently met with considerable consumer resistance in a number of countries, including the United States (Burton & Pearse, 2003).

Public opinion polling on the question of acceptance of agricultural biotechnology has, however, consistently shown distinct differences between European and U.S. consumer attitudes (Hoban, 2001). In a study comparing U.S. and European acceptance levels of biotech foods, U.S. consumers were more accepting of biotech foods and rated their trust in national government agencies considerably higher than did Europeans, although their factual knowledge of science and biology was comparably lower (Gaskell, Bauer, Durant, & Allum, 1999). Some researchers have contended that disparities between United States and European media coverage might account for the relatively lower levels of resistance to biotechnology in the United States, compared to Europe (Gaskell et al., 1999; Peterson, 1999).

Although differences in the way the media cover a story might be related to the organization and structure of news operations, the primary concern in this study is the difference in the way the issue is portrayed, or framed, in the news. Framing, a characteristic of press coverage, involves the organization and packaging of information (Simon & Xenos, 2000) and is defined by Reese, Gandy, and Grant (2001, p. 11) as "organizing principles that are socially shared and persistent over time, that work symbolically to meaningfully structure the social world." The way information is framed is the way people come to understand that issue.

Based on the above, this study sought to develop a deeper understanding of the differences in news media framing of agricultural biotechnology in U.S. and British newspapers. These regions were chosen for their similarities in terms of language, culture, and news media. For the purposes of analysis, the study focused on the news coverage of three major national "newspapers of record" during the calendar year 2002: *The New York Times*, *The Washington Post*, and *The Guardian*.

Theoretical Framework

The science of biotechnology is sophisticated, rapidly changing, and sometimes difficult to understand and communicate to lay audiences. While researchers of public attitudes and awareness of biotechnology have reported that many Americans are positive about agricultural biotechnology (Hoban, 1998), consumers have also cited several concerns. Studies have shown (Pearsley & Siedow, 1999) that consumers perceive the risks of agricultural biotechnology to include food and worker safety; increased resistance to pests creating "superweeds"; potential decline in genetic and pheno-

typic variability and biodiversity; fears about expression of genetic material from pathogens causing diseases harmful to other plants, animals, and humans; and uncontrolled (and perhaps unintended) gene transfer “upsetting nature’s balance” (Persley & Siedow, 1999).

Most Europeans generally trust newspaper coverage of biotechnology (Gaskell et al., 2000). Gaskell et al., (1999), studying differences between European and United States acceptance of biotech foods, argued that the influence of three factors—difference in press coverage, trust in regulatory procedures, and level of knowledge—might account for the relatively higher European resistance to these foods.

According to Priest (2001), public opinion and reaction to agricultural biotechnology are primarily media-driven as the “media set agendas for the rest of us and suggest certain interpretations over others” (p. 15). This can be construed as evidence that agricultural biotechnology is an issue that is being framed by the media. In general, framing involves the organization and packaging of information (Simon & Xenos, 2000). Goffman (1974, p. 21) says, “We actively classify and organize our life experiences to make sense of them.”

According to Entman (1993, p. 52), “To frame is to select some aspects of a perceived reality and make them more salient in communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.” Frames emerge in the media in the form of present or absent key words or sources of information (Entman, 1993).

According to Gitlin (1980, p. 7), framing is “persistent patterns of cognition, interpretation, and presentation, of selection, emphasis, and exclusion, by which symbol-handlers organize discourse, whether verbal or visual.” Framing analysis looks at “how the media create meaning out of an issue or event, define it for the public, and direct discussion about it” (Lane, 1998, p. 9). Journalists use media frames to organize stories and uncover meaning from related stories and events (Gamson & Modigliani, 1989).

When a topic is framed or related to an existing cultural frame, the topic’s meaning is influenced by the frame (Hertog & McLeod, 2001). The framing process is heavily influenced by rhetoric as the rhetorical positions of interest groups become pervasive in ongoing social debates (Andsager, 2000). In framing, rhetoric functions primarily to manipulate the public vocabulary to induce social change (Andsager, 2000). A rhetorical study of public relations analyzes words and other symbols (Palenchar, 2001). The symbolic representations of an issue, such as sentence structure, “code”

Research

words, and modifiers, are influenced by frame choice (Hertog & McLeod, 2001).

The selection of given words affects the consideration of information and the reaction produced (Van Dijk, 1988). Framing can significantly affect the perception of a problem and the evaluation of alternative options (Davis, 1995). Frames used by the media give audiences the ability to organize and understand new information (Lane, 1998; Tewksbury, Jones, Peske, Raymond, & Vig, 2000). Frames can have powerful effects on audience perceptions and ideas about an issue. For example, a study by Tewksbury et al. (2000) found that exposure to one single news article on a particular issue was influential enough to direct respondent comments on the issue several weeks later.

Rather than promoting one policy or ideology, media often use frames to limit the choices that can be debated (Lane, 1998). Media framing is important because it relates isolated incidents to public issues (Gamson & Modigliani, 1989). Often media go beyond setting an agenda for the public to suggesting validity for certain opinions, interpretations, and definitions of a controversial issue (Pan & Kosicki, 1993). Many studies of framing involve controversial scientific or medical topics, like agricultural biotechnology, which are inherently complex (Andsager & Smiley, 1998).

Purpose and Objectives

This study investigated the difference in the framing of agricultural biotechnology in two U.S. newspapers and one British newspaper, specifically *The Washington Post*, *The New York Times*, and *The Guardian*. The purpose of this framing analysis was to investigate national newspaper coverage of agricultural biotechnology in 2002. The objectives of the study were to compare:

- (1) Patterns in coverage of agricultural biotechnology by selected U.S. and British national newspapers,
- (2) Use of sources in coverage of agricultural biotechnology by U.S. and British national newspapers, and
- (3) Use of frames in coverage of agricultural biotechnology by U.S. and British national newspapers.

Methods/Procedures

A textual analysis was conducted to identify the media frames used to cover agricultural biotechnology in selected U.S. and British national print media for the year 2002. A previous study analyzed U.S. and British framing

of biotechnology in the six months surrounding September 11, 2001 (Lundy & Irani, 2003). According to Lundy and Irani (2003), to generalize differences in the U.S. and British national print media required looking at a wider time frame. Therefore, for this study, the time frame selected was January 1, 2002, to December 31, 2002.

Articles were collected via a Lexis-Nexis database search using the following key words: *genetically modified food*, *genetically engineered food*, *biotech food*, *genetically engineered crops*, *genetically modified crops*, and *genetically altered food* (Whaley, 2002). The researchers cross-referenced the resulting articles and removed all duplicates. This resulted in a population of 317 articles—*The Guardian* (178), *The New York Times* (77), and *The Washington Post* (62). To conduct in-depth analysis and establish intercoder reliability, a subset of this population was analyzed. To extract a sample size of 50 articles, the researchers took a stratified systematic random sample. Based on the proportion of articles in the population, the researchers selected 28 articles from *The Guardian*, 12 from *The New York Times*, and 10 from *The Washington Post* for a total of 50 articles.

The analysis focused on the content of all selected news, feature, opinion, and editorial articles published in these three major daily newspapers. *The Washington Post* and *The New York Times* represent comprehensive coverage of U.S. and foreign news and are two of the dominant daily newspapers in the United States. *The Guardian* was selected to give the British perspective on the framing of agricultural biotechnology. *The Guardian* is one of Britain's oldest and most widely-read newspapers.

Full texts of the articles were analyzed for the study. The unit of analysis for the study was the individual article. The principal researcher examined the stories using a coding sheet. The second author, trained in framing research methods, coded 20 percent of the sample ($n = 10$), which yielded a subsequent intercoder reliability rating of .75. The researchers analyzed several factors within each article. Each article was given an item identification number. The newspaper name, headline, type of item (news, feature, editorial, column, or other), length in words, month, day of the week, author, types of sources, and prominent frames were also recorded for each article.

Findings

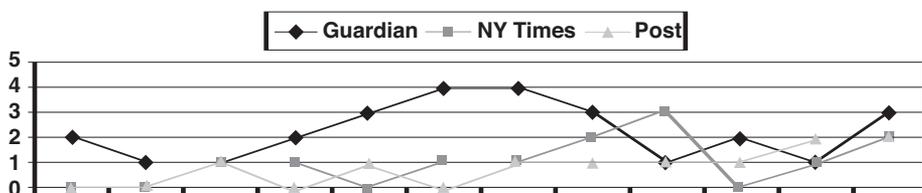
Objective 1: To compare the patterns in coverage of agricultural biotechnology by selected U.S. and British national newspapers.

In 2002, there were notably more articles that mentioned agricultural biotechnology in *The Guardian* (178) than in either *The New York Times* (77) or

Research

The Washington Post (62). These same proportions were maintained in the sample. The difference in amount of coverage was most evident mid-year in June and July (Figure 1). This may be attributed to a vote taken by the British Parliament on July 3, 2002, to extend labeling of GM foods to GM derivatives. This legislative activity in Great Britain coincided with several lengthy articles in *The Guardian*.

Figure 1. 2002 coverage in newspapers by month



The most prevalent type of article in all three newspapers was the news article (Table 1). *The Guardian*, however, ran a similar number of news articles (13) and editorials (10). This finding is consistent with previous research, which found *The Guardian* published a higher number of editorials than did the United States papers regarding agricultural biotechnology (Lundy & Irani, 2003).

Table 1. Types of Articles

	<i>The Guardian</i>	<i>The New York Times</i>	<i>The Washington Post</i>
News	13	11	9
Editorial	10	0	1
Feature	3	1	0
Column	1	0	0
Total	27	12	10

Objective 2: To compare the use of sources in coverage of agricultural biotechnology by U.S. and British national newspapers.

Government officials and environmental agency representatives were used widely as sources across all three newspapers (Table 2). However, *The Washington Post* used industry sources frequently and the widest variety of source types within its articles. *The Washington Post* also used more sources

overall, an average of 1.8 sources per article compared to an average of 1.04 sources per article for *The Guardian* and 1.08 for *The New York Times*.

Table 2. *Types of Sources*

	<i>The Guardian</i>	<i>The New York Times</i>	<i>The Washington Post</i>
Industry executive	2	0	3
Industry scientist	1	0	0
Industry representative	3	2	5
University scientist	4	1	2
Political leader	2	0	0
Government official	9	6	4
Environmental agency representative	7	4	3
Other	1	0	1
Total	29	13	18
Average # of sources per article	1.04	1.08	1.80

Objective 3: To compare the use of frames in coverage of agricultural biotechnology by U.S. and British national newspapers.

Articles published in *The Guardian*, *The New York Times*, and *The Washington Post* in 2002 covered a variety of topics in agricultural biotechnology. Using frames found in a previous study that investigated United States and British framing of biotechnology (Lundy & Irani, 2003), the researchers established several anticipated frames a priori to look for in the analysis. These frames, found in Lundy and Irani's 2003 study, were *contamination*, *human risk*, *environmental risk*, *scientific progress*, *labeling*, *protests*, and *world hunger*.

Contamination of the food supply was a prominent frame in the U.S. and British national newspapers in 2002. Contamination is defined as "to make unfit for use by the introduction of unwholesome or undesirable elements." This frame of contamination may be communicating that consumers feel they lack control of agricultural biotechnology manipulation of their food supply. For example, articles referenced the inevitability of "GM contamination of conventional and organic crops" and referred to concerns about

Research

biodiversity and cross-pollination. While previous research showed that Europeans are more concerned about *food safety* than *environmental risk* (Gaskell et al., 2000), both frames were equally prevalent in the sample.

Table 3. *Prominent Frames*

	<i>The Guardian</i>	<i>The New York Times</i>	<i>The Washington Post</i>
Contamination	9	3	6
Human risk	7	2	2
Environmental risk	5	2	0
Scientific progress	6	3	3
Labeling	2	1	0
Protests	0	1	0
World hunger	6	3	3
Monsanto	4	2	1
Public acceptance	2	3	2
Consumer choice	3	0	0
Politics	4	0	0
Dependence	3	0	0

Several other frames not established *a priori* surfaced in the framing analysis. One frame found in all three newspapers was *public acceptance of agricultural biotechnology*. According to Juanillo (2001), public support for a technology relies on its moral acceptability. A 1999 study conducted in Germany on public attitudes regarding biotechnology concluded that moral acceptability predicted public support for biotechnology (Hampel, Ruhrmann, Kohring, & Goerke, 1999).

One frame found in *The Guardian* that was absent from the U.S. newspapers was *consumers' right to know and make choices about their food*. This is supported by Juanillo's (2001) assertion that biotechnology opponents cite the concern that agricultural biotechnology will cause consumers to lose their right to know and make choices about their food.

World hunger and securing food for developing nations was a prominent frame in all three newspapers. While agricultural biotechnology was framed in all three newspapers as a potential solution for world hunger, this was balanced in *The Guardian* by the prevalent frame of *dependency*. This dependency frame, found in *The Guardian* but absent in U.S. newspapers, appeared

in such phrases as “dependency on a handful of bio-tech corporations” and referred to the process of developing countries dealing with agricultural biotechnology as a “test of national strength.” The inclusion of this frame corresponds to the concerns many opponents of agricultural biotechnology have about developing countries becoming dependent on technology researched and manufactured in developing countries (Juanillo, 2001) and about farmers becoming dependent on technology they are not allowed to reproduce, share, or store due to intellectual property rights (Altieri, 2000).

Conclusions/Recommendations/Implications

This study examined the framing of agricultural biotechnology in selected U.S. and British newspapers for one year. Biotechnology has the potential to change the way food is grown and accessed. If media coverage of biotechnology has the ability to affect public perception, then it has the potential for affecting policy (Cobb & Elder, 1983). The difference in prevalence of articles related to agricultural biotechnology in *The Guardian* (178), *The New York Times* (77), and *The Washington Post* (62) was not a constant difference throughout the calendar year but rather coincided with a particular legislative occasion in Great Britain. Thus, this difference in amount of coverage, also found in previous research (Lundy & Irani, 2003), may represent the prioritization of biotechnology issues on the public agenda in Great Britain and may simply be an effect of agenda setting (Protest & McCombs, 1991).

Consistent with previous research (Lundy & Irani, 2003), there is a higher use of editorials in British coverage of agricultural biotechnology. This may represent a difference in practice between United States and British media, but this difference is important for agricultural communicators to understand as they communicate with different audiences about agricultural biotechnology. Communicating effectively with European audiences is important for agricultural communicators as “this new era of globalization requires a careful effort designed to build and maintain European consumer confidence in United States science and technology” (Moore, 2001, p. 4).

No single frame was dominant in U.S. or British national newspaper coverage of agricultural biotechnology in 2002. Some of the prominent frames were contamination of the food supply, human risk, environmental risk, scientific progress, and world hunger. There were more different frames used in *The Guardian* (concepts as *consumer choice*, *dependency*, and *politics*) than in the U.S. newspapers.

The differences in U.S. and British national newspaper coverage of agricultural biotechnology established in this and previous studies have implications for agricultural communicators. If there is a higher use of

editorials in British coverage of agricultural biotechnology, agricultural communicators should consider ways to penetrate this editorial context of agricultural biotechnology coverage in Great Britain.

Newsom and Carrell (2001) stress the importance of researching media outlets before contacting them with news releases and tip sheets. Understanding the frames used by a media outlet to communicate about a given issue can be helpful to communicators developing a plan for getting their organization's news or information about the issue into the media.

Agricultural communicators should look for opportunities to tie their organization's news to current events related to agricultural biotechnology or the prevalent frames used, including the food supply, human risk, environmental risk, scientific progress, and world hunger. In Great Britain, stories can also be related to news concerning consumer choice, dependency, and politics.

Further research should be done to examine the frames used in communicating about agricultural biotechnology by media of different types and media with different audiences. More research should be done on the framing of agricultural biotechnology to look at other types of media in Great Britain, as well as media outlets in other European nations. As agricultural communicators increase their understanding of media coverage of agricultural biotechnology, they will increase their ability to reach consumers with current and relevant information about agricultural biotechnology.

About the authors

ACE member Lisa K. Lundy is an assistant professor of public relations at Louisiana State University. ACE member Tracy A. Irani is an assistant professor in the Agricultural Education and Communication Department at the University of Florida. This article is based on a paper presented at the 2003 Agricultural Communicators in Education Meeting, June 2003, Kansas City, Mo. E-mail addresses are llundy@lsu.edu and irani@ufl.edu.

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