

**A Case Study of Indonesian Journalists' Participation  
in a Cochran Fellowship Program focused on Biotechnology and Journalism**

Holli R. Leggette  
Texas A&M University

Samuel Thomas Hall  
Borlaug Institute of International Agriculture

Theresa Pesl Murphrey  
Texas A&M University

*Abstract*

*This case study describes the participation of Indonesian journalists in a two-week Cochran Fellowship Program designed to teach about biotechnology and the process of disseminating scientific information. The purpose of this case study was to examine the experience of Indonesian journalists who participated in science communication training in an effort to document practices that improve journalistic writing skills and encourage positive perceptions of biotechnology. Therefore, we collected pre- and post-training reflections, photo reflections, and project debriefing session reflections from six Indonesian journalists who specialized in various types of journalism and worked for private or government-owned news organizations. The reflections revealed changes in comfort level with journalistic writing, thoughts and behaviors, and understanding of the biotechnology process. The journalists showed the most change in comfort level for explaining communication tools; using, evaluating, and choosing communication mediums; and translating science related to biotechnology. They described biotechnology as a highly debated, multi-step process affecting food security and noted that they gained valuable information about science journalism and biotechnology. Training journalists and understanding their voices could enable agriculturalists to more effectively communicate about scientific issues and develop impactful capacity-building activities. Because journalists have the power to inform and influence, programs, like this one, can have far-reaching, beneficial impacts on the adoption of biotechnology. However, researchers should investigate future programs using a longitudinal study to determine if programs influence the stories published in the years following the training.*

**Keywords:** biotechnology, science journalism, United States agriculture, photovoice

## Introduction

Journalists' role as societal gatekeepers and disseminators of information is important (Shoemaker, Vos, & Reese, 2009) as the "globalization of the mass media" increases (Mwesige, 2004, p. 69). Malian journalists studied by Cartmell et al. in 2008 noted that influencing public affairs was a key aspect of the media as the news media is obligated "to meet the public's need for receiving information promptly and to help people better understand complex issues" (p. 90). In a similar study, Mwesige (2004) found that Ugandan journalists believed they were obligated to analyze and interpret information for their lay audiences. Furthermore, Ruth and Rumble (2016) labeled the media as key influencers on "public and decision makers' opinions" (p. 33). Those same Malian journalists studied in a five-month post-training follow-up study claimed "provid[ing] analysis and interpretation of complex problems" and "get[ting] information to the public quickly" were the most important functions of the media (Cartmell et al., 2009, p. 116). The two Cartmell et al. studies suggest people are the purpose and reason for global mass media.

Yet, journalists often shy away from complex science issues because they lack access to or understanding of scientific information (Moualhi, Galhena, Maredia, & Weebadde, 2014), which often leads to avoiding science-related issues (Navarro, Tome, & Gimutao, 2013). Their lack of access to "evidence-based factual information" (Moualhi et al., 2014, p. 51) could negatively impact people's perceptions and understanding of science. Marks, Kalaitzandonakes, Wilkins, and Zakharova (2007) found that the media have framed agricultural biotechnology negatively in recent years, hindering adoption of such technologies. Journalists

perceive biotechnology as complex and struggle to disseminate information in a "simple layman language" (Navarro et al., 2013, p. 31) even though there is a significant relationship between "communication variables and biotechnology support" (Besley & Shanahan, 2005, p. 347).

A potential solution and reason-based argument for decreasing the lack of understanding of and increasing access to scientific information is to provide journalists with skills to disseminate science-based information to broad public audiences. Delivering science-based curriculum to journalists will help them understand the science behind complex issues, which will facilitate dissemination of accurate, credible news (Hogue, 2015). Treise and Weigold (2002) claimed "science writers are at the critical intersection of the practice of science and the public understanding of science" (p. 320). However, over time and through adoption of emerging media, science journalists have become a single voice among the many voices of scientists, readers, and citizen journalists. Science communication has transitioned from a one-way communication platform to a two-way communication platform where everyone can disseminate scientific information—factual or not (Fahy & Nisbet, 2011). Yet, foundational to science journalism training is the ability to gather factual information and transform the information into compelling stories (Ridgway, 2016). In 2016, Ridgway argued the need for "short, sharp science writing training," which should include "how to find stories and how to shape them into clear, engaging and accurate content" as editors seek journalists who can write and "produce credible evidence" of their writing abilities (p. 3). Such training, however, should be delivered to journalists by journalists (Hogue, 2015).

Within the agricultural context, Cartmell et al. (2008) argued “the role of a well-informed and professional media is integral to initiatives designed to foster growth, expansion, and development of a nation’s agricultural sector and rural populace” (p. 90). One way for journalists to become educated about scientific issues within agriculture is through connecting with extension professionals, which Ruth and Rumble (2016) claimed is key if issues are to become public agenda items. However, if extension professionals fail to develop and leverage relationships with the media, they run the risk of “other voices, possibly not backed by science,” becoming the voice of agriculture (p. 34). Thus, a positive relationship between scientists and the media, fostered through continuing education opportunities, could facilitate communication between producers and consumers and increase the likelihood that evidence-based information is disseminated (Ruth & Rumble, 2016).

### **Theoretical Framework**

Social cognitive theory (Bandura, 1986) guided the development of this training program because the study focused on change in perceptions related to biotechnology and science journalism skills. Individuals learn and experience change through observation, interaction, and engagement. Bandura (1997) identified three domains within social cognitive theory: behavior, environment, and personal (cognitive, affective, and biological events). The three domains are interconnected and “influence one another bidirectionally” (p. 6). Social cognition is how individuals perceive themselves and others within their environment (Fiske & Taylor, 1991). Therefore, understanding an individual’s reactions to content presented in social contexts and the further understanding of the

change in perceptions allows interpretation of program impact.

The journalists in this study experienced the domains of Bandura’s (1986) social cognitive theory as the training content and environment challenged their personal beliefs about biotechnology and caused them to evaluate their science journalism skills. The environment was different than they had experienced before because it and people within it advocated for biotechnology. This environment forced the journalists to confront their fears of and previous experiences with biotechnology to understand the benefits of adopting biotechnologies.

### **Context of the Study**

This case study took place within the context of a Cochran Fellowship Program (CFP), an element of the United States Department of Agriculture’s Foreign Agricultural Service (USDA-FAS). It provides participants short-term technical training to improve their country’s agricultural systems, strengthen trade linkages with the United States (USDA, 2016), and assist “emerging market countries [with] develop[ing] their agricultural systems for the food and fiber needs of their domestic population” (Carlson, 2011, p. 2). The program provides participants with access to “professional and organizational knowledge and skills, attitudes, continued contacts, job changes, organizational changes, and trade-related activities” (Carlson, 2001, p. ab.). Traditionally, each program has five to seven participants from a specific geographic region who gain knowledge and information through “technical instruction, practical field observation, and ‘hands-on’ experience[s]” (Carlson, 2001, p. 2).

This case study investigated a two-week CFP that exposed Indonesian journalists to biotechnology science and to

disseminating scientific information. We designed this innovative approach to on-site training to enhance journalists' ability to disseminate positive messages about biotechnology benefits. The program included two days of classroom activities about the basics of science journalism and seven days of on-site visits throughout the mid-western and eastern United States. The journalists learned about biotechnology and scientific communication through visits to corn and soybean farms, companies that research and promote biotechnology, government entities, and communication organizations. Following on-site visits, the journalists drew from their notes and their experiences to develop a feature story about biotechnology.

### **Purpose and Objectives**

The purpose of this case study was to examine the experience of Indonesian journalists who participated in science communication training in an effort to document practices that improve journalistic writing skills and encourage positive perceptions of biotechnology. Three objectives guided the study: a) describe change in comfort level with journalistic writing components, b) identify journalists' perceptions of biotechnology, and c) understand individual program experiences—views and interpretation of the experience.

### **Methods**

Case study research captures unique experiences to help others learn from such experiences. Such studies have been used to analyze bounded systems (Merriam, 2009) related to international experiences (Black, Moore, Wingenbach, & Rutherford, 2013), viewpoints of opinion leaders (Shinn, Ford, Attaie, & Briers, 2012), and business owner perspectives (Kock, & Turnbull, 2011). Case study research “focuses on describing,

understanding, predicting, and/or controlling the individual (i.e., process, animal, person, household, organization, group, industry, culture, or nationality)” (Woodside, 2010, p. 1). Such research provides a deeper understanding of “how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences” (Merriam, 2009, p. 5). To interpret the CFP experiences through the eyes of the journalists and achieve a deep understanding of their realities, we used a qualitative approach to the case study and achieved triangulation through observation and participant-produced artifacts (Woodside, 2010).

Six ( $N = 6$ ) Indonesian journalists participated in the two-week experience exposing them to United States biotechnology and to the process of disseminating scientific information. The group consisted of four males, two females, three print journalists, three broadcast journalists, four employees of government-owned sources, and two employees of private-owned news sources. Throughout the manuscript, we refer to the participants as journalists.

### **Procedures**

We collected the data for this study throughout the two-week experience using multiple collection methods and assigned each journalist a number at the beginning of the experience. We analyzed the data in three rounds. In the first round, we met to open code and categorize the data based on units of analysis (e.g., words, phrases; Strauss, 1987). In the second round, we used axial coding (Strauss, 1987) and Lincoln and Guba's (1985) constant comparative method to integrate the categories and identify emergent themes across the data. This process helped us narrow the categories from the first round and identify the themes and sub-themes within the data. We chose to

include sub-themes because the themes were overarching and the sub-themes were too different to collapse into a major overarching theme. In the third round, we independently confirmed our results. If discrepancies existed, we made note of them and worked through them in person as needed to establish fluidity within the results.

We established trustworthiness using Merriam's (2009) four criteria: credibility (reflexive journal and persistent observation), dependability (data triangulation, peer debriefing memos, and an audit trail), transferability (thick description of the results), and confirmability (reflexive journals, triangulation, and peer debriefing memos). During the experience, the researcher who accompanied the participants kept an observation notebook and noted specific experiences as they occurred. We used the notes generated during the experience to interpret the data within context. Additionally, the use of multiple methods to examine the participants' experience established triangulation and confirmability of the results as we interpreted their experiences through different data analysis lens and developed conclusions from the perspectives of those lenses.

**Research objective one.** We investigated journalists' change in comfort level with 17 journalistic writing concepts using pre- and post-training reflections. The journalistic writing concepts used in this study are concepts typically taught within formal science journalism writing courses. Prior to and at the end of the experience, journalists described their level of comfort with each concept. Twelve reflections comprised the data for this objective, which we coded with the journalists' number. We analyzed the reflections using a qualitative content analysis (Berg, 2001) to reduce the

data into categories or themes (Patton, 2002, p. 453). We carefully interpreted the reflections within context and concept (Hodder, 1994) and presented the data by concept.

**Research objective two.** We studied journalists' perceptions of biotechnology using a modified version of Wang and Burris' (1997) photovoice method. During the field experience, journalists collected photographs that portrayed biotechnology and United States agriculture through their lenses. At the end of the experience, we asked each participant to submit 15 photographs capturing his or her understanding of biotechnology and submit a caption with each photograph that answered Wang's (1999) SHOWeD questions. Data included 103 photographs with corresponding captions as not all journalists submitted 15 photographs.

We coded the photographs and captions with the journalists' number, a sequential number, and a P for photograph and a C for caption (e.g., the sixth photograph in the series for participant one would be 01:06P). We used a grounded theory approach (Glaser & Strauss, 1967) guided by our research question "How do Indonesian journalists perceive biotechnology in U.S. agriculture?" to analyze the photographs and captions. Using an open coding technique to begin the interpretation process, we found 19 original themes. During the second round of analysis, we used axial coding to narrow the 19 themes down to three emergent themes and grouped the photographs accordingly. In the third round, we individually reviewed the photographs and captions to confirm the themes.

**Research objective three.** We examined the journalists' individual views and interpretation using observations and

written debriefing sessions directly related to the day-to-day participant experience. The journalists completed two written debriefing sessions to allow for mid-experience observations. We distributed the first debriefing instrument one-third of the way into the experience and the second one about two-thirds of the way through the experience. Twelve written debriefs along with observation data comprised the data for this objective. Prior to data analysis, we coded the data with the journalists' number and a sequential number. We used constant comparative methods to interpret the data, yielding 11 themes. Using focused and axial coding during the second round of analysis, we narrowed emergent themes to six primary themes. During the third round, we individually reviewed and confirmed the themes.

## Findings

### Research Objective 1

**Explaining writing voice and style** is a “tool to know about” oneself (P2). At the beginning of the experience, four journalists had minimal comfort and two journalists had moderate comfort level. One journalist with minimal comfort level did not see the connection and need for print journalists to understand writing voice and style. At the end, three journalists were moderately comfortable explaining writing voice and style and claimed to understand writing voice and style as it related to hard news, soft news, and documentaries.

An initial step for writing a scientific feature story is **identifying target audiences**. One journalist reported a true change in comfort level, and five journalists used the experience to refine their skills. For example, one journalist initially said the audiences he serves are broad but the experience helped him understand audiences are different and depend on story angle.

Once journalists identify a target audience, they must **analyze the target audience**. Before the experience, journalists were not comfortable analyzing target audiences. Two journalists recognized audiences for science communication could include many types of people with varying backgrounds (e.g., policy makers, farmers, consumers, and researchers), making it difficult to write about scientific topics. In reflection, three journalists noted a change in comfort level—two developed complete comfort with analyzing audiences and one noted that writing is more than understanding the topic.

In addition, journalists need to **explain communication tools** and their uses as communication tools are part of disseminating an effective message (P2) and the “medium is the message” (P6). Prior to the experience, the journalists were not familiar with explaining communication tools. Journalist five documented “working in TV makes me realize ... visualization somehow works better to communicate something rather than any other tools/means.” At the end, however, two journalists noted a change in comfort level. One developed a medium level of comfort while another developed complete comfort.

All but one of the journalists were comfortable with **choosing story ideas**. Although five journalists did not note a change in their comfort level, they did note a change in thought or behavior. For example, one journalist noted that choosing story ideas is a priority in writing and important for keeping stories organized (P05). Perhaps, it is the second most important thing behind analyzing audiences (P06).

Part of telling a compelling story is **choosing communication mediums** that engage the audience. The six journalists had varying levels of comfort at the beginning of the experience. Yet, at the end, some felt more comfortable with choosing

communication mediums that complemented their stories. The “medium is the message!” It is “parallel with ... [analyzing] target audience ... and choosing story ideas. After we know our audience and decide what story idea, we have to decide by which medium we would like to deliver it” (P06).

After choosing communication mediums, journalists need to **use communication mediums effectively** because different communication mediums target different audiences more effectively (P02). Prior to the experience, two journalists had a low comfort level with using communication mediums and two recognized the importance of using communication mediums to disseminate messages (P05; P06). After the experience, each journalist had at least a medium comfort level.

**Evaluating communication mediums** is important to choosing and using communication mediums. Prior to the experience, the journalists had three levels of comfort: no idea, low comfort level, and no formal experience. For example, “I might never evaluate the communication mediums seriously[,] but somehow I can tell why such stories are success[ful] in [some] platform[s] and not in the others” (P06). At the end, the journalists were more comfortable with evaluating and understanding the need for evaluating communication mediums.

Journalists should spend time **comparing story structures** and choosing the most effective story structure. Prior to the experience, some journalists had low comfort and no familiarity with the term while others noted that they understood story structures. After the experience, two journalists still noted low comfort level with comparing story structures and four journalists noted increased or consistent comfort level.

**Developing persuasive writing** is an important component of journalism as factual information helps consumers make informed decisions (P01) and represents both sides of the story (P02). One journalist had a very low comfort level with persuasive writing while others understood it but could not do it. “Other than the language and the striking facts and data, I have no idea on how to develop persuasive writing and I would like to learn about this writing technique” (P06). At the end, one journalist still had a low comfort level with developing persuasive writing while others understood persuasive writing.

The basis of science journalism is **analyzing credible and reliable facts**. Before the experience, two journalists reported a low comfort level with analyzing facts. However, at the end, all journalists had at least a medium comfort level with analyzing facts. Although journalists can gather facts from direct interviews with experts and research from print sources (e.g., official print or electronic documents from an organization or the government; P02; P05), verifying them is instrumental to disseminating scientific information (P06).

To obtain factual information, journalists must **illustrate interview and research skills** and plan data collection as “interview and research data blend to support our story” (P01). Researching is important and senior journalists must “illustrate and teach young reporters in my organization how to conduct research and interview” (P06). Two of the six journalists reported a low comfort level with this concept. However, at the end, all journalists had at least a medium comfort level with illustrating interview and research skills.

Beyond illustrating such skills, journalists must be able to **demonstrate interview and research skills**. Three of the six journalists had a very low to low comfort level demonstrating interview and research

skills. Two journalists believed interviewing and researching were instrumental to their success and believed they possessed such skills (P05, P06). After the experience, the journalists had a medium comfort level with interviewing and researching. One noted that reading is important in writing interview questions because, without reading, a journalist cannot obtain the necessary background information or develop effective interview questions.

Specific to this experience was teaching journalists to **translate science related to biotechnology**. Thus, we expected the journalists to have a low comfort level with translating biotechnology information, which they did. At the end of the experience, one journalist still had a low comfort level while the others had medium to high comfort levels. Providing simple explanations that educated and uneducated audiences can easily understand is central to translating biotechnology information (P02). The experience taught journalists to “simplify the biotech terms” (P05) and “translate science related to biotech ... [in] very simple terms and words as this issue is complicated and quite difficult to understand” (P06).

Thoroughly **developing a scientific feature story for a target audience** leads to a compelling news story. Prior to the experience, three journalists were not comfortable writing a scientific feature story. After the experience, the journalists had mixed emotions about writing scientific feature stories and still had anxiety about developing scientific stories. For example, “this is the hardest part of all, but I think I can do it all. I am coping with that” (P06).

After developing a scientific feature story, journalists **revise a scientific feature story for a target audience**. Prior to the experience, the journalists had never revised a story and reported a low comfort level with revising. Contrary to the group, one

journalist was “quite good” at revising (P01). At the end, the journalists began to understand and feel comfortable revising. One journalist who had never revised a scientific feature story was excited because she was able to revise her final project with help from the trainer (P06).

After a scientific feature story has undergone a thorough revision, journalists **edit a scientific feature story for a target audience**. Prior to beginning the experience, two journalists reported a low comfort level with editing and one hoped to learn about editing. At the end of the experience, all of the journalists noted an increased comfort level with editing, and journalist six said next time will be better, implying editing improves with practice.

## Research Objective 2

Using the photographs journalists submitted, we identified their perceptions of United States biotechnology over time and topic. The data yielded three overarching themes with sub-themes: **GMO debate**, **process**, and **food security**.

**GMO debate**. Collectively, journalists recognized GMOs as a debated agricultural issue in the United States. The GMO debate had two sub-themes: **general debate** and **labeling**. GMOs have been on the market for more than 20 years. Yet, United States consumers continue to “misunderstand” the technology (01:08P, C; 02:01P, C) in spite of the vast differences between the organic soybean plant infested with soybean loopers and velvetbean caterpillars and the resistant plants without infestations (02:05P; 05:13P). In comparison, Indonesian farmers have “not applied biotechnology” but have “started using hybrid [crops]” (05:12C).

An ongoing issue in the United States is labeling across all food products. GMO labeling was a “hot issue in the USA” (01:03C) at the time of the experience. One

journalist noted that “regardless [of] the controversy, labeling the product [is a] must” (05:02C), even for locally grown and/or organic food products (04:09P, C; 06:04P, C; 06:05P, C; 06:06P, C; 06:07P, C). Yet, another one was quick to notice product mislabeling as well. “There is no GMO tea,” but the label clearly notes gluten-free and non-GMO (07:15P, C; 07:16P, C).

**Process.** Collectively, the journalists perceived biotechnology as a **process** carried out as the **whole process** and **process steps**. Instrumental to learning about the biotechnology process was “listening” to experts explain the complexities of science (04:06P, C; 05:14P, C; 06:13P, C). Biotechnology is a “process to produce superior seeds safe for humans, animals, and the environment, ... requires lengthy and costly research” (01:06C, 01:07C), and “increases productivity” in the field with “minimal consumption of water and pesticides” (01:02C). Consumers are interested in the process as more than 20,000 visitors tour the St. Louis Monsanto facility every year (01:15C). Thus, opening “high-tech facilities” (01:10C) and “involving consumers” in “every process of farming” (02:10C) is important.

Various processes are situated within the larger process of producing GMOs (01:04P, C). The process begins with plant breeding (01:06P), ends with packaging and distributing (04:15P; 05:11P, C), and includes incremental process steps (e.g., field test plots (01:12P), greenhouses (01:01P; 06:11P), plant breeding (01:06P), and research (01:04P; 01:07P; 01:15P)). For one Midwestern dairy farm, the complete biotechnology process occurs on premises. The cattle are fed grain produced on the farm, the cattle sleep on sand that is cleaned and repurposed on the farm, and the cattle waste is recycled and used for milk truck fuel and transportation (02:13–02:15P,C).

Research, a critical part of the 13-year process, is a large part of the biotechnology process. As an example, researchers at the Danforth Plant Science Center test plants’ adaptability to climates around the world using phenotyping (06:14P, C).

**Food security.** Journalists viewed biotechnology’s role in **food security** as **variety** and **productivity** (02:08C) because agriculture is about variety and modifications (05:07P, C). Biotechnology allows for crop variety (05:03P, 05:07C) and pest resistant crops, which improves yields, increases productivity (02:03C, 02:04C), and increases food availability (5:06P). Prior to the use of GMOs, soybean crops lacked sufficient yields and suffered from low production (01:13P, C), but “management and technology” has helped American farmers produce the highest quality food possible (02:09C). “I am glad I have options” because having options is a “privilege for the buyers” (05:01P, C).

### Research Objective 3

The debriefing session data yielded six overarching themes. During the first debriefing session, the journalists focused on **journalistic concepts, understanding biotechnology and agriculture, and program improvement**. Because the first part of the experience centered on journalistic concepts related to writing a scientific story, the journalists noted two subthemes (story ideas and writing a scientific story). For example, “I learned something new”—how to target audiences and how to use style and voice (P04). The producers whom the journalists met helped them further understand not only how to write a scientific story but also how to write about biotechnology (P03). The journalists appreciated gaining “insights from experts” because the information was “helpful and useful” (P06). Program improvement was also an important part of the first debriefing

session because the journalists were tired (P01; P06). The schedule was too tight and busy (P04) and the climate was very hot (P01). Even though the journalists noted that the program scheduling needed improvement, it was a “once in a lifetime experience” (P06).

During the second debriefing session, the journalists’ thoughts shifted as the overarching themes included **biotechnology information, biotechnology benefits, and biotechnology challenges**. Biotechnology can help farmers increase production while decreasing the use of non-renewable resources, leading to food security. “Biotechnology gives hope ... [and has] improved many things,” including “productivity and income” (P01). Access to information is important for journalists who cover scientific topics because science is complex (P03). Yet, one journalist did not “think biotechnology [was] a ‘big deal’ business” until he met producers.

The experience helped the journalists understand the benefits and challenges of biotechnology. Biotechnology benefits

included increased productivity and profit for farmers; less water, pesticide, and herbicide use; world food security; limitless possibility; job creation; consumer choice; enhanced nutritional composition of food; reduced fuel use; preservation of endangered species; and solutions for common agricultural issues. However, the challenges included safety of GMOs, farmers’ dependency on large seed corporations, loss of food for native species, expensive process, hard on the environment, increased initial investment, regulations, and pressure to consume GMO products.

### **Conclusions**

The journalists identified one journalistic writing concept as very important to the program and five concepts as important to the program. In addition, they showed the most change in comfort level for explaining communication tools, using communication mediums, evaluating communication mediums, choosing communication mediums, and translating science related to biotechnology (Table 1).

Table 1

*Journalists' Change in Comfort Level Related to Journalistic Writing Concepts and the Importance of the Concept to the Program*

Journalistic Writing Concept	Change in Comfort Level		Importance of Concept to the Program
	Pre	Post	
Explaining writing voice and style	Low	Moderate	Important
Identifying target audiences	Moderate	Moderate	Important
Analyzing target audience	Low to Moderate	Moderate to High	Not Important
Explaining communication tools	Very Low to Low	Moderate to High	Not Important
Choosing story ideas	High	High	Not Important
Choosing communication mediums	Low to Moderate	Moderate to High	Not Important
Using communication mediums	Low to Moderate	Moderate to High	Important
Evaluating communication mediums	Not At All to Very Low	Moderate	Very Important
Comparing story structures	Low	Low to Moderate	Not Important
Developing persuasive writing techniques	Low	Low to Moderate	Important
Analyzing credible and reliable facts	Very Low to Low	Moderate	Not Important
Illustrating interview and research skills	Very Low to Low	Moderate	Not Important
Demonstrating interview and research skills	Very Low to Low	Moderate	Somewhat Important
Translating science related to biotechnology	Low	Moderate to High	Important
Developing a scientific feature story	Not At All	Low	Somewhat Important
Revising a scientific feature story	Very Low to Low	Moderate	Somewhat Important
Editing a scientific feature story	Very Low to Low	Moderate	Somewhat Important

*Note:* We reported comfort level based on the majority and reported concept importance indicated by the journalists.

The journalists in this study seemed to struggle with using, evaluating, and choosing communication mediums to translate information about science. Thus, future programs similar to this should focus on teaching program participants how to translate science using specific communication mediums and tools in specific contexts. Journalists are critical components in the translation of science (Fahy & Nisbet, 2011; Houge, 2015; Ridgway, 2016; Treise & Weigold, 2002). However, without the skills and knowledge in translating science using specific communication mediums and tools, they cannot effectively disseminate information or change the public's perceptions of science.

Within the context of this study, science was defined as biotechnology. In discussing biotechnology, the journalists

noted that the GMO labeling debate, production process, and food security have influenced their understanding of biotechnology. They described biotechnology as a highly debated, multi-step process affecting food security. The position of biotechnology and product labeling in the national news at the time of the experience could have been instrumental in forming the journalists' ideologies about biotechnology being a highly debated topic. Furthermore, the United States media has highlighted biotechnology as primarily a food production issue. Perhaps this is why the journalists in this study associated biotechnology with food production and not with the production of other outputs (e.g., laundry detergent, human genes). The journalists could relate to the United States GMO debate because biotechnology had been the center of lawsuits and

governmental discussion in Indonesia. Therefore, the journalists came with a somewhat negative feeling related to biotechnology.

Media's impact on the dissemination of science related to biotechnology further supports the need for journalists to be educated as they are influential gatekeepers (Shoemaker et al., 2009) between agricultural issues and the public. If the media lack access to or misunderstand evidenced-based information about complex science issues as Moualhi et al. noted in 2014, the lack of information is passed on to consumers, leading to mistrust in agriculture and its production processes. Thus, effective communication between the agricultural industry and the media is pivotal for educating consumers and necessitates the need for having Cochran programs (Carlson, 2011; USDA, 2016) focused on educating journalists about complex, scientific issues. The journalists in the Cartmell et al. (2009) and Mwesige (2004) studies noted their role in disseminating complex, scientific information, but without adequate training, journalists cannot be positive influencers for agriculture or effective scientific communicators without adequate training.

Post review and evaluation of programming is a critical component as the outcome of these reviews can guide future programming. When designing programs like this one, training coordinators should consider curriculum, climate, and scheduling. Future training coordinators should eliminate the journalistic writing concepts the journalists noted as not important (Table 1) and spend more time on the important or very important concepts. The concepts specific to translating science and writing persuasively as well and the tour stops were critical to the training because journalists serve as gatekeepers (Shoemaker et al., 2009) and facilitators of information. Providing the varying perspectives related to

biotechnology (i.e., media, consumers, producers, manufacturers, scientists) helped journalists use the information to develop their own perspectives with the intention of taking the information back to Indonesia. Holistically, the journalists enjoyed visiting each location, wanted additional tours, appreciated the diverse perspectives, and enjoyed making connections.

I love the idea [of] getting in touch with farmers like Sue and Kip. ... Going to their farm has made me know more about the real life and business of American Farmers. ... The most important lesson of this trip [was] to also see the connection to Indonesian Farmers, including how applicable and affordable biotechnology is for farmers. (P06)

Program improvement was important to the individual experience. Yet, the journalists did not reflect on program improvement during the second debriefing session. Perhaps this was because the journalists enjoyed the tours during the second part of the experience and did not focus on program improvement. When designing these types of programs, training coordinators need to consider the time of year in which journalists will visit the United States as certain times of the year could present unfavorable climates. Further, training coordinators should avoid scheduling too many activities close together as the journalists seemed fatigued between stops and were often distracted as a result.

### **Recommendations and Implications**

We recommend researchers investigate future programs using a longitudinal study as doing so would allow researchers to determine if the program influenced the stories published in the years following the training. To complete this type of study, the journalists would need to

provide three to five stories they wrote about the topic before attending the training and commit to providing three to five stories about the topic in the months after they complete the training. The study would be qualitative in nature and could include an ethnography and a content analysis of the published stories. Carlson (2011) substantiated the need for this research by stating few studies have documented the impact of Cochran programs because many of the program evaluations focus on logistics and content. Additionally, if this type of program was completed in a year-long format that met three to four times a year, we recommend developing a pre- and post-test to identify change in perception over time. This type of study would be similar to the Cartmell et al. studies conducted in 2008 and 2009. To add a component to the study, researchers could identify a group of journalists who did not participate in the program to determine if differences existed in the two groups' perceptions about biotechnology.

International extension services should design programs that provide journalists with access to content, context, and skill enhancement opportunities and focus on national and global agricultural issues, as extension is critical to developing positive relationships with the media (Ruth & Rumble, 2016). The one-day programs could be part of a year-long training program that includes a field trip. To enhance relationships between journalists and producers and to enhance journalists' access to factual information from credible sources, the trips should include visits with leading producers in the region. This type of program has a broad application in many international extension services as programs around the world have focused more on training consumers and producers rather than training gatekeepers, such as journalists.

In addition, United States agriculturalists should continue to provide international journalists with opportunities to learn about scientific communication (Cartmell et al., 2008, 2009; Mwesige, 2004). To tailor the curriculum to the audience, to allow for the development of a more targeted program, and to ensure the program is delivering the level and type of content the journalists need and want to learn, coordinators should deliver a pre-training survey to the journalists at least one month prior to the program.

Few programs train international journalists about the issues facing American agriculture. Understanding their voices could enable agriculturists to more effectively communicate about scientific issues and develop impactful capacity-building activities. The goal of this program was to enhance trade agreements between the United States and Indonesia by educating Indonesian journalists— influential gatekeepers (Shoemaker et al., 2009)—about the benefits of biotechnology (USDA, 2016). At the time of the program, the Indonesian government was on the cusp of passing laws that influenced the use of biotechnology, and the journalists were in the position to influence government officials and policy development. Because journalists have the power to inform and influence (Cartmell et al., 2008; Ruth & Rumble, 2016), this type of program can have far-reaching, beneficial impacts on the adoption of biotechnology.

### References

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. London: Macmillan Publishers.

- Berg, B. L. (2001). *Qualitative research methods for the social sciences*. Needham Heights, MA: Allyn & Bacon.
- Besley, J. C., & Shanahan, J. (2005). Media attention and exposure in relation to support for agricultural biotechnology. *Science Communication, 26*(4), 347–367.
- Black, C., Moore, L., Wingenbach, G., & Rutherford, T. (2013). Selected students' perspectives on international service-learning: A case study in Chajul, Guatemala. *Journal of International Agricultural and Extension Education, 20*(2), 6–19. doi: 10.5191/jiaee.2013.20201
- Carlson, M. L. (2001). Impact of technical assistance resulting from USDA emerging initiatives in the newly independent states. *Proceedings of the 17th Annual Meeting of the Association of International Agricultural and Extension Education, Baton Rouge, LA*.
- Carlson, M. L. (2011). The USDA Cochran Fellowship Program's Influence on Attitudes of Polish Participants about America. *Proceedings of the 20th Annual Meeting of the Association of International Agricultural and Extension Education, Dublin, Ireland*.
- Cartmell, D. D., Edwards, M. C., Sitton, S., Blackwell, C., Hynes, J. W., & Irani, T. (2008). An agrarian society's developing press system: Malian journalists' views on media, ethics, and democracy. *Proceedings of the 24th Annual Meeting of the Association of International Agricultural and Extension Education, E.A.R.T.H. University, Costa Rica*.
- Cartmell, D. D., Blackwell, C., Sitton, S., Edwards, M. C., Hynes, J. W., & Irani, T. (2009). The impact of cross cultural training experiences on Malian journalists who report on agricultural and environmental issues: Did their views on job duties, media and ethics change? *Proceedings of the 25th Annual Meeting of the Association of International Agricultural and Extension Education, InterContinental San Juan Resort, Puerto Rico*.
- Fahy, D., & Nisbet, M. C. (2011). The science journalist online: Shifting roles and emerging practices. *Journalism 12*(7), 778–793. doi: 10.1177/1464884911412697
- Fiske, S. T. & Taylor, S. E. (1991) *Social Cognition* (2nd ed.). New York, NY: McGraw-Hill.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory*. London: Weidenfeld and Nicholson.
- Hodder, I. (1994). The interpretation of documents and material culture (pp. 393–402). In N. K. Denzin, & Y. S. Lincoln (Eds.) *Handbook of qualitative research*. Thousand Oaks, CA: Sage Publications, Inc.
- Houge, C. (2015, March). Journalist need to get educated on the science. *Environmental Forum, 32*(2), 52.
- Kock, T. K., & Turnbull, J. (2011). Rural development centers (farm stores) in Afghanistan, do they work? The business owners' perspectives. *Journal of International Agricultural and Extension Education, 18*(3), 35–44. doi: 10.5191/jiaee.2011.18303
- Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE Publications, Inc.
- Marks, L. A., Kalaitzandonakes, N., Wilkins, L., & Zakharova, L. (2007).

- Mass media framing of biotechnology news. *Public Understanding of Science*, 16, 183–203. doi: 10.1177/0963662506065054
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.
- Moualhi, I., Galhena, H., Maredia, K., & Weebadde, C. (2014). Perceptions of non-Europeans on biotechnology in Europe: Bridging the knowledge gap. *Asian Biotechnology and Development Review*, 16(2), 43–52.
- Mwesige, P. G. (2004). Disseminators, advocates, and watchdogs: A profile of Ugandan journalists in the New Millennium. *Journalism* 5(1), 69–96. doi: 10.1177/1464884904039556
- Navarro, M., Tome, K., & Gimutao, K. (2013). *From monologue to stakeholder engagement: The evolution of biotech communication*. ISAAA Brief No. 45. Ithaca, NY: ISAAA.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: SAGE Publications.
- Ridgway, A. (2016). How training can fix the existential crisis in science journalism. *Journal of Science Communication*, 15(04), C05, 1–5.
- Ruth, T. K., & Rumble, J. N. (2016). The gold standard: A qualitative framing analysis of newspaper coverage of golden rice in the United States and Philippines. *Journal of International Agricultural and Extension Education*, 23(3), 23–37. doi: 10.5191/jiaee.2016.23302
- Shinn, G. C., Ford, R. K., Attaie, R., & Briers, G. E. (2012). Understanding Afghan opinion leaders' viewpoints about post-conflict foreign agricultural development: A case study in Herāt Province, Afghanistan. *Journal of International Agricultural and Extension Education*, 19(2), 27–38. doi: 10.5191/jiaee.2012.19204
- Shoemaker, P. J., Vos, T. P., & Reese, S. D. (2009). Journalists as gatekeepers. In K. Wahl-Jorgensen, & Hanitzsch (Eds.), *The Handbook of Journalism Studies* (pp. 73–87). Madison, NY: Routledge.
- Treise, D., & Weigold, M. F. (2002). Advancing science communication: A survey of science communicators. *Science Communication*, 23(3), 310–322.
- United States Department of Agriculture. (2016). *Cochran Fellowship Program*. Foreign Agricultural Service. Retrieved from <http://www.fas.usda.gov/programs/cochranfellowship-program>
- Wang, C. C. (1999). Photovoice: A participatory action research strategy applied to women's health. *Journal of Women's Health*, 8(2), 185–192.
- Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, 24(3), 369–387.
- Woodside, A. G. (2010). *Case study research: Theory, methods and practice*. Bingley, UK: Emerald Group Publishing.

### Acknowledgement

This work was made possible through support provided by the United States Department of Agriculture Foreign Agriculture Service under the terms of the Cochran Fellowship Program. The opinions expressed herein are those of the authors and do not reflect the views of the USDA-FAS