

## Introduction

Agricultural science communicators and extension agents must continue to connect with broad public audiences in need of science-based information through traditional outreach efforts as well through digital platforms (O'Neill et al., 2011; Jernigan et al., 2015; Tresnawati, 2021). Unfortunately, when covering science-based topics, some media sources have been found to increase ambiguity, share misinformation, and reinforce existing negative perceptions (Caulfield, 2019; Lundy et al., 2007; MacKenzie, 2019; Valenzuela et al., 2019). In an effort to counterbalance the spread of misinformation and to instead increase public science literacy, scientists, educators, and agricultural organizations are using podcasts as a tool to conduct outreach (Barnes et al., 2021; Rose et al., 2021; Tresnawati et al., 2021). However, further research is needed that focuses on the process of producing food, agricultural, natural resource, and human science (FANRHS) podcasts (Aenlle et al., 2023; Lim & Swenson, 2021), and producers', guests', listeners' levels of trust in science and science-based podcasts, or how trust in science may impact the overall podcast experience. Organizations leveraging podcasts need more information about FANRHS podcast producers, guests, and listeners to ensure their podcast communication strategies meet the needs and interests of their target audiences to instill trust and create lasting relationships.

Incorporating technological experiences such as podcasts into different environments can support science engagement, improve attitudes toward science learning, and potentially establish trust in science (Ting & Tai, 2012). Fiske and Dupree (2014) identified trust and trustworthiness as a critical component of successful science communication. This study explored the role of trust in FANRHS podcast creation, support, and consumption. The results of this study offer several benefits to each of the target audiences involved in the research. The study provides FANRHS subject matter experts and organizations with information highlighting the impacts of podcasting for public outreach and science communication, as well as participants' perceptions of trust and trust-building strategies. The purpose of this study was to examine FANRHS podcast producers', guests', and listeners' perceived trust in agricultural science. The study was guided by the following research questions:

RQ1: What are FANRHS podcast producers' level and perception of trust in science?

RQ2: What are FANRHS podcast guests' level and perception for trust in science?

RQ3: What are FANRHS podcast listeners' level and perception of trust in science?

## Literature Review

The following is a review of current research literature that informed the study. The review included an examination of trust in science and science engagement.

### *Science Engagement and Trust in Science*

Much research has been conducted regarding public opinion and trust of science and scientists in various fields, including stem cell research, global warming, and biology, to name a few (Critchley, 2008; Hmielowski et al., 2013; Kreps & Kriner, 2020; Varner, 2014). Gray et al. (2012) examined the level of trust between fishery stakeholders and management in an attempt to begin to understand public trust in natural resource management. The study included 240 participants from New Jersey and Rhode Island who attended U.S. saltwater fishing expositions

(Gray et al., 2012). The researchers found that when individuals were closely involved with an institution and were a part of decision-making items, they utilized active information processing rather than relying on emotional reactions (Gray et al., 2012). Other factors to consider when discussing trust in science are the channels consumers use to obtain information while acknowledging the uniqueness of different audiences (Lee et al., 2018). As organizations move away from using traditional channels such as journalists, they are beginning to explore opportunities on social media platforms that allow them to communicate more directly with the public (Lee et al., 2018).

### ***Trust Equation & Trust in Podcasts***

Maister et al. (2012) first presented the idea of the trust equation in their book, *The Trusted Advisor*. The trust equation is a formula for evaluating components of trustworthiness, and includes a combination of credibility, reliability, intimacy, and self-concept (Maister et al., 2012). Other scholars have adjusted the equation over the last 20 years to include additional variables such as product value and affinity (Barolsky, 2020) in an attempt to make the trust equation more suitable for long-term relationships. As researchers and institutions continue to seek ways to address decreasing public trust in science (Millstone & Zwanenberg, 2020), science communication technologies have been identified as an area of opportunity to increase an understanding of the nature of science and decrease uncertainty around science topics (Behrends et al., 2022; Kreps & Kriner, 2020). In the context of podcasts, an increasing amount of research has begun focused on the role of trust in podcast production and advertisement (Brinsen & Lemon, 2022). Tsagkias et al. (2008) created a framework that measured podcast trustworthiness, credibility, expertise and quality. Other recent research explored podcasts hosts' role as a trusted opinion leader (Brinson & Lemon, 2022). This study aimed to expand on these concepts by exploring FANRHS podcast producers', guests', and listeners' levels and perceptions of trust.

### **Conceptual Framework**

Social Capital Theory (SCT), social trust, and the overall concept of trust guided the study. The concept of trust continues to be evaluated by researchers who have contrasting views on a solid concept or definition of trust based on the situation, topical application, types of relationships being analyzed, and more (PytlikZillig & Kimbrough, 2016). Trust in agricultural production practices has varied for consumers and can affect their perceptions and opinions of agricultural industries, practices, and products (LaGrande et al., 2021). Previous research on trust within agricultural disciplines has analyzed trust in agricultural messaging, agricultural production practices, marketing, consumer purchasing behaviors and more (LaGrande et al., 2016, Lazaroiu et al., 2019; Robison et al., 2020).

SCT describes the connection between social relationships and collaborative efforts in society (Machalek & Martin, 2015), as well as other capital-building outcomes that may result in prosocial actions (Institute for Social Capital, 2022). According to the Institute for Social Capital (2022), positive social connections can lead to increased collaboration and trust. SCT has been connected to social trust, with some notable differences (Kwon, 2019). Social trust differs from SCT because it can better account for cultural dimensions and norms (e.g., collectivist societies) that would impact trust structures and development (Kwon, 2019).

To share reliable information and create trustworthiness, FANRHS podcast producers, scientists, and listeners need to have trust in the content shared (i.e., a foundational concept of trust), trust in one another (i.e., social trust), and trust in the institutions or organizations facilitating the podcasts.

## **Methods**

This research was part of a larger research study that explored FANRHS podcast production, preferences, demographics and best practices from the perspectives of the podcast producers, listeners, and guests. This study followed an explanatory sequential mixed-method design. Since the 1980s, fields such as healthcare, sociology, and education have used mixed methods approaches (Creswell & Plano Clark, 2011; Creswell & Plano Clark, 2018; Tashakkori & Teddlie, 2009). This type of research has become more widely accepted in recent years across many academic disciplines (Plano Clark, 2010). An exploratory sequential mixed method design involves beginning the research with quantitative data collection, then using the initial findings of this phase to design an additional phase collecting qualitative data that can add clarity and detail to the initial quantitative data (Creswell & Creswell, 2018).

## **Worldview**

The world view that guided the study included a combination of social constructivism and pragmatism. The researchers appreciate the idea of dialectical pluralism and strive to incorporate several worldviews and values into my mixed methods research. Johnson and Stefurak (2013) describe dialectical pluralism as a process philosophy which promotes fairness and equality and allows the values of the researcher to guide the study. Constructivists, also known as interpretivists, believe an individual's reality is unique and constructed based on their personal experiences, then used as a lens to view the world. Each individual develops subjective views and opinions towards phenomena, leading to a single phenomenon holding several meanings for a single group (Creswell, 2013). Research conducted through a constructivist lens, often includes broader, more general questions to allow participants to apply their own meaning and to encourage discussion (Creswell, 2013). Constructivism is most often used for performing qualitative studies and this method incorporates the personal experiences and social interactions of all participants (Creswell & Plano-Clark, 2017).

Pragmatists place emphasis on the outcomes and implications of research and are flexible in their philosophical foundations and in the design of their research (Creswell, 2013). Another unique attribute of pragmatists is their belief in "an external world independent of the mind as well as those lodged in the mind" (Creswell, 2013 p.11). Plowright (2011) explained that, "Pragmatism argues that the truth is 'what works'" (p. 261). Pragmatism is often utilized for mixed method research and combines inductive and deductive processes (Creswell & Plano-Clark, 2018).

## **Data Collection and Instrumentation**

Data were collected in the form of three Qualtrics® surveys and semi-structured interviews. The survey instruments were developed based on two existing instrument designs with the intent of 1) examining the demographics of podcast producers, guests, and listeners, and

2) determining their level of trust in science. The demographic questions were designed to mimic typical survey items from Edison Research's nationwide general podcast research surveys. From Nadelson et al. (2014), a 21-item construct was used to measure levels of trust in science and scientists on Twitter. This trust instrument was field-tested twice with a large convenience sample of undergraduate students (Nadelson et al., 2014). Adjustments were made between the first and second field test. The value for the Cronbach's alpha for the survey was  $\alpha=.86$  (Nadelson et al., 2014). Though Nadelson et al. (2014) used this instrument to primarily generate a combined average trust score, the researchers also found differences between individual averages based on their political views, religious affiliations, and number of college-level science classes students had taken (Nadelson et al., 2014). The entirety of the survey was shared with the author team to determine face and content validity.

### **Sampling and Recruitment**

We began by purposively sampling for FANRHS podcast producers using existing lists of FANRHS podcasts provided by universities, online blogs, and other digital publications. Seventy-one podcast producers were contacted, and of these, 23 completed the survey provided in its entirety. When contacted, producers were also asked to share additional, unique surveys with their past guests and with their current audiences. From this point, chain referral sampling was used to gather any remaining responses. Chain referral sampling is often used when sampling otherwise hard-to-reach populations, and can help maintain the anonymity of participants (Penrod et al., 2003). At the end of each survey, participants were asked if they would like to voluntarily participate in follow-up interviews. While none of the listeners opted into the interviews, five guests and five producers did.

### **Data Analysis**

We analyzed the quantitative data collected from the Qualtrics surveys using the Statistical Package for the Social Science (SPSS). Data were first exported from Qualtrics into Microsoft Excel to be cleaned, then imported into SPSS. Survey responses were included if they were above 96% complete. We then calculated descriptive statistics based on the trust instrument. For the trust in science items, 12 of the items were reverse coded; then the means and standard deviations for each of the 21 items were calculated by SPSS and combined to create an overall construct mean.

### ***Surveys***

Nadelson et al. (2014) constructed this trust instrument with 21 items using a 5-point Likert-type scale ranging from strongly disagree to strongly agree. The instrument included items such as: "scientists don't value the ideas of others," "we should trust the work of scientists," and "we cannot trust science because it moves too slowly." To evaluate the survey instruments as a whole, the lead author piloted the survey by having three individuals on their graduate committee complete it to ensure content and face validity (Creswell & Creswell, 2018).

### ***Interviews***

Data was triangulated by collecting complementary data from various sources on the same phenomenon (Creswell & Creswell, 2018; Polit & Beck, 2012). Data sources included interview transcripts, memos, and survey responses. Memos are a record of notes and ideas the researcher develops while processing and analyzing data (Montgomery & Bailey, 2007). Lastly, I provided a subjectivity statement to explain any biases that could have affected the design of the study or data analysis (Creswell & Creswell, 2018). Additional trustworthiness for the study was obtained by providing rich descriptions of the findings (Creswell & Creswell, 2018). The interview protocol was designed based partially on the initial results from the survey. The protocol included two blocks of questions. The first covering trust topics and asking interviewees to attempt to define or conceptualize trust. The second, focused on how interviewees perceived the relationship between trust, science, scientists, and podcasts. Questions from the interview protocol included: How does podcasting impact science education, communication, engagement and/or trust? And, what are your thoughts on the term “trust in science?”

The interviews were recorded on Zoom and then exported to Sonix.ai for transcription. Once transcribed, the transcriptions were checked for accuracy (Creswell & Creswell, 2018). Data were analyzed by the first author using the constant comparison method; first by using open coding to build concepts (Glaser, 1965), then comparing emerging codes with existing codes to discover areas of consensus or conflict, and relationships between categories (Corbin & Strauss, 1990; Glaser & Strauss, 1967; Scott & Medaugh, 2017).

## **Subjectivity**

My academic career has focused on the agricultural industry, and all three of my degrees involve agriculture. I have a social media presence as an agricultural communicator and podcaster, which makes me keenly interested in ethical, constructive, and responsible communication practices. For this study, I had virtual, one-on-one interaction with the study's participants in the form of interviews. Therefore, I considered how my own relationship with these individuals might have impacted the study. At the time of data collection, I was pursuing a graduate degree in agriculture, which was an underlying focus area of this research. The second author is an assistant professor of agricultural communication also at the University of Florida (UF) Department of Agricultural Education and Communication. The third is an associate professor of agricultural education at the UF Department of Agricultural Education and Communication. The fourth author is a professor of agricultural communication at the University of Florida Department of Agricultural Education and Communication. And the final author is a professor in the Horticulture Department at UF.

## **Findings**

### **RQ1: What are FANRHS podcast producers' level and perception of trust in science?**

A 21-item survey construct (Nadelson, 2014) measured producers' levels of trust in science using a Likert-type scale (1 = strongly disagree, 5 = strongly agree). The mean level of trust for podcast producer participants ( $n=22$ ) was 3.86 ( $SD = 0.43$ ).

Participants' perceptions of science and trust in science were further explored during the semi-structured interviews. Five podcast producers participated in these interviews (see Table 1).

During the interviews, producers were asked about their perceptions of trust in science and how podcasts impact trust in science/science education/science communication. A theme that emerged from this portion of the interviews was that *podcasting raises awareness for science topics*.

**Table 1**

*Descriptive Information on Producer Interview Participants*

Podcast Producer Identifier	Career/Field of Expertise	Level of Education Completed
Producer 1	High School Educator	Advanced Degree
Producer 2	Farmer/Rancher	Advanced Degree
Producer 3	Educator	Advanced Degree
Producer 4	High School Educator	Advanced Degree
Producer 5	University Graduate Student	Four-year Degree

***Podcasting raises awareness of science topics***

The producers identified podcasting not only as a tool for science communication, but also as an opportunity to raise awareness around science topics to provide inspiration for conversations, to share complex issues at a more understandable and palatable level, and to use a platform that is preferred by their target audiences. Producer 2, a cattle rancher who also hosts a podcast that discusses cattle management, explained how, as a podcast host, they may not be the subject matter expert, but they can still use their platform to share science information:

We do have scientific discussions, but I don't have a science background. So, I'm not really able to get into the weeds on some of those things. But I do try to ask questions that help people understand. Because that's what I'm trying to do. I'm trying to get my head wrapped around the topic, and so I think it's a layperson's perspective on those issues.

Other producers also discussed the best platforms used to share science information. Producer 1 described how podcasting is a popular channel used by their target audience, which makes it an ideal medium for them to connect with the listeners:

I always have heard that a lot of the careers that we might be preparing students for don't even exist yet. And I think podcasting is a really good way to get the word out about agriculture in a format that young people are listening to. I think we always need to get agriculture out there and educate people on it. And you have to really follow the trends. I know there's a lot of people on Tik Tok right now, too, that are promoting agriculture, but I think podcasting is kind of a new way to stay relevant with people who might not know about agriculture or who might have some misconceptions about what agriculture is.

Producer 4, a supervisor of agriculture educators statewide and a previous high school agriculture educator, also mentioned how podcasting as a medium is helping reach a younger generation of consumers who might not be using more traditional communication mediums:

Podcasting gives consumers information and something that's more palatable because that's a part of science. That's a challenge. If you think about talking about GMOs, right, some of the fear that we have in them is because of not understanding the science. And so, I think podcasting gives information in a palatable form. It's also targeting a generation of people that aren't reading the news in a magazine or in a newspaper. They're not watching the news. So, it's targeting a whole different generation of people and reaching them in a way that they like to consume information.

Producers also acknowledged that the podcasting medium could improve trust in science. Producer 5, a master's student studying animal science and agricultural communications, said, "podcasting is a great avenue in terms of reaching people that way because, you know, especially if you have a high trusted voice that's leading the platform of the podcast sort of thing." Participants primarily described the way that podcasts provide an additional communication tool for distributing educational content, specifically to younger generations who tend to use new media more often than more traditional media platforms. Regardless of the producers' discipline or occupations, they were able to leverage podcasts as an outlet for sharing educational science content to their audiences.

**RQ2: What are FANRHS podcast guests' level and perception of trust in science?**

The same 21-item survey construct was used to measure podcast guests' levels of trust in science (Nadelson et al., 2014). The mean level of trust for podcast guests ( $n = 18$ ) was 4.28 ( $SD = 0.37$ ). Podcast guests' perceptions of science and trust in science were further explored in semi-structured interviews. Interview participants included university scientists, educators, and employees of national organizations (see Table 2). Overarching themes that emerged and supporting excerpts from the interviews are included below.

**Table 2**  
*Descriptors of Podcast Guest Interview Participants*

Podcast Guest Identifier	Career/Field of Expertise	Level of Education
Guest 1	Extensionist/Educator	Advanced Degree
Guest 2	Extension Professional/Organizational	Advanced Degree
Guest 3	University Scientist/Educator	Advanced Degree
Guest 4	University Scientist	Advanced Degree
Guest 5	University Scientist/Educator	Advanced Degree

***Unethical scientists can fuel biases and misinformation***

Respondents indicated that they believed scientists are generally ethical. Guest 2 was an Extension professional who worked with marine programs and who has participated in science communication opportunities such as magazine articles, served on professional level committees, and delivered numerous guest presentations. As he explained, "Trust in science has really come under fire, but, you know, I like to believe that most scientists are ethical." While producers generally trusted scientists, they gave specific examples of how they identify scientists who might be unethical or are preying upon audiences' innate biases. Guest 2 also said:

I do think most scientists are good, and you can generally pick out the ones that aren't because they're the ones that are kind of going out there and, you know, they're not necessarily the invited speaker, they're the ones that are kind of pushing their own research agenda and they give a lot of publicity. That's unfortunate because, you know, so many people want answers, and they want the answer that aligns with whatever they kind of believe. And so, they'll pick that person.

Guests also mentioned how listeners' political views and other constructs of identity might influence their trust in science or which scientists they trust. Guest 1, an individual who possesses a Ph.D. with over 20 years of experience with pesticide use and management, said:

Mostly politics, the side that you tend to fall on tends to be the quote unquote scientists you will listen to. Whereas in my mind, trust in scientists isn't about any one individual, it's trust in the process. And so, it is one scientist may say something that is different from this scientist, but it is in the aggregate.

In summary, guests believed that scientists are often ethical, but also acknowledged that some scientists selfishly push their own research agenda, and that trust in science and scientists can be influenced by identifying constructs such as religious or political views.

### ***Trust in science depends on discipline***

Another overarching theme was that the perception or level of trust in science depends on the scientific discipline or technology being discussed. For instance, when asked about their level of trust in science, Guest 5, a university professor and associate chair of research for their department, said, "Which Science?" Similarly, Guest 4, a university professor and Extension specialist working in food safety, responded:

The idea of trust in science is very different, depending on what science you're trusting, right? Everybody trusts the science in their cars that drive them to work every day, and everybody trusts the science of chemotherapy or a lot of the medical advances and science when you're in the hospital and it's an emergency and you need something that's going to help you right away. And so, there are areas of science where the trust seems to be there, and it seems universal. And then there's areas of where we talk about trust, science, and we can talk about vaccine hesitancy. We can talk about fear of processed foods. We can talk about fear of genetic engineering. In fact, we can talk about a lot of agricultural sciences, right? Fear of pesticide use, where there's not the same level of trust that we see in things like smartphone technology or computer technology or car technology.

When discussing the connection between trust and discipline expertise, Guest 1 mentioned how a lack of public trust in their discipline affected their work in public outreach. Guest 1 said:

We, as scientists, are not trusted. It's painful to a degree because we're people, too. And especially with pesticides, there's this thought that we're evil and we're part of some awful thing. But that's the reality, and it's our job to a degree. I think where I get into the podcasting and doing the communicating is we are people, too. And I think as scientists, we failed to project that we are full people, not just the science that we do. And maybe that's a way to start earning some of that trust back.

There are different scientific tools and technologies associated with various science disciplines. The public perceptions of these tools and technologies affect public trust in different science disciplines.

***The nature of science is nuanced and often misunderstood which can lead to public mistrust.***

Guests frequently mentioned public misunderstanding of the nature of science. First, several guests described the interdisciplinary nature of science topics and how it takes the input of various experts to adequately cover a complex science issue. Guest 4 said:

A lot of what we communicate is interdisciplinary or should be interdisciplinary. And I think, you know, as scientists, we need to lean in pretty hard to the fact that science is not easy, and it's often not black and white, right? Like it's nuanced and it's complicated, and that's okay.

Guests described the way that certain sciences, by their nature, are ever-changing and scientists rarely if ever make concrete conclusive claims because of this. Guest 1 mentioned how the evolving nature of science can be harmful to public understanding and trust in science:

Part of the degradation of trust in science is that science by its very nature admits that we might be wrong. We say we want to be proven wrong, and in our society, that is not a trait that is generally accepted. We don't like to be wrong. We don't like to be told we are wrong. We don't like to admit we are wrong. And when science has done it, its best, it does. And even in the scientific realm, we have become reluctant to say we are wrong.

Similarly, several guests acknowledged that science as a process is not always linear, and that makes it unappealing to public audiences. As Guest 3, a communications professional and university faculty member, explained, "We're seeing in some of these emerging science issues is the public seeing it while it's messy and they don't like it." Guests also mentioned the challenges of understanding data and jargon presented in research. Guest 3 went on to give an example of how scientific findings are reported and how the use of jargon can cause the public to misinterpret the information:

We run statistics, and we say with a 95% confidence interval with an 80% power, we still have a degree of uncertainty in our findings. And again, that's how science works. We would never be able to say beyond the shadow of a doubt.

Even though podcast guest participants mentioned ways that the public often misunderstands the nature of science, they described feeling hopeful that by connecting more directly with the public, they can establish a deeper understanding and develop a more trusting relationship.

***Staying within one's area of expertise and partnering with professional science communicators can strengthen science communication efforts and trust***

Podcast guests frequently mentioned the idea of expertise, and how it factors into their decision about which podcast opportunities they accept or decline. The podcast guests explained that they are very conscious about not speaking outside of their expertise or encroaching on the work of other experts. Guest 4 said:

I have a lane, and I tried to stay in it. And when I feel like questions or concerns or topic areas are sort of out of my comfort area, then I am really comfortable at this point saying, 'You know what? We're outside my specialty. Let's reach out to the right person and bring them in to answer.'

Guests also cautioned other scientists and science communicators not to speak outside of their expertise and to collaborate with other experts who work on a similar topic to approach it from a different lens. Guest 5 said:

Consider when you're asked to speak about a certain topic. If you can only speak to 25% of it, don't. Referring to a person who can speak on the 75%, if not 100%, because our goal as scientists to communicate science is to communicate accurately. If you are claiming to know something, and then the questions get to a point where it's actually quite grey in terms of your own knowledge, then you're not helping.

Podcast guests acknowledged the importance of expertise, and then connected that to the importance and effectiveness of working with an expert in science communication. Guests discussed the need to recognize the science behind science communication, and work with communication experts when developing messages. Guest 1 explained:

We are certainly experts in our field. And we may be experts at looking at data and interpreting the data. But there is a science to communication, and we are not experts necessarily there.... So, I think, making that shift to recognize communication is a science and to lean into, they are experts, too. And just like I would present data and say, this is what this means. Leaning in and listening to communicators is going to be an important part. Science hasn't changed with how we ask questions, how we gather data, how we write things up, how we do science. What needs to change is how we communicate it because we are increasingly not just communicating to other scientists.

Similarly, Guest 3 also mentioned the need for working with science communication professionals:

You wouldn't call me to repair your tractor. Because I am not trained, I was not good at it, right? Maybe I've picked up a few things here or there. I could watch some YouTube videos. I could try to figure it out for you, but I wouldn't be the best choice if I was standing next to somebody in bioenergy engineering. They would be the clear candidate to work on your tractor. Well, I feel like it's the same way, right? If given a choice? Somebody that studies science communication and studies how consumers receive information and process information would be the better choice to train people about science communication. But if you were stranded in the middle of nowhere and the only person you had to work on your tractor was me and my YouTube video skills, then maybe you would take them.

A final recommendation guests provided was to utilize the introduction of a podcast episode as an opportunity to disclose speakers' areas of expertise.

***Podcasting can both positively and negatively impact science communication, engagement, and trust***

A consideration podcast guests made was that not all podcasts provide high quality science communication. When asked if and how podcasts impact trust in science, science engagement, and science education, Guest 4 said, "I think it depends on the podcast." Guest 4 went on to explain:

I wish that I could say all podcasts are a fantastic way to engage the public, and that all podcasts are fantastic for science education. I think there are certainly examples that can be pointed to of podcasts that cause distrust in science, podcasts that cause, you know, distrust in science education and distrust in scientists who engage with people sort of looking at podcasts holistically. I mean, they are a fantastic tool. But there is a freedom of speech in this country that allows a lot of people to say a lot of different things that are not always complimentary of science or the scientific method.

Guest 1 agreed that podcasts are effective in engaging public audiences and noted how the format of podcasts can be more accessible and personable than other learning formats:

A lot of times in science, we just send out information. It's a one way set of communication. A podcast is already implying there's more than one stream of communication here. And I think the more a podcast is conversational, it does humanize. Somebody lecturing in a big room, pointing at data is not something a lot of people know in their life. But sit around having a conversation with somebody to explain... that sort of style of communication hits home with people and already breaks down some of those barriers and then allows for the science piece to come through. So, I think that a podcast, by its nature, is a conversation. It's already on familiar footing for a lot of people.

In contrast, guests also acknowledged the detrimental effect certain podcasts can have on trust in science. Guests also mentioned how FANRHS podcasts can combat misinformation being shared in these disciplines. Guest 5 said:

Podcasting is one of the key ways to replace misinformation because, if you think about the older generation, we trusted the voice you heard on the radio. We developed a relationship on those lonely nights, that might be the only voice that they could hear. When you think about the soldiers in World War II, when they're away in the Vietnam War, in any war, you go back to hearing something familiar, the voice that can calm them down. If podcasts become similar to some of these very popular talk shows, that's the avenue-

While guests acknowledged the value of well-produced podcasts for science trust and education, they also mentioned the harmful effects that podcasts can have if not produced well or if they contribute to misinformation.

### **RQ3: What are FANRHS podcast listeners' level and perception of trust in science?**

Forty-nine FANRHS podcast listeners completed the Trust in Science and Scientists Inventory (Nadelson et al., 2014) with a mean level of combined of 3.99 ( $SD = 0.52$ ). No follow-up interviews were able to be conducted with FANRHS podcast listeners due to lack of volunteers, therefore, there are no factors for trust to report.

## **Discussion and Recommendations**

RQ1 determined FANRHS podcast producers' trust in science using both a quantitative survey instrument and semi-structured interview questions. Findings showed that the producers had an elevated level of trust in science based on the survey instrument, but they were less trusting of the speed of science and of scientists' willingness to dialogue/listen to people's ideas. This was in line with previous literature that discussed a need for better public understanding of the nature and processes of science (Nadelson & Hardy, 2015). Respondents believed that podcasting could help increase science trust by developing well-made products with credible speakers, specific and relevant topics, an engaging story-like format, and strong supporting resources. For RQ2, FANRHS podcast guests also had a moderately high level of trust in science and scientists, with the acknowledgment that some scientists could be occasionally unethical. Guests also emphasized some best practices for science communicators, including declaring and speaking to their particular area of expertise and nothing outside of it. These best practices were supported by past research as well (Fiske & Dupree, 2014). Though there was not enough supporting data to be reported as a true finding, guests mentioned that a thorough understanding of science starts in youth education settings. There might be opportunities for scientists to get more involved with outreach to youth in informal settings, and to expose them to different scientific disciplines by beginning to show the broad implications of science. Listeners had a moderate to elevated level of trust in science (RQ3), but little was known about their conceptualization of trust or the factors that support this number due to a lack of interest in participating in follow-up interviews.

There was a slight divergence between participants' quantitative trust in science scores and their qualitative discussion of trust in science. While producers and guests shared comments that indicated they had high levels of trust in science, their quantitative results were not as consistently trusting of science. The discrepancy could be attributed to participants considering different science disciplines when responding to the quantitative or qualitative portions of the study or feeling more comfortable speaking in an interview about their area of scientific expertise rather than considering science fields in a more general sense. According to SCT, the positive social interaction during the interview could have resulted in increased trust and transparency during this portion of the study (Machalek & Martin, 2015). The contrast also could be consistent with previous challenges in conceptualizing trust (PytlikZillig & Kimbrough, 2016). Given that many of the podcast guests were closely, if not directly, involved with science, it is interesting to note that their trust in science was not significantly higher than that of podcast producers or podcast listeners. Another interesting concept to note is that, although the sample of this study did not include some of the more largely recognized national network podcasts (e.g., NPR, etc.), some of the podcasts included in the study were hosted by educational organizations that may have already garnered more trusting relationships than other industry or homegrown level podcasts that did not have an established group of stakeholders.

Guest speakers identified concerns with participating in podcasting opportunities and how science communication efforts could negatively impact engagement and trust. This supports previous literature on barriers scientists face in participating in science communication efforts (Varner, 2014). Podcasters with a more developed understanding of effective communication practices could also use their platforms to better explain science concepts. Quintana & Heathers (2021) emphasized the opportunity for scientists to explain the nature of science through media like podcasts, which was consistent with the guests' comments on podcasts explaining the nature of their expertise without extending past it. Key concepts to address also included the process of science, the nature of science, and scientific inquiry (American Association for the Advancement of Science, 1990).

Podcast producers and guests are crucial for sharing science information that can address mistrust in science and provide important scientific knowledge. Producers and guests can use solution-based communication to address or alleviate concerns listeners have about FANRHS and increase trust. Solution-based communication is an applied approach used to create communication material that incorporates solutions to existing issues and can help decrease ambiguity and fear surrounding a topic (Smith et al., 2011). Future research should examine factors of source credibility, differences in trust based on science disciplines, SCT in relationship to podcast engagement, how podcasts can promote attitude change, and what factors lead to listeners having an elevated trust in science score.

## References

- Aenlle, J., Loizzo, J., Lundy, L. K., Bunch, J. C., & Folta, K. M. (2023). Podcasts in production: An examination of current and best practices for agricultural and natural resource podcast producers. *Journal of Applied Communications*, 106(4). <https://doi.org/10.4148/1051-0834.2461>

- American Association for the Advancement of Science. (1990). *Science for all Americans*.  
<http://www.project2061.org/publications/sfaa/online/sfaatoc.htm>
- Barnes, J., Carraway, C., & Jones, S. (2021). Using lecture podcasts in the COVID-19 transition to virtual post-secondary education in agriculture. *Natural Sciences Education, 50*(2). <https://doi.org/10.1002/nse2.20064>
- Barolsky, J. (2020). Taking the master trust equation to a new level. *Relationship Capital*.  
<https://relationshipcapital.com.au/2013/03/26/taking-the-master-trust-equation-to-a-new-level/>
- Behrends, M., Warnecke, J., Witte, M., Klemmt, C., & Hoffmann, I. (2022). The podcast “Digitization of medicine” as a form of science communication. *Studies in Health Technology and Informatics*. <https://doi.org/10.3233/shti220677>
- Brinson, N. H., & Lemon, L. L. (2022). Investigating the effects of host trust, credibility, and authenticity in podcast advertising. *Journal of Marketing Communications, 29*(6), 558-576. <https://doi.org/10.1080/13527266.2022.2054017>
- Corbin, J.M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology 13*, 3–21. <https://doi.org/10.1007/BF00988593>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Creswell, J.W. and Plano Clark, V.L. (2011) *Designing and Conducting Mixed Methods Research*. 2nd Edition, Sage Publications, Los Angeles.
- Creswell, J.W., & Plano Clark, V.L., (2018). *Designing and conducting mixed method research*. Sage Publications.
- Critchley, C. R. (2008). Public opinion and trust in scientists: the role of the research context, and the perceived motivation of stem cell researchers. *Public Understanding of Science, 17*(3), 309–327. <https://doi.org/10.1177/0963662506070162>
- Fiske, S.T., & Dupree, C. (2014) *Gaining audiences’ trust and respect about science*. Proceedings of the National Academy of Sciences (Supplement 4) 13593- 13597; <https://10.1073/pnas.1317505111>
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Transaction Publishers.
- Gray, S., Shwom, R., & Jordan, R. (2012). Understanding factors that influence stakeholder trust of natural resource science and institutions. *Environmental Management, 49*(3), 663-674. <https://doi.org/10.1007/s00267-011-9800-7>

- Hmielowski, J. D., Feldman, L., Myers, T. A., Leiserowitz, A., & Maibach, E. (2014). An attack on science? Media use, trust in scientists, and perceptions of global warming. *Public Understanding of Science*, 23(7), 866–883. <https://doi.org/10.1177/0963662513480091>
- Huber, B., Barnidge, M., Gil de Zúñiga, H., & Liu, J. (2019). Fostering public trust in science: The role of social media. *Public Understanding of Science*, 28(7), 759–777. <https://doi.org/10.1177/0963662519869097>
- Kreps, S. E., & Kriner, D. L. (2020). Model uncertainty, political contestation, and public trust in science: Evidence from the COVID-19 pandemic. *Science Advances*, 6(43). <https://doi.org/10.1126/sciadv.abd4563>
- Institute for Social Capital. (2022). *Guide to social capital: The concept, theory, and its research*. Institute for Social Capital. <https://www.socialcapitalresearch.com/guide-to-social-capital-the-concept-theory-and-its-research/>
- Jernigan, H., Edgar, L. D., Miller, J. D., & Cox, C. K. (2015). Communication Technology Training Beyond the University Campus: A Case Study of Skill Development in the Arkansas Cooperative Extension Service. *North American Colleges and Teachers of Agriculture Journal*, 59(2), 122-129. <https://www.jstor.org/stable/pdf/nactajournal.59.2.122.pdf>
- Kwon, O. Y. (2019, October 25). *Social trust: Its concepts, determinants, roles, and raising ways*. Elgar Online. <https://doi.org/10.4337/9781784719609.00008>
- LaGrande, L. E., Meyers, C., Cummins, R. G., & Baker, M. (2021). A moment-to-moment analysis of trust in agricultural messages. *Journal of Applied Communications*, 105(2). <https://doi.org/10.4148/1051-0834.2375>
- Lazaroiu, G., Andronie, M., Uță, C., & Hurloiu, I. (2019). Trust management in organic agriculture: Sustainable consumption behavior, environmentally conscious purchase intention, and healthy food choices. *Frontiers in Public Health*, 7. <https://doi.org/10.3389/fpubh.2019.00340>
- Lee, N.M, VanDyke, M.S., & Cummins, R.G. (2018) A missed opportunity? NOAA’s use of social media to communicate climate science, *Environmental Communication*, 12:2, 274-283, <https://doi.org/10.1080/17524032.2016.1269825>
- Lim, M., & Swenson, R. (2021). Talking plants: Examining the role of podcasts in communicating plant pathology knowledge. *Journal of Applied Communications*, 105(2). <https://doi.org/10.4148/1051-0834.2366>
- Machalek, R., & Martin, M. W. (2015). Sociobiology and sociology: A new synthesis. *International Encyclopedia of the Social & Behavioral Sciences*, 892-898. <https://doi.org/10.1016/b978-0-08-097086-8.32010-4>

- MacKenzie, L. E. (2019). Science podcasts: Analysis of global production and output from 2004 to 2018. *Royal Society Open Science*, 6(1), 180932. <https://doi.org/10.1098/rsos.180932>
- Maister, D. H., Galford, R., & Green, C. (2012). *The trusted advisor*. Simon & Schuster.
- Mertler. (2016) Chapter 7: *Quantitative research methods*. Sage Publications. 107-143
- Montgomery, P., & Bailey, P. H. (2007). Field notes and theoretical memos in grounded theory. *Western Journal of Nursing Research*, 29(1), 65-79. <https://doi.org/10.1177/0193945906292557>
- Millstone, E., & Van Zwanenberg, P. (2000). A crisis of trust: For science, scientists or for institutions? *Nature Medicine*, 6(12), 1307-1308. <https://doi.org/10.1038/82102>
- Montgomery, P., & Bailey, P. H. (2007). Field notes and theoretical memos in grounded theory. *Western Journal of Nursing Research*, 29(1), 65-79. <https://doi.org/10.1177/0193945906292557>
- Nadelon, L.S., & Hardy, K. (2015). Trust in science and scientists and the acceptance of evolution. *Evolution, Education, and Outreach*, 8(9). <https://doi.org/10.1186/s12052-015-0037-4>
- Nadelson, L. S., Jorcyk, C., Yang, D., Smith, M. J., Matson, S., Cornell, K., & Husting, V. (2014). I Just Don't Trust Them: The Development and Validation of an Assessment Instrument to Measure Trust in Science and Scientists. *Trust in Science and Scientists*, 114(2), 76-87. <https://doi.org/10.1111/ssm.12051>
- O'Neill, B., Zumwalt, A., & Bechman, J. (2011). Social Media Use of Cooperative Extension Family Economics Educators: Online Survey Results and Implications. *Journal of Extension*, 49(6). [https://archives.joe.org/joe/2011december/pdf/JOE\\_v49\\_6rb2.pdf](https://archives.joe.org/joe/2011december/pdf/JOE_v49_6rb2.pdf)
- Opat, K. (2020, October 20). Disseminating scientific information to Generation Z through podcasts: An explanatory sequential mixed methods study. <https://ttuir.tdl.org/handle/2346/86540>.
- Penrod, J., Preston, D. B., Cain, R. E., & Starks, M. T. (2003). A discussion of chain referral as a method of sampling hard-to-Reach populations. *Journal of Transcultural Nursing*, 14(2), 100-107. <https://doi.org/10.1177/1043659602250614>
- Polit, D.F., & Beck, C.T. (2012). *Nursing research: Generating and assessing evidence for nursing practice*. Philadelphia, PA: Lippincott Williams and Wilkins.
- PytlikZillig, L. M., & Kimbrough, C. D. (2016). Consensus on conceptualizations and definitions of trust: Are we there yet? *Interdisciplinary Perspectives on Trust*, 17-47. [https://doi.org/10.1007/978-3-319-22261-5\\_2](https://doi.org/10.1007/978-3-319-22261-5_2)

- Robinson, C. R., Ruth, T. K., Easterly, R. G., Franzoy, F., & Lillywhite, J. (2020). Examining consumers' trust in the food supply chain. *Journal of Applied Communications*, 104(2). <https://doi.org/10.4148/1051-0834.2298>
- Rose, D.C., Chivers, C-A, de Boon, A, Schillings, J, Smith, R, Lishman, L and Bliss, K (2021) *Videos and podcasts as potential approaches for knowledge exchange with farmers: testing their potential role in ELM*. Project Report. Agricolology.
- Scott, C., & Medaugh, M. (2017). Axial coding. *The International Encyclopedia of Communication Research Methods*, 1-2. <https://doi.org/10.1002/9781118901731.iecrm0012>
- Smith, S., Adam, D., Kirkpatrick, P., & McRobie, G. (2011). Using solution-focused communication to support patients. *Nursing standard (Royal College of Nursing (Great Britain))*: 1987. 25. 42-7. <https://doi.org/10.7748/ns2011.08.25.52.42.c8675>
- Tashakkori, A. & Teddlie, C. (2009). Integrating qualitative and quantitative approaches to research. In Bickman, L., & Rog, D. J. *The SAGE handbook of applied social research methods* (pp. 283-317). SAGE Publications, Inc. <https://doi.org/10.4135/9781483348858>
- Ting, Y., & Tai, Y. (2012) Using technology in students' daily life to teach science. *International Journal of Technology and Engineering Education*. 9(1) <http://www.ijtee.org/ijtee/system/db/pdf/91.pdf#page=27>
- Tresnawati, T., Medionovianto, D., & Pradhista, H. N. (2021). The use of podcast in disseminating agricultural technology innovation: A SWOT analysis. *E3S Web of Conferences*, 306, 03006. <https://doi.org/10.1051/e3sconf/202130603006>
- Tsagkias, M., Larson, M., Weerkamp, W., & De Rijke, M. (2008). PodCred: A framework for analyzing podcast preference. *Association for Computing Machinery*. <https://doi.org/10.1145/1458527.1458545>
- Quintana, D. S., & Heathers, J. A. (2021). How podcasts can benefit scientific communities. *Trends in Cognitive Sciences*, 25(1), 3-5. <https://doi.org/10.1016/j.tics.2020.10.003>