Evaluations of the Current Use of Digital Media to Generate Agricultural Education and Impact Among Target Audiences

by

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Abstract

The media landscape has experienced a thorough reinvention over the course of the last four decades. Media was once thought to consist of only print and television news, due to the widespread use of the internet it has now expanded to included digital media such as: podcasts, social media, blogs, and more. With the U.S. Census Bureau (n.d.) and the USDA Census of Agriculture (2017) reportings showing that roughly 1% of people in the United States play a role in food production, those that do not experience agriculture regularly are questioning how the food they consume is produced. Additionally, over time the widely baby boomer run agricultural industry will continue to experience turnover into the hands of a whole new generation: Millennials. Problems faced today include the need to discover what platforms best reach young, concerned consumers on social media and the need to determine how to best inform new, young producers about the latest technological discoveries in production agriculture. Because of these challenges, the following research studies have been conducted to evaluate the use of podcasts as CES tool and to measure the means of influence that agricultural social media influencers can have on young adults using Instagram. Researchers utilized a mixed methods approach where both quantitative and qualitative data were collected. Data were collected through surveys on the platform Qualtrics, participation was voluntary, and participants were anonymous.

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List of Abbreviations

ACES Alabama Cooperative Extension System

CEO Chief Executive Officer

CES Cooperative Extension System

GMO Genetically Modified Organisms

IT Information Technology

NIFA National Institute of Food and Agriculture

RSS Really Simple Syndication

SLO Social License to Operate

SM Social Media

SMI Social Media Influencer

U.S. United States

USDA United States Department of Agriculture

VARK Visual, Aural, Read/Write, Kinesthetic

Chapter 1

Literature Review

Introduction

Since the organizations' creation, personnel working for the Cooperative Extension System (CES) have been tasked with maintaining the relevance of their work, meeting the needs of their everchanging clientele, dealing with budget changes and fluid full time personnel (Everts et al. 2012; Hendrickson et al., 2010; Henning et al., 2014; Wang, 2014). In addition, Extension personnel also face the challenge of adjusting their communication practices to remain relevant with technological advances and teaching styles. The following review of current literature aims to identify the history of CES, current CES stakeholder demographics, anticipated stakeholder demographic changes, current learning theories, the history of podcasts, and the current use of podcasts as an education tool for CES programming. This study seeks to explore the perceptions of CES personnel towards the use of podcasts as an additional CES tool, the current use of podcasts as an CES tool, as well as stakeholders current use of already established CES podcasts and their opinions towards podcasts as an CES tool for their use.

History of the Cooperative Extension System

The land-grant university system was created through the signing of the Morrill Act by President Abraham Lincoln on July 2, 1862 (Croft, 2019). The grant permitted every state in the United States (U.S.) to build institutions of higher learning known as land-grant universities to encourage higher learning in agricultural and mechanical studies (Croft, 2019). The three functional pillars of land-grant universities were later declared to consist of teaching, research, and extension (Croft, 2019). As a result of the Smith-Lever Act signed by President Woodrow

Wilson in 1914 (Mercer, 2014), the U.S. Cooperative Extension Service (CES) was created in partnership with not only the land-grant universities, but also with federal, state, and local governments (Croft, 2019). The establishment of CES was to help guarantee that land-grant universities had the ability for their findings in agricultural research to be disseminated to the non-university public so that these findings may be applied in production and contribute towards the improvement of agricultural practices (Croft, 2019; Henning et. al., 2014). Currently, CES programs primarily receive funding through grants from the United States Department of Agriculture's (USDA) National Institute of Food and Agriculture (NIFA), which was created through the Food, Conservation, and Energy Act of 2008 (Wang, 2014). Annual grants provided through NIFA include funds based on population-related formulas and funds exclusively meant for land-grant institution programs (Wang, 2014). As part of this funding agreement that supports CES, states are requested to match these formula-based portions of federal funding (Wang, 2014).

Since its establishment, CES has focused on three guiding principles which were outlined by Henning et al., (2014) during the organizations' centennial year. The first principle illustrated in the Smith-Lever Act, (1914) is the idea that through its existence, CES will aid in "the development of practical applications of research knowledge and giving of instruction and practical demonstrations of existing or improved practices or technologies in agriculture…" The second principle being to maintain the relevancy of CES programs work and connection to the local communities that CES personnel serve. Henning et al., (2014) went as far to state that, "Our nations' demographics have changed immensely during the last century, but the charge to serve ***all*** audiences remains a constant." The final principle was described as CES' obligation to remain relevant with modern educational approaches, which include the use of innovative digital

technologies (Henning et al., 2014). Previous research studies reported that CES professionals would need to anticipate the learning demand and adjust programming and their modes of delivery to remain current with new and future technologies (Ezell, 1989). Each of these guiding principles, in one fashion or another, point towards the support of and further exploration of podcasts as a modern-day tool for CES programming across the country.

Current and Expected Demographic Changes in Extension Stakeholders

According to population estimates from the U.S. Census Bureau as of July 2019, the Millennial generation has now surpassed Baby Boomers as the United States' largest living adult generation (Fry, 2020). The Millennial generation, defined as the ages of 23 to 38, in 2019 numbered 72.1 million while Baby Boomers, defined as the ages of 55 to 73, numbered 71.6 million (Fry, 2020). A change in generational numbers may not seem significant, however the inevitable changes in population demographics also hints towards the inevitable need for changes in the delivery of CES information for effective dissemination and consumption by CES target audiences. According to Fry (2020), the Baby Boomer population is projected to dwindle to 16.2 million as Millennial populations reach 72.2 million by 2050. This anticipated generational shift demonstrates the need for CES professionals to begin focusing on new methods to educate and communicate with an entirely different generation.

Preferred methods of communication can be influenced greatly by factors such as age, level of education, and access to technology (Howell & Habron, 2004). With the USDA Census of Agriculture (2017) indicating that nearly 1 in 10 U.S. producers are ages 35 or younger, understanding that CES' new target audience will differ is more important than ever before. this new target audience will consist of mostly Millennials, the first generation to never know life

without the internet (McAlister, 2009), and for whom integrating technology for educational engagement is crucial (Aviles & Eastman, 2012; McAlister, 2009). Sumpter & Koonce (2019) found in their exploratory study evaluating potential resources for CES to invest efforts for addressing the Millennial generation, that among the four CES educators interviewed, all reported that across all generations CES stakeholders had not been attending programs in-person as in previous programming years. These data do not consider the major behavioral shifts and in-person event attendance rates that have been reported over last three years because of the COVID-19 Global Pandemic. Personal communications with Alabama Cooperative Extension System (ACES) personnel have reported that as a result of the COVID-19 Global Pandemic, restrictions on in-person meeting opportunities have caused a reduction in attendance to events that have been hosted. However, generational shifts are not the only aspect of CES stakeholder demographics that changes should be anticipated in.

CES personnel have a more traditional audience that they may be used to working with, however recent data indicates that the CES stakeholder audience of the near future may be more diverse. In 2012, the USDA Census of Agriculture (2012) reported that 86.3% of the 2,109,303 primary operators were male and only 13.7% were female. In contrast, in the 2017 USDA Census of Agriculture (2017) it was reported that males made up 70.9% of the primary operator population and that females made up 29.1%. That is a 15.5% increase in females serving as primary operators over the course of only five years. As of 2012, females outnumbered males in terms of the number of degrees earned in agriculture and natural resources at postsecondary education institutions (IPEDS Data Explorer, 2022). Recent data indicates that in 2018, 55% of degrees earned in agriculture and natural resources were awarded to females at postsecondary education institutions (IPEDS Data Explorer, 2022). A change in gender demographics within

college and university programs related to agriculture and CES programming highlights the growth of female participation in agricultural roles, three decades ago Rivera & Corning (1990) wrote for the Journal of Extension highlighting the need to generate female oriented CES content at that time. The same call to action was made recently based off research conducted by Braiser et al. (2019), who in a survey of CES educators found that they perceived the educational needs of their female audience to be different from their male counterparts. It has been noted that the increase in audience diversity has been acknowledged by CES personnel, however the needs of these new stakeholders are sometimes neglected by CES personnel to meet the "high-maintenance needs" of traditional CES stakeholders (Diem et al., 2011).

Plastina et al. (2019) anticipated the same generational and gender shifts in CES stakeholders and noted that while these changes occur a wider focus on more diverse content including more focus on farm management, agribusiness, and agricultural development may need to follow. However, calls for more diverse content do not end there. CES program users today are no longer just limited to producers and those within rural communities, the CES audience has over time expanded to include nonprofit organizations, private industry, consultants, hobbyists, master gardeners, and the general public as well (Lim & Swenson, 2021). Topics covered by CES programming on a national level span more than just agriculture and now include coverage of topics including food security, youth development, public health, family programming, financial literacy, and so much more.

Understanding the VARK Model and Connectivism – Learning Theories and Podcasts

The VARK model (visual, aural, read/write, and kinesthetic) is based on the principle that various perceptual strengths should be utilized to deliver information to successfully reach individuals with differing learning styles (McLeod, 2006). CES commonly uses the VARK model in meeting the needs of CES stakeholders who prefer reading/writing learning styles using blog posts, review papers, and forums. In addition, CES also delivers educational information to stakeholders that prefer kinesthetic learning styles through in-person field days, or stakeholders that prefer visual and aural learning through in-person lectures and webinars. The use of podcasting as a CES tool presents the opportunity for Extension professionals to meet the needs of those that prefer aural learning opportunities opposed to others presented by the VARK model in an easy to create form of content (Lim & Swenson, 2021). Aural learning through audio formats can be considered a less formal, more engaging way of communicating science-based content than written material (Merzagora, 2004). Fleming, (1995) indicates the significance of utilizing multiple forms of VARK model instruction stating that, "Each presentation in another mode gathers in another group of students who might otherwise have missed the point..." This statement supports the concept that podcasting could serve as a unique communications platform for CES to reach audiences that CES personnel may never have connected with previously.

The previously discussed various tools and methods used in CES outreach today also coincide with the learning theory known as "connectivism" (Hendrickson et al., 2010). But the argument could also be made that the addition of podcasts into the pedagogical toolbox of CES programs could further their ability to model this learning theory. Connectivism, as proposed by Siemans (2006), is the idea that learning and knowledge come from a diversity of sources and opinions that are constantly changing due to the radical changes in information distribution due

to modern technology. It was also described as, “the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks” (Hendricks, 2019). Based on this learning theory fit for the digital age, connectivism supports the idea that it is not always what the individual knows, but what educational tools the individual has access to or individuals with more knowledge that they could connect with (Siemans, 2006). This idea supports the opportunity that podcasts as an educational medium present to CES programs. The opportunity to connect with and play a role in the educational sphere of stakeholders that they otherwise would have never reached. Siemans (2006) ends his paper on the theory with, “The field of education has been slow to recognize both impact of new learning tools and the environmental changes in what it means to learn. Connectivism provides insight into learning skills and tasks needed for learners to flourish in a digital era.”

History of Podcasts

Podcasts, derived from the words “iPod” and “broadcast,” as we truly know them to exist today were created through the technology Really Simple Syndication (RSS) technology (Campbell, 2005). While RSS technology had been developed by Dave Winer in 2000, the podcast format was not truly established until Adam Curry’s release of his podcast directory system, iPodder, in 2005 which is recognized as the first “true” podcast directory like what we see today (Chen, 2009). The new communications platform was further solidified in 2005 when Apple released their iTunes 4.9 update, which was the first software version to fully offer podcast support and included a podcast directory which allowed for Apple users to easily search for and subscribe to podcasts (Friess, 2005). A decade later Friess (2015) wrote, “Prior to the

iTunes 4.9 update on June 28, 2005, podcasts were so clumsily arranged around the internet and so technologically challenging to use on any device other than a desktop or laptop computer that only the most tech-savvy even knew they existed." Apple's incorporation of the medium into the technology of their well-known and modern platform allowed podcasts to be introduced to their millions of iPod owners and iTunes customers. RSS technology allows for media to be syndicated directly on the Internet permitting platforms such as Apple Podcasts, Google Podcasts, and Spotify to utilize the technology and automatically update their feeds with content as it is shared (Xie & Gu, 2007). Birch & Weitkamp (2010) described RSS feeds as a hybrid "push" and "pull" system, with content being "pushed" by podcast creators and "pulled" by podcast listeners. Additionally, podcast distribution platforms allow for podcast content to be easily searched for and discovered by these platforms' users. Searching for and listening to podcast content has become extremely popular among these platforms' users, Edison Research & Triton Digital (2021) in The Infinite Dial 2021 Report concluded, "Spotify has solidified its spot as the largest single-source for online audio and has played a role in the growth of podcasting (especially with younger listeners)."

Over the course of the last 17 years of the medium's history, the use of podcasts has exponentially increased. In the U.S. it was reported by The Infinite Dial that in 2010 approximately 23% of the population over the age of 12 years old had ever listened to a podcast (Edison Research & Triton Digital, 2021). In 2021, that study reported that roughly 57% the U.S. population over the age of 12 years old had ever listened to a podcast (Edison Research & Triton Digital, 2021). This study documenting podcast use in the U.S. alone demonstrated a 34% increase in use of podcasts over the course of eleven years. In that same study, Edison Research & Triton Digital (2021) found that at the time of data collection an estimated 80 million people

in the U.S. had listened to a podcast in the last week, and of that 80 million the standard U.S. weekly podcast listeners listened to an average of eight podcasts in a week. These data demonstrated that those in the U.S. population that listened to podcasts were dedicated listeners that valued time spent using the medium. With 46% of monthly podcast users in the U.S. today reported as female and 56% of monthly listeners within the age demographic of 12-34 years old (Edison Research & Triton Digital, 2021), podcast user demographics today could potentially coincide with the CES stakeholder audience of the future that we described previously.

Current Use of Podcasts as an Education Tool

The use of podcasts as a platform for educational purposes has been used across many different disciplines. Disciplines spanning from medical schools, teacher preparation courses, nursing schools, and graduate studies programs have all explored the use of podcasts as an educational tool (Kennedy et al., 2015; Luna & Cullen, 2011; McNamara & Haegele, 2020; Young et al, 2021). A study conducted by Young et al. (2021) looked at the use of podcasts as a feasible way of disseminating educational material regarding ophthalmology to medical students. For the purposes of their study, Young et al. (2021) created 49 podcast episodes and released the episodes on a weekly release schedule over the course of a year. Results of that study indicated that from January of 2019 to February of 2020 episodes were downloaded 122,709 times and obtained 114 ratings on iTunes with an average rating of 5.0 stars (Young et al, 2021). In a study conducted by Luna & Cullen (2011), 51 nursing and social work graduate students were asked about their perceptions towards their use of a podcast as a teaching tool in their college courses. Of the 51 participants, 76% indicated that provided podcast listening enhanced their learning, while 12% of students found the podcast produced for the purposes of this study unhelpful (Luna

& Cullen, 2011). Similarly, but with teacher candidate preparation content, Kennedy et al. (2015) compared knowledge and application of material when provided either through podcasts in addition to course text or though text only instruction. Participants whose learning had been supplemented with podcasts scored significantly higher on both knowledge and application assessments and stated that they felt more motivated opposed to participants that received text only instruction (Kennedy et al., 2015). Additionally, McNamara & Haegele (2020) conducted a study where 19 undergraduate students in a physical education program and as participants were asked to listen to a 36-minute-long podcast episode related to inclusion in physical education programs and to then complete a written statement reflection on the provided podcast. The consensus of student feedback regarding the usefulness of the podcast to deliver information was positive, and McNamara & Haegele (2020) went so far to state that, "Participants viewed podcasts as valuable in aiding the learning process, even when tackling controversial and complex topics." As far as the actual use of the medium for CES related educational purposes, a study conducted by Mills (2011) drew comparisons in web traffic on an Australian Extension website between the top thirteen dairy podcast episodes and the top thirteen dairy PDFs for a month in 2009. Results of that study indicated that the top thirteen dairy podcast episodes generated 3.65 times the number of downloads when compared to the top thirteen dairy publications in a PDF format (Mills, 2011).

While still considered a novel medium in CES programming, podcasts are not exactly unheard of in the world of CES today. In fact, the first land-grant institution program in the U.S. to utilize podcast technology was Texas A&M University in September of 2003 with the creation of their podcast, *Agnews Weekly* (Fannin, 2006). Started as an experiment with no budget, the CES oriented podcast concluded the first two years of its existence with 84,316 downloads

(Fannin, 2006). From their unprecedented use of the platform, Fannin (2006) stated that, "Podcasting provides new ways to target general consumer and agricultural producers with audio news content." Fannin (2006) also stated that *Agnews Weekly* had listeners tuning in from as far as Chicago, New York City, and even Scotland, proving the unique audience that podcasting platforms can provide CES programs with. Outside of the inaugural *Agnews Weekly* created by Texas A&M University, CES podcasts have grown to include the *Alabama Crops Report Podcast* produced by the ACES crops team, *Backyard Farmer* produced by University of Nebraska-Lincoln, *Extension 302* produced by University of Delaware Cooperative Extension, *Two Agents and the FACS* by University of Georgia Family and Consumer Sciences' agents, and more. Comparatively, some CES programs have been more open to exploring podcasts as a medium, such as the University of Minnesota Extension team who as of 2022 has 17 different podcasts listed on their website. However, podcasting has still yet to become a CES content format that has been widely utilized across all national CES programs.

The Appeal of Podcasts as an Extension Tool

As the digital age has continued, the demand for more online CES resources has only increased (Diem et al., 2011). For CES this call to action is understandable because online programming has proven to help increase CES reach, expand the flexibility of content, and make materials and information more accessible for stakeholders, all while lessening financial costs (Rich et al., 2011). The successful widespan adoption of technology as CES tools today have included the integration of blogs, social media, and web conferencing tools (i.e., Zoom, Microsoft Teams, Skype, etc.) (Barton et al., 2017). Prior to the adoption of social media by most CES programs, some perceived barriers of social media use by CES personnel included concerns

over lack of training, time availability, information control, and lack of acceptance by fellow CES professionals (Gharis et al., 2014; Newbury et al., 2014). However, little has been reported about the reasoning behind why podcasting as a similar technological tool has yet to be more widely adopted across CES programs, and this study as it stands hopes to fill that knowledge gap.

Technological abilities have long been perceived as significant skills necessary to have in CES personnel for the success of CES programming (Harriman & Daugherty, 1992). Mills (2011) communicated the belief that podcasting was a tool that could feasibly be picked up across extension programming and even stated that, "The skill set required to develop and deliver podcasts is one that can be readily acquired by most extension officers with minimal training." This potential opportunity for training and support could theoretically be facilitated by CES programs' IT support departments (Xie & Gu, 2007). Not only is podcasting an information delivery platform with an easy to navigate learning curve in terms of content creation, but it could also be an easy way for CES to repurpose already created content from other events such as lectures, webinars, or field days (Lim & Swenson, 2021). Having this content in the form of a podcast gives clientele the convenience of listening the content on demand, replaying the audio as needed, and learning in their own setting of choice (Lim & Swenson, 2021). The ability for podcasts to be produced expeditiously was also commented on by Mills (2011) who stated that podcasts, "Can be recorded and edited in an hour, transcribed overnight and be on a website or emailed to clients within 24 hours, or perhaps sooner if required." However, it is important to note that many organizations, such as CES programs, may have policies and procedures that limit the ability for podcasts to be released in the quick fashion that they may lend themselves to (Mills, 2011). In addition to the ease of podcast content creation, making it an appealing medium

for CES programs, is its affordability. CES educators have had a challenging time finding affordable ways to not only meet current audience needs but to also expand into new programs and audiences and utilizing podcasts as a CES tool might be a cost-effective way to do that (Hendrickson et al., 2010). Assuming that all CES personnel already have access to a computer and some basic forms of computer programming, it is possible for interested CES personnel to start a podcast for less than $200 (*How much does it cost to start a podcast?,* 2020). Anticipated needs to start a podcast can include: a computer, a quality microphone, audio editing software, headphones, and digital media branding components such as podcast cover art (Ferreira, 2020; *How much does it cost to start a podcast?,* 2020). With many of those start up needs already resources readily available to CES professionals, it is fair to say that the feasibility of creating a podcast on a budget is highly probable.

Not only are podcasts easy and affordable to produce, but the ease of podcast consumption and the convenience that it provides is something that many CES stakeholders value. In fact, of the 3,399,834 producers in U.S. reported in the 2017 USDA Census of Agriculture, 58.3% of producers' primary occupation was outside of farming. This means that opportunities to travel to CES meetings and demonstrations might be out of question for potential CES stakeholders, making podcasts a CES tool that this demographic could utilize at their own discretion. Additionally, a study by Hendrickson et al. (2010) found that when conducting a focus group with college students related to a CES podcast that students discussed the importance of finding information with as little time commitment as possible. College students even went as far as stating that having the ability to immediately access timely information from CES podcasts was something that interested them (Hendrickson et al., 2010). While this study does not propose for CES oriented podcasts to replace other current CES tools,

simply to add to the CES pedagogical toolbox, research conducted by Raupach et al. (2015) found that comparisons between podcasts and live lectures indicated that student podcast users' knowledge acquisition and retention surpassed those of live lectures. Xie & Gu (2007) stated that because CES stakeholders have established a baseline of expertise related to their knowledge and professional experience, their learning is typically more self-directed than that of students in a traditional classroom setting. Podcasts provide listeners the unique ability to listen when most convenient for them and to stop, rewind, and replay the podcast audio as needed, allowing for listeners to better manage the information that they chose to consume on their own time (Schreiber et al., 2010).

According to Farivar (2004), podcasting can be defined as an internet-based recorded audio that is accessed by listeners via an online subscription technology called Really Simple Syndication (R.S.S.). In 2012, the USDA Census of Agriculture reported that 69.6% of U.S farms had Internet access. Over the course of five years, that percentage jumped to 75.4% in 2017. With the percentage of U.S. farms with Internet access continuously rising, podcasts could serve as an easily accessible tool for CES clientele to utilize while they have Internet capabilities to download podcast episodes and then listen later when they are no longer in areas with proper internet connections. This technology could allow producers to access CES podcasts while operating a combine, fixing farm equipment, or while driving across town. This multitasking listening approach is backed by research done by Birch & Weitkamp (2010) where they found that majority of their study's participants listened to podcasts while doing other things (i.e., walking, commuting, cleaning, or working). The opportunities for podcasts as a medium to infiltrate the daily life of CES program users are limitless and could allow valuable CES

knowledge to be more accessible for audiences with limited time, such as CES stakeholders who may not have the ability to attend in-person events.

Conclusion

In conclusion, an evaluation of current literature indicates that podcasts may play a pivotal role in the digital media space and may be impactful in reference to learning (Kennedy et al., 2015; Luna & Cullen, 2011; McNamara & Haegele, 2020; Young et al, 2021). While the technology has existed since 2000, the widespread use of podcasting did not pick up until 2005 and since then has drastically grown into the mainstream media format that it exists as today (Chen, 2009; Edison Research & Triton Digital, 2021). While podcasts as an CES education tool may not appeal to the target audience of CES programming from the past or even as it exists currently, literature illustrates that the direction demographics are moving towards due to changes within the agricultural industry may coincide with demographics that do actively listen to and enjoy podcasts (Edison Research & Triton Digital, 2021; Fry, 2020; IPEDS Data Explorer, 2022; USDA Census of Agriculture, 2017). Not only would podcasts serve as a way to reach new and diverse audience members for Extension programming, but they also provide content for Extension users in a unique format that may appeal to stakeholders that are aural learners. This would allow for Extension to further meet the needs of even greater audience members based on what is understood of the V.A.R.K. learning model (Fleming, 1995). For these reasons, podcasting as a pedagogical tool needs to be further explored and researched to make a case for being more widely used for CES program purposes.

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The following pages have been formatted to fit the style and guidelines for the peer-reviewed Journal of Extension.

Chapter 2 – Manuscript 1: Podcasting as an Extension Tool: Limitations and Opportunities

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Abstract

Extension challenges today include prompts for increased consideration for online platforms for educational content programming. For the purposes of this research, a mixed methods approach was utilized to collect both quantitative and qualitative data. Surveys for data collection were distributed via Qualtrics in two phases: phase one consisting of Extension personnel nationally, and phase two consisting of Extension stakeholders on a national level. Participant recruitment took place through email and data analyses utilized SPSS to conduct descriptive statistics and frequencies. Results included personnel's perspectives towards podcasts, the status of use for their work, and stakeholders' viewpoints and current use of already available Extension podcasts. Results indicated diverse views, varied levels of podcast understanding, plans for adoption, and perceived barriers for use of podcasts in Extension.

Keywords: Agriculture Communications, Digital Media, Education, Podcast, RSS Technology

Introduction

Since the organizations' creation, personnel working for the Cooperative Extension System (CES) have been tasked with maintaining the relevance of their work, meeting the needs of their everchanging clientele, and tackling budget changes and fluid full time personnel (Everts et al. 2012; Hendrickson et al., 2010; Henning et al., 2014; Wang, 2014). Not only that, but they also face the challenge of adjusting their communication practices to stay up to date with technological advances and teaching styles. The following review of current literature hopes to shine light on current CES stakeholder demographics and anticipated changes, current learning theories, the history of podcasts, the current use of podcasts as an education tool and why podcasts as a pedagogical tool should appeal to Extension programming. This study seeks to explore the perceptions of CES personnel towards the use of podcasts as an additional Extension tool, the current use of podcasts as an CES tool, as well as stakeholders current use of already established CES podcasts and their opinions towards podcasts as an CES tool for their use.

Current and Expected Demographic Changes in Extension Stakeholders

Preferred methods of communication can be influenced by factors such as age, levels of education, and access to technology (Howell & Habron, 2004). As CES programming stands now, most program content is tailored towards a more traditional target audience. Despite this more traditional audience that CES personnel are used to working with, data from the latest USDA Census of Agriculture (2017) indicated that 1 in 10 U.S. producers are ages 35 or younger. This new potential CES target audience will consist of mostly Millennials, the first generation to never know life without the internet (McAlister, 2009), and for whom integrating technology for educational engagement is key for (Aviles & Eastman, 2012; McAlister, 2009).

Additionally, the USDA Census of Agriculture (2012) revealed that 86.3% of the 2,109,303 primary operators were male and only 13.7% were female. However, in the USDA Census of Agriculture (2017) it was reported that males made up 70.9% of the primary operator population and that females made up 29.1%. This reveals a 15.5% increase in females serving as primary operators over the course of five years. Recent data revealed that in 2018, 55% of degrees earned in agriculture and natural resources were awarded to females at postsecondary education institutions (IPEDS Data Explorer, 2022). Even though these growing new and more diverse audiences have been acknowledged by CES personnel, it has been noted that programing for this group is often sacrificed to meet the "high-maintenance needs" of more traditional CES clientele (Diem et al., 2011).

Understanding the VARK Model and Connectivism – Learning Theories and Podcasts

The VARK model (visual, aural, read/write, and kinesthetic) is based on the principle that various perceptual strengths should be utilized to deliver information to successfully reach individuals with differing learning styles (McLeod, 2006). CES already commonly uses the other VARK models meeting the needs of those who prefer reading/writing learning styles through blog posts, review papers, and forums, those who prefer kinesthetic learning styles through in-person field days, and those who prefer visual and aural learning through in-person lectures and webinars. Podcasts as a CES tool presents the opportunity for Extension professionals to meet the needs of those that prefer aural learning opportunities opposed to others presented by the VARK model in an easy to create form of content (Lim & Swenson, 2021). Aural learning through audio formats can be considered a less formal, more engaging way of communicating about science-based content than written material (Merzagora, 2004). Fleming, (1995) wrote on

the significance of utilizing multiple forms of VARK model instruction stating that, “Each presentation in another mode gathers in another group of students who might otherwise have missed the point...” This statement further backs the idea that podcasting could serve as unique medium for CES to reach audiences that they might have never connected with before.

The previously discussed various tools and methods used in CES outreach today also coincide with the learning theory known as “connectivism” (Hendrickson et al., 2010). But the argument could also be made that the addition of podcasts into the pedagogical toolbox of CES programs could further their ability to model this learning theory. Connectivism, as proposed by Siemans (2006), is the idea that learning and knowledge come from a diversity of sources and opinions that are constantly changing due to the radical changes in information distribution due to modern technology. Based on this learning theory fit for the digital age, connectivism supports the idea that it is not always what the individual knows, but what educational tools the individual has access to or individuals with more knowledge that they could connect with (Siemans, 2006). This idea supports the opportunity that podcasts as an educational medium present to CES programs: to connect with and play a role in the educational sphere of stakeholders that they otherwise would have never reached.

History of Podcasts

Podcasts, derived from the words “iPod” and “broadcast,” as we truly know them to exist today were created through the technology Really Simple Syndication (RSS) technology (Campbell, 2005). Despite RSS technology being developed by Dave Winer in 2000, the podcast format was not truly established until Adam Curry’s release of his podcast directory system, iPodder, in 2005 which is recognized as the first “true” podcast directory like what we see today

(Chen, 2009). Birch & Weitkamp (2010) described RSS feeds as a hybrid "push" and "pull" system, with content being "pushed" by podcast creators and podcast listeners "pulling" what content they want to listen to. Over the course of the last 17 years of the medium's history, the use of podcasts has exponentially increased. In the U.S. it was reported by The Infinite Dial that in 2021 approximately 57% the U.S. population over the age of 12 years old had ever listened to a podcast (Edison Research & Triton Digital, 2021). With 46% of monthly podcast users in the U.S. today reported as female and 56% of monthly listeners within the age demographic of 12-34 years old (Edison Research & Triton Digital, 2021), podcast user demographics today could potentially coincide with the CES stakeholder audience of the future that we described previously.

Current Use of Podcasts as an Education Tool

The use of podcasts as a platform for educational purposes has been used across many different disciplines including: medical schools, teacher preparation courses, nursing schools, and graduate studies programs (Kennedy et al., 2015; Luna & Cullen, 2011; McNamara & Haegele, 2020; Young et al, 2021). As far as the actual use of the medium for CES related educational purposes, a study conducted by Mills (2011) drew comparisons in web traffic on an Australian Extension website between the top thirteen dairy podcast episodes and the top thirteen dairy PDFs for a month in 2009. Results of that study indicated that the top thirteen dairy podcast episodes generated 3.65 times the number of downloads when compared to the top thirteen dairy publications in a PDF format (Mills, 2011). While still considered a novel medium in CES programming, podcasts are not exactly unheard of in the world of CES today. In fact, the first land-grant institution program in the U.S. to utilize podcast technology was Texas A&M

University in September of 2003 with the creation of their podcast, *Agnews Weekly* (Fannin, 2006). Started as an experiment with no budget, the CES oriented podcast concluded the first two years of its existence with 84,316 downloads (Fannin, 2006). From their unprecedented use of the platform, Fannin (2006) stated that, "Podcasting provides new ways to target general consumer and agricultural producers with audio news content." Fannin (2006) also stated that *Agnews Weekly* had listeners tuning in from as far as Chicago, New York City, and even Scotland, proving the unique audience that podcasting platforms can provide CES programs with. Outside of the inaugural *Agnews Weekly* created by Texas A&M University, CES podcasts have grown to include the *Alabama Crops Report Podcast* produced by the ACES crops team, *Backyard Farmer* produced by University of Nebraska-Lincoln, *Extension 302* produced by University of Delaware Cooperative Extension, *Two Agents and the FACS* by University of Georgia Family and Consumer Sciences' agents, and more. Comparatively, some CES programs have been more open to exploring podcasts as a medium, such as the University of Minnesota Extension team who as of 2022 has 17 different podcasts listed on their website. However, podcasting has still yet to become a CES content format that has been widely utilized across all national CES programs.

The Appeal of Podcasts as an Extension Tool

As the digital age has continued, the demand for more online CES resources has only increased (Diem et al., 2011). For CES this call to action is understandable because online programming has proven to help increase CES reach, expand the flexibility of content, and make materials and information more accessible for stakeholders, all while lessening financial costs (Rich et al., 2011). The successful widespan adoption of technology as CES tools today have

included the integration of blogs, social media, and web conferencing tools (i.e., Zoom, Microsoft Teams, Skype, etc.) (Barton et al., 2017). Prior to the adoption of social media by most CES programs, perceived barriers of social media use by CES personnel included concerns over lack of training, time availability, information control, and lack of acceptance by fellow CES professionals (Gharis et al., 2014; Newbury et al., 2014). However, little has been reported about the reasoning behind why podcasting as a similar technological tool has yet to be more widely adopted across CES programs, and this study as it stands hopes to fill that knowledge gap.

Technological abilities have long been perceived as significant skills necessary to have in CES personnel for the success of CES programming (Harriman & Daugherty, 1992). Mills (2011) communicated the belief that podcasting was a tool that could feasibly be picked up across extension programming and even stated that, "The skill set required to develop and deliver podcasts is one that can be readily acquired by most extension officers with minimal training." This potential opportunity for training and support could theoretically be facilitated by CES programs' information technology (IT) support departments (Xie & Gu, 2007). Not only is podcasting an information delivery platform with an easy to navigate learning curve in terms of content creation, but it could also be an easy way for CES to repurpose already created content from other events such as lectures, webinars, or field days (Lim & Swenson, 2021). Having this content in the form of a podcast gives clientele the convenience of listening the content on demand, replaying the audio as needed, and learning in their own setting of choice (Lim & Swenson, 2021). In addition to the ease of podcast content creation, making it an appealing medium for CES programs, is its affordability. CES educators have had a challenging time finding affordable ways to not only meet current audience needs but to also expand into new programs and audiences and utilizing podcasts as a CES tool might be a cost-effective way to do

that (Hendrickson et al., 2010). Assuming that all CES personnel already have access to a computer and some basic forms of computer programming, it is possible for interested CES personnel to start a podcast for less than $200 (*How much does it cost to start a podcast?,* 2020). Anticipated needs to start a podcast can include: a computer, a quality microphone, audio editing software, headphones, and digital media branding components such as podcast cover art (Ferreira, 2020; *How much does it cost to start a podcast?,* 2020). With many of those start up needs already resources readily available to CES professionals, it is fair to say that the feasibility of creating a podcast on a budget is highly probable.

Not only are podcasts easy and affordable to produce, but the ease of podcast consumption and the convenience that it provides is something that CES stakeholders value. In fact, of producers in U.S. reported in the 2017 USDA Census of Agriculture, 58.3% of producers' primary occupation was outside of farming. This means that opportunities to travel to CES meetings and demonstrations might be out of question for potential CES stakeholders, making podcasts a CES tool that this demographic could utilize at their own discretion. Xie & Gu (2007) stated that because CES stakeholders have established a baseline of expertise related to their knowledge and professional experience, their learning is typically more self-directed than that of students in a traditional classroom setting. Podcasts provide listeners the unique ability to listen when most convenient for them and to stop, rewind, and replay the podcast audio as needed, allowing for listeners to better manage the information that they chose to consume on their own time (Schreiber et al., 2010).

According to Farivar (2004), podcasting can be defined as an internet-based recorded audio that is accessed by listeners via an online subscription technology called Really Simple Syndication (R.S.S.). In 2012, the USDA Census of Agriculture reported that 69.6% of U.S

farms had Internet access. Over the course of five years, that percentage jumped to 75.4% in 2017. With the percentage of U.S. farms with Internet access continuously rising, podcasts could serve as an easily accessible tool for CES clientele to utilize while they have Internet capabilities to download podcast episodes and then listen later when they are no longer in areas with proper internet connections. This technology could allow producers to access CES podcasts while operating a combine, fixing farm equipment, or while driving across town. This multitasking listening approach is backed by research done by Birch & Weitkamp (2010) where they found that majority of their study's participants listened to podcasts while doing other things (i.e., walking, commuting, cleaning, or working). The opportunities for podcasts to infiltrate the daily life of CES program users are limitless and could allow valuable CES knowledge to be more accessible for audiences with time constraints.

Methodology

Two separate surveys were written for the purposes of this study, and both were housed on the survey platform Qualtrics (Version 2022, Provo, Utah, U.S.). Of the two surveys regarding perspectives towards podcasting as a CES tool, one was written for data collection from CES personnel, and the other was written for the purposes of collecting data from CES stakeholders. Both surveys were reviewed for validity by expert panels consisting of graduate students, university faculty, and CES personnel. Prior to survey recruitment, survey materials were provided to the Auburn University Institutional Review Board, and study #21-438 was considered exempt. CES personnel participants for this study were recruited through an agreed upon email invitation which was sent to all Alabama Cooperative Extension System (ACES) personnel by ACES Director, as well as to all CES directors on a national level. This recruitment

email invitation consisted of a description of the research study, as well as a link that directed interested participants to more information regarding the study and the ability for them to consent to beginning the survey prior to the start of the survey itself. Recruitment of CES stakeholders for the purposes of this study consisted of an agreed upon invitation which was emailed by ACES Director to all CES directors on a national level with instructions for how to invite CES stakeholders to participate in the separate specified survey with an included link. From those emails, it was up to the CES directors' discretion to determine whether or not they wanted to distribute the surveys to both their employees and stakeholders. Data collection took place over the course of six months, beginning in September of 2021 and ending with the closing of the surveys in February of 2022. Data analysis consisted of an initial scrubbing of incomplete data followed by a series of analyses including descriptive statistics and frequencies through the use of IBM SPSS (Version 28) for quantitative data and coding and frequencies for qualitative data.

Results

Survey CES personnel total participants consisted of 193 individuals and participant locations varied across 14 different states, the distributions of which can be found in Table 1. Of personnel participants, 65% reported that they were female (n = 126) and 35% reported that they were male (n = 67). Participant ages ranged from 21 years old to 69 years old, with the average age being 44 years old. CES personnel participants were asked to select all that applied of the listed departments that best described their area of work within CES. Data indicated that among participants 25% work in 4-H/Youth Development (n = 51), 41% work in Agriculture, Forestry, and Natural Resources (n = 83), 16% work in Human Sciences (n = 32), 18% work in County Office Operations (n = 36), and 8% work in CES Administration/Business Offices (n = 17).

Among CES personnel that participated, only 26% of respondents reported that they had participated in the creation or production of a podcast before, 74% had not. Respondents that reported having previously participated in the creation or production of a podcast before were asked how likely they believed a new stakeholder was connected to/ learned about CES from their experience on a podcast and 39% reported extremely likely, 35% reported somewhat likely, 20% reported neither likely nor unlikely, 4% reported somewhat unlikely, and 2% reported extremely unlikely.

When prompted with the question of whether or not they had considered creating a podcast for CES, 50% of personnel participants responded no, 18% responded maybe, 18% responded yes, and 14% responded that they have already created a podcast or in the process of creating one. Participants that had responded no or maybe to whether or not they had considered creating a podcast were asked to of the following select all that apply to why they would not create a CES podcast, 17% reported that they have no interest in utilizing podcasts as a CES tool, 13% reported that podcasts as a CES tool are too much work, 30% reported that they were intimated by the idea of creating a podcast, 36% reported that they believe they do not have the means necessary to create a meaningful CES podcast, 7% reported not believing that podcasts can serve as an effective CES tool, 26% reported that they did not think CES stakeholders would listen to a podcast, 11% reported believing that there was not a need for CES produced podcasts, and 49% reported not having the time to create a CES podcast on top of all other responsibilities.

Qualitative data for CES personnel participants that responded in the previous question that podcasting was too much work were asked why they believed podcasting as a CES tool to be too much work. Responses included 41% of participants mentioning concerns regarding the time it would take to produce a podcast. For example, one responded stated, “ Doing a podcast takes

time, a lot of it (especially early on). It can be difficult for people to find the time to dedicate to getting a podcast off the ground." Among participants, 25% made statements relaying that there is an anticipated learning curve or that training would be needed to create a podcast and that is why they believe that podcasting as a CES tool would be too much work. One participant coded into this group stated, "Given my age and my expertise, I don't have the skills necessary to do podcasting. The learning curve is too steep." Additionally, 22% of participants shared that their priorities working for CES lie elsewhere. A participant in this category stated that, "It would be an entirely new skill set which would likely mean that I would need to drop other responsibilities and programs from my current workload to take on. We already ask ourselves to be jack of all trades and masters of none and this would add to that feeling of being overburdened at a local level."

Personnel participants that responded to a previous survey question that they believed podcasts would go unused by stakeholders were asked why they believed that to be true. Among those participants, 47% of replies consisted of comments regarding that CES's target audience consists of an older generation or that target audience members will not know how to access CES podcast content. An example of this type of response is, "Many of our stakeholders are older/and or rural folks. I believe these people would not be comfortable with or care to learn about podcasts." Another widely shared opinion on why participants believed stakeholders would not use a CES podcast includes the idea that interest among stakeholders would play a key role, so either interest in podcasts as a platform in and of itself or also interest in the CES content being shared. For example, one participant said, "If it's lame, it won't be used. If it's special/thrilling/ funny/charming; it will work well."

Survey CES stakeholder participants consisted of 52 individuals whose locations varied from 18 different states, the distribution of which can be found in Table 2. Among stakeholders, the youngest stakeholder participant age reported was 22 years old while the oldest age reported was 83. The age average of stakeholder participants was 39 years old. Among CES programs reportedly used by these participants, the most widely used were Alabama Cooperative Extension (n = 28), University of Georgia Extension (n = 8), Kansas State University Research and Extension (n = 7), Mississippi State University Extension Service (n = 7), and Texas A&M AgriLife Extension (n = 7). The rest of the programs reportedly used by participants can be found in Table 3. Stakeholders reported various lengths of time utilizing CES resources, and time reported spanned from as little as 1 month to at most 45 years.

Stakeholder participants were asked to select all that apply to them from a list of CES stakeholder type descriptions. Responses indicated that 56% of respondents consider themselves a producer/farmer/rancher, 29% selected family resource, 20% selected hobbyist, 42% selected university student, 27% selected youth programs coordinator, and 11% selected community programs coordinator. Participants were asked if they currently listened to podcasts in general and 68% reported yes and 32% reported no. Of the participants that reported listening to podcasts, 30% indicated that they listened to CES oriented podcasts and 70% indicated that they did not. Of the respondents that reported they did not listen to CES oriented podcasts, 81% reported that they were unaware that CES podcasts existed, 5% reported that they are uninterested in listening to CES podcasts, 5% reported not having the time to listen to a CES podcast, and 9% reported other. Participants that reported that they do currently listen to a CES podcast were asked to select all that applied to them for reasons why they choose to listen to a CES podcast. Of those participants, 67% reported that they listen because CES programs are a

trustworthy source of information, 44% reported that podcasts are an easily accessible way for them to learn from CES, 11% reported that they just enjoy listening to CES podcasts and that they are entertaining, 89% reported that they multitask while listening to and learning from CES podcasts, and 44% reported that they consider themselves auditory learners and CES podcasts allow for them to easily learn CES information.

Discussion

This research hoped to explore current production of CES podcasts, the extent of their use by CES stakeholders, and perceived barriers as to why more CES programs had not yet adopted podcasting as an education and outreach tool. This research demonstrated the hesitancy of CES personnel to adopt podcasts, a newer modality of communication with their stakeholders. Their concerns mirrored some of those that were demonstrated prior to the adoption of social media, which was outlined by research conducted by Gharis et al. (2014) and Newbury et al. (2014). Concerns which included a need for training, perceived lack of time to commit, and concerns for a deficiency of use of the tool by the standard CES target audience. Results also indicated that current understandings of CES personnel of their audience and audience's opinions and the actual CES stakeholder population's opinions differ. Despite many CES personnel's concerns with podcasts as a CES tool stemming from the idea that their target audience is older and therefore would not be interested in utilizing CES podcasts, the stakeholder participants for this study had an average age of 39 years old and a 68% response rate proving that stakeholders do currently listen to podcasts in general, suggests otherwise.

Additionally, this research revealed that there is value in the role that podcasts can play as a CES tool in the lives of busy CES stakeholders. With 89% of participants reporting that they

currently listen to CES podcasts while multitasking, this demonstrates the added benefit that podcasts present and the role that they can play in the outreach and education of CES stakeholders. CES personnel study participants reported a concern for stakeholders' actual use of CES podcasts, but an audience can only use a tool if they are first made aware of its existence. Of stakeholder participants that reported listening to podcasts in general, but not listening to CES podcasts, majority of these respondents shared that they had no idea that CES podcasts even existed. This finding demonstrates the need for increasing CES stakeholder awareness of all CES tools readily available for them, which can be done through word of mouth, social media, meeting announcements, and advertisements on CES websites.

Because the study did not obtain a 100% response rate from those employed the CES or those that are considered stakeholders, differences between respondents and non-respondents could threaten external validity. These data are limited in that the response rate was relatively low and from a limited number of locations across the U.S. that utilize a limited number of CES programs and their tools, so the responses received from these participants may not realistically reflect the actual opinions of the entirety of these two populations. Further research should be conducted to evaluate specific CES podcast programs reach of target audience members and perceived impact on listeners knowledge and understanding.

Conclusion

Conclusions that can be drawn from the results of this research include that CES personnel are hesitant to adopt podcasting as a newer modality for education and outreach for CES programming. CES personnel podcast adaptation hesitancy included a concern for the time required, a need for training, being intimidated by the idea of creating a podcast, lack of means necessary to create a podcast, priorities lying elsewhere and an anticipated lack of use from CES

stakeholders. CES personnel also conveyed that reasons they believed CES stakeholders would not utilize a CES podcast include CES stakeholders' ages, and a lack of interest in the platform and the CES content shared. CES stakeholder results showed that many CES stakeholders do in fact listen to podcasts, and that among those that do majority are unaware that CES podcasts exist. Results also showed that CES stakeholders that do listen to CES podcasts listen because it allows for them to multitask, CES programs are trustworthy sources of information, podcast are an easily accessible way for them to learn from CES, and because they consider themselves auditory learners. These conclusions provide greater insight into reasons why podcasts as a CES tool have not been more widely adopted across CES programming and why CES stakeholders consider them to be a valuable CES tool.

Tables and Figures

Table 1. ***Frequency results of stakeholder participants reported CES* programs used***[1]

CES Program	n	% of Cases Reported (N = 164)
Alabama Cooperative Extension	28	60%
University of Georgia Extension	8	17%
Kansas State University Research and Extension	7	15%
Mississippi State University Extension Service	7	15%
Texas A&M AgriLife Extension	7	15%
University of Arkansas Cooperative Extension	6	13%
University of Florida Extension	6	13%
University of Illinois Extension	6	13%
Iowa State University Extension and Outreach	6	13%
Oklahoma Cooperative Extension	6	13%
Clemson University Cooperative Extension	6	13%
Virginia Cooperative Extension	6	13%
University of Kentucky Cooperative Extension Service	5	11%
Purdue University Extension	4	9%
University of Missouri Extension	4	9%
University of Nebraska Extension	4	9%
North Carolina Cooperative Extension	4	9%
Ohio State University Extension	4	9%
Pennsylvania State University Extension	4	9%
Colorado State University Extension	3	6%
University of Idaho Extension	3	6%
University of Tennessee Extension	3	6%
University of Maryland Extension	2	4%
University of Minnesota Extension	2	4%
Lincoln University Cooperative Extension	2	4%
Cornell University Cooperative Extension	2	4%
South Carolina State University Extension	2	4%
South Dakota State University Extension	2	4%
University of California System Cooperative Extension	1	2%
University of Delaware Cooperative Extension	1	2%
Kentucky State University Cooperative Extension	1	2%
Louisiana State University Extension	1	2%
University of Maine Cooperative Extension	1	2%
Michigan State University Extension	1	2%
Rutgers New Jersey Cooperative Extension	1	2%
New Mexico State University Extension	1	2%
North Dakota State University Extension Service	1	2%
Oregon State University Extension Service	1	2%
Washington State University Extension	1	2%
West Virginia University Extension Service	1	2%
University of Wisconsin- Madison Cooperative Extension	1	2%
University of Wyoming Extension	1	2%
American Samoa Extension	1	2%

[1] Surveys were distributed via email to CES* directors for further distribution to CES* personnel as well as CES* stakeholders. Participants consisted of 193 CES* personnel and 52 CES* stakeholders. This survey sought to evaluate their current production and use of podcasts as a CES* tool.

* Cooperative Extension System

Figure 1. ***Map displaying CES* personnel participant reported locations***[1]

[1] Surveys were distributed via email to CES* directors for further distribution to CES* personnel as well as CES* stakeholders. Participants consisted of 193 CES personnel and 52 CES* stakeholders. This survey sought to evaluate their current production and use of podcasts as a CES* tool.

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Figure 2. ***Map displaying CES* stakeholder participant reported locations***[1]

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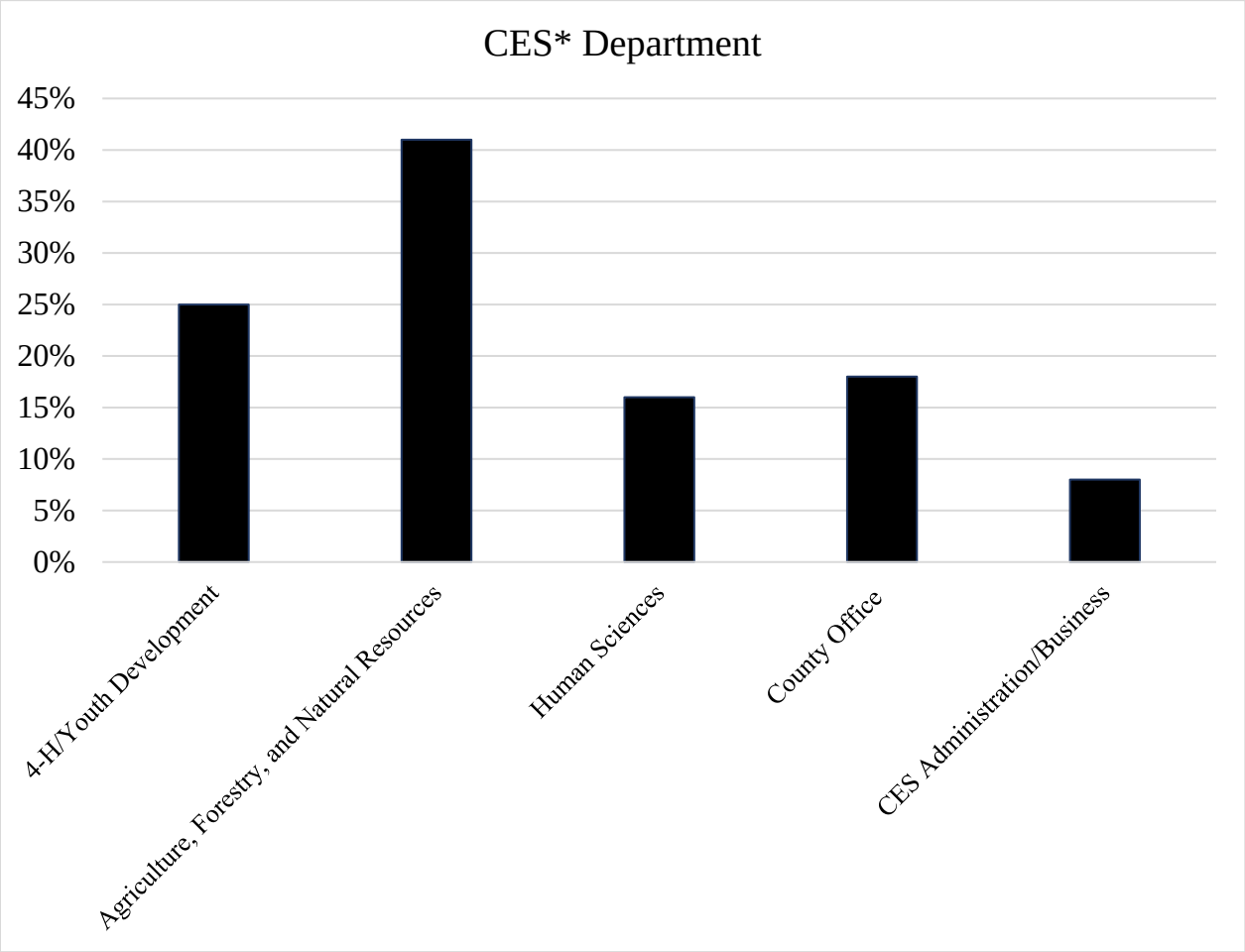
Figure 3. ***CES* Personnel reported CES* departments***[1,2]



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[2] Participants were asked to select all that apply from this survey question.

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Figure 4. ***CES* personnel reported experience with podcasts***[1]

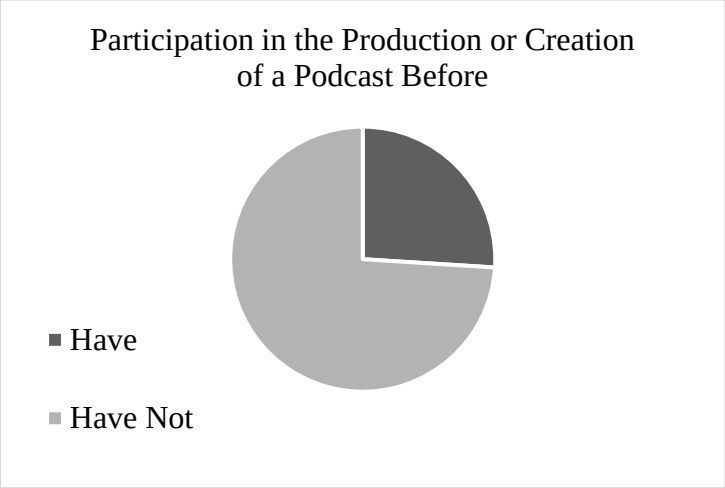

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Figure 5. ***CES* personnel reported likelihood of introducing new stakeholders to CES* programming from podcast***[1]

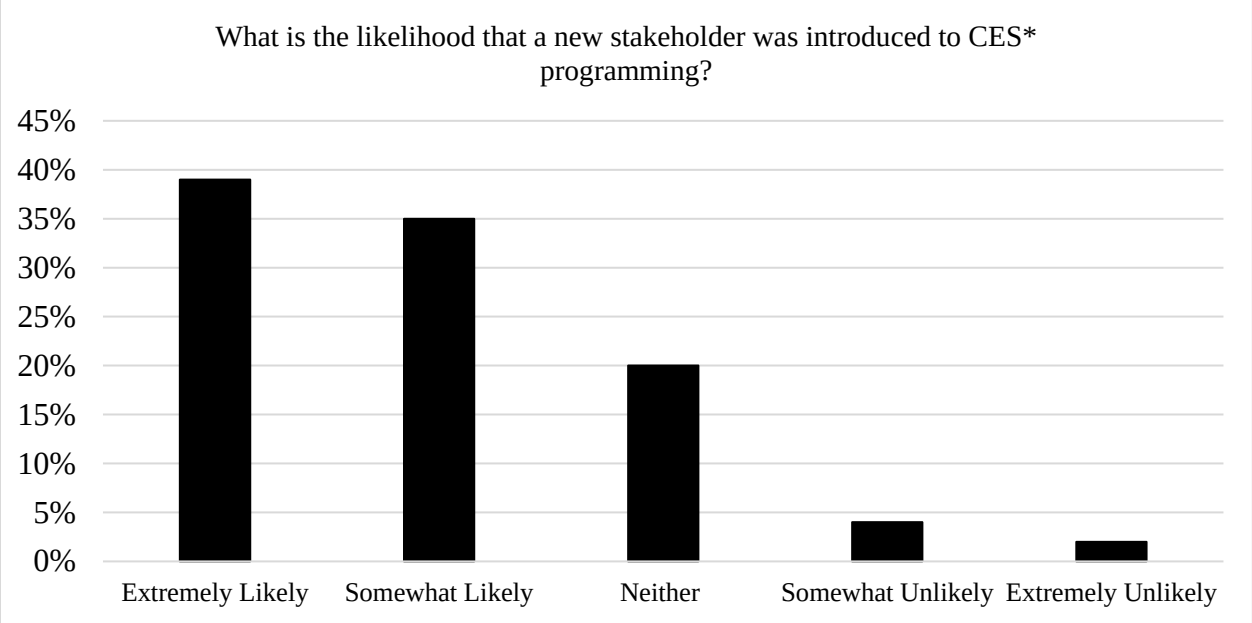

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Figure 6. ***CES* personnel response to consideration of creating CES podcast***[1]

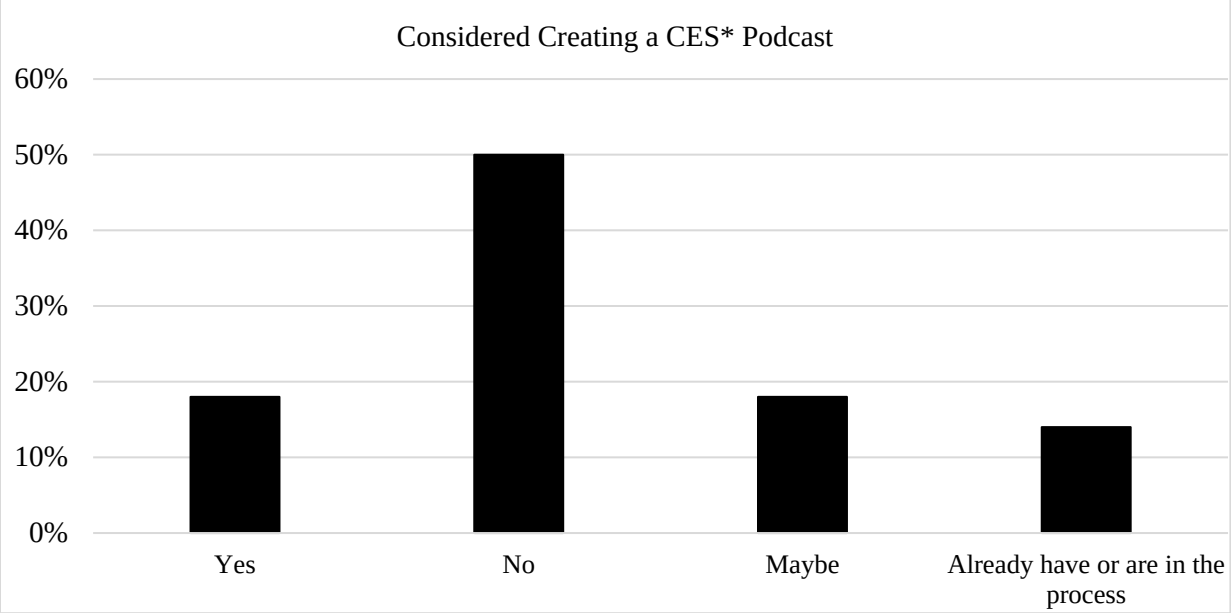

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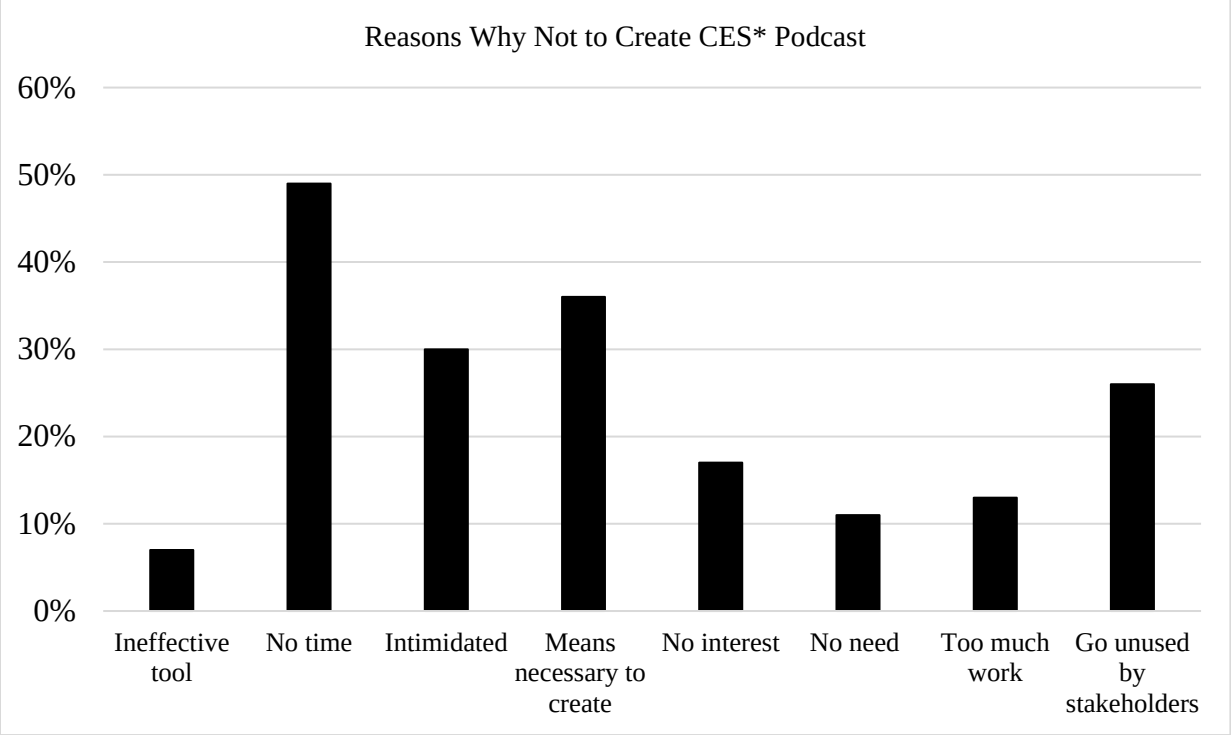
Figure 7. ***CES* personnel reported reasons why not to create CES podcast***[1,2]



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[2] Participants were asked to select all that apply from this survey question.

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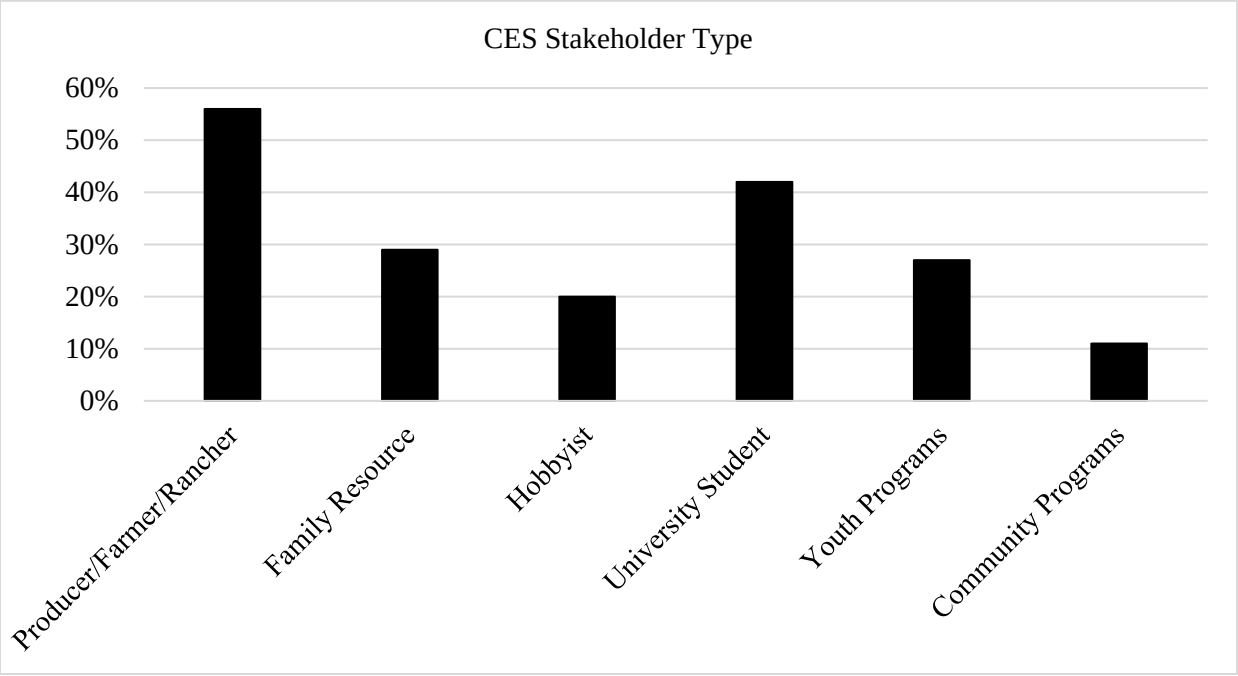
Figure 8. ***CES* stakeholder participant reported stakeholder type***[1,2]



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[2] Participants were asked to select all that apply from this survey question.

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Figure 9. ***CES* stakeholder reported listening of podcasts***[1]

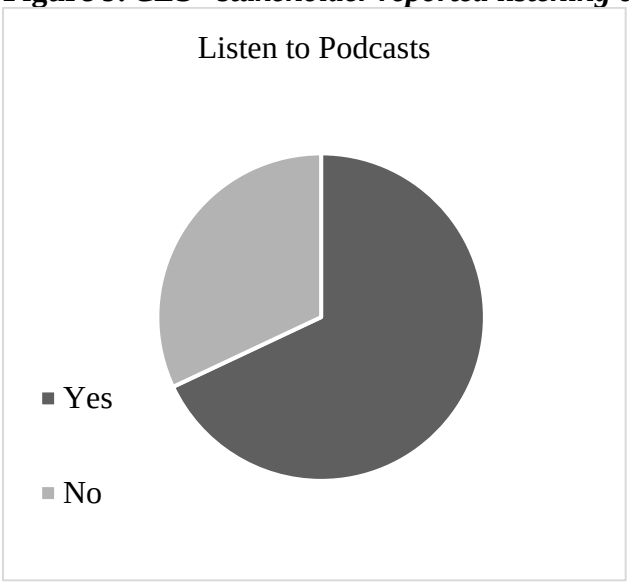

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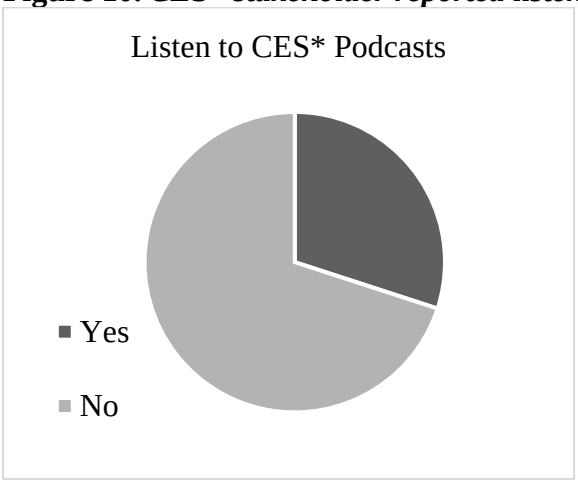
Figure 10. ***CES* stakeholder reported listening to CES* podcasts***[1]



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* Cooperative Extension System

Figure 11. ***CES* stakeholders listening to podcasts reported reasons why not listening to CES* podcasts***[1]

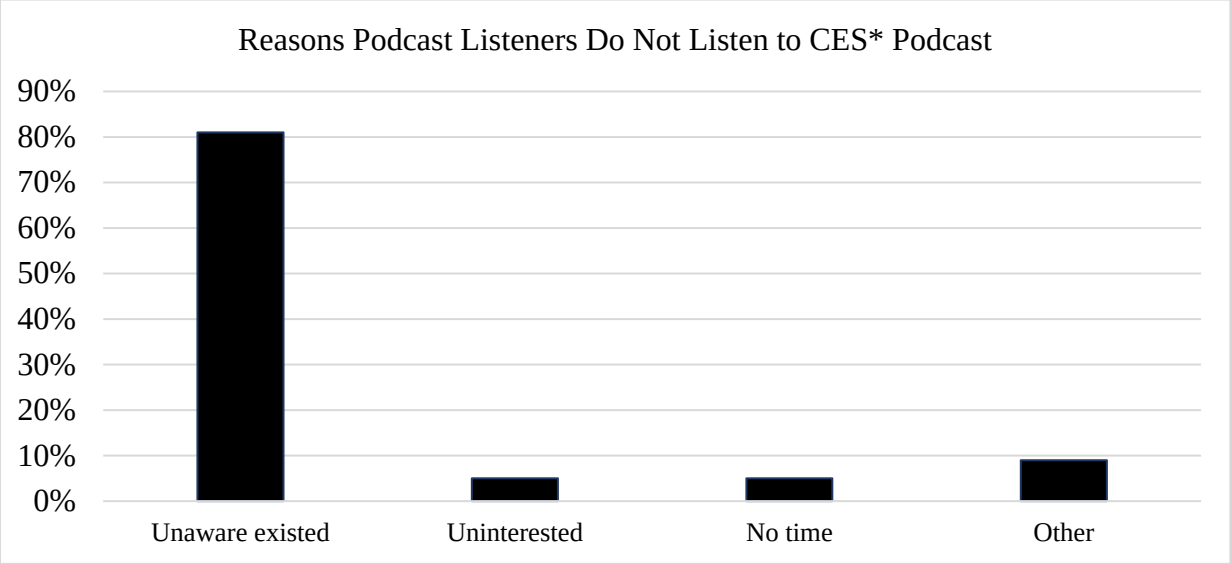

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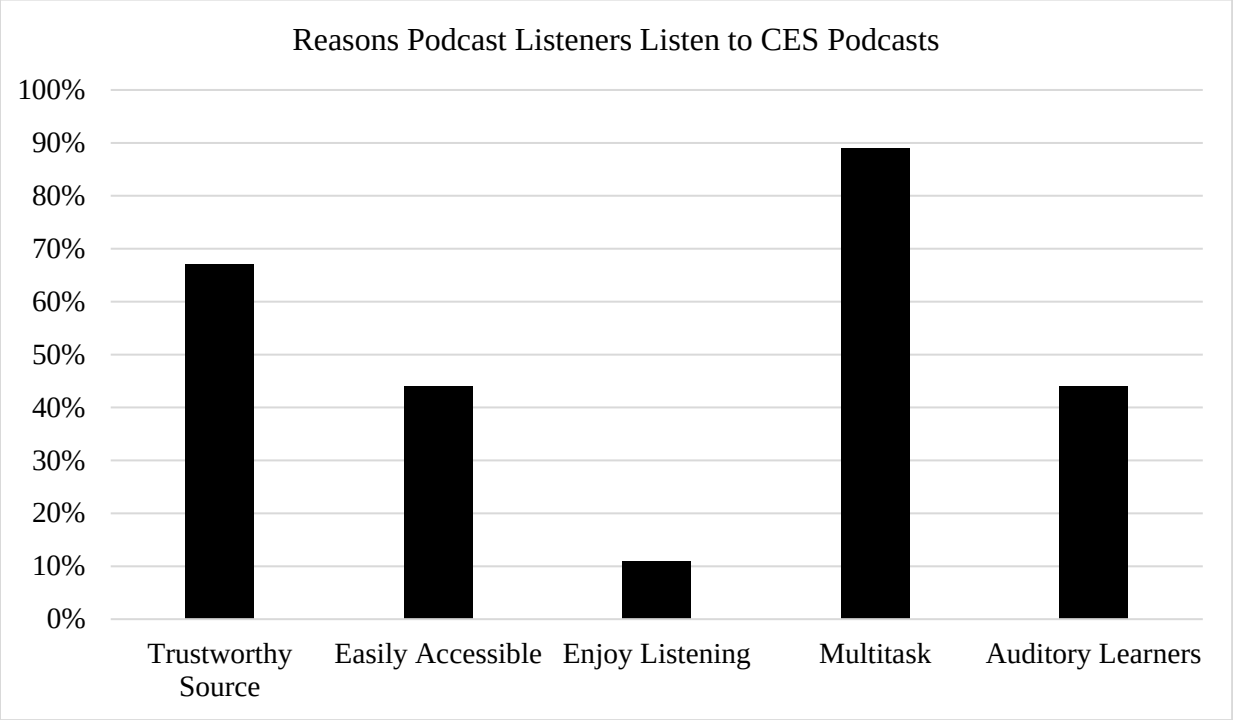
Figure 12. ***CES* stakeholders listening to CES* podcasts reported reasons why they choose to listen to CES* podcasts***[1,2]



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* Cooperative Extension System

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Chapter 3

Introduction

Communicating scientific topics to the public has always come with challenges. Due to the agricultural industry being a highly scientific field, communicating agricultural topics lies within the same predicament as other scientific fields in that there are difficulties in reaching and increasing the understanding of lay audiences. As a result of the United States' (U.S.) shift over time from rural to urban lifestyles over the course of nearly the last century (U.S. G.P.O., 1968), there is a specific lack in the general public's understanding of agricultural sciences. In addition to that difficulty, society's consumption of information has changed drastically in the last 30 years, and as a result the agricultural industry is fighting to remain a part of the media landscape. With the gradual death of print news and the dominant rise of social media consumption by young adults (Twenge et al., 2019), this leaves the questions of where do young consumers get new information and how do pro-agriculture voices successfully communicate scientific agricultural topics with them? According to Ruth-Mcswain (2008), with majority of agricultural information in the past being dispersed by print news and small amounts of television news, agricultural communication specialists are left with the question of how to best spread their messages today. With extremist activist voices like @PETA, @plantbasednews, @mercyforanimals and many more on Instagram gripping the attentions of young adult social media users, opposing voices of influence sharing scientific and pro-agriculture messages seem to be missing. These missing voices are necessary because without them different forms of agriculture will experience what is referred to as an erosion of social license to operate (SLO).

Social media influencers (SMIs), of which can be found on the social media platform Instagram, were defined by Freberg et al. (2010) as "third party endorsers" who impact

audiences such as young consumers' or social media users' feelings and opinions through content shared on social media. Additionally, Hearn & Schoenhoff (2016) stated that, "the SMI works to generate a form of "celebrity" capital by cultivating as much attention as possible and crafting and authentic "personal brand" via social networks, which can subsequently be used." Cultivating agricultural SMIs on Instagram would give agricultural communicators the direct opportunity to share accurate scientific agricultural information to young adult users. The ability to find media outlets communicators could trust, whether in print or television, to accurately share scientific agricultural information is an issue that Ruth-Mcswain (2008) found that specialists in the field had in spreading their messages. Social media provides the unique opportunity to remove the middleman of other media formats and offers field specific influencers the chance to accurately spread their messages and information in the exact context that they desire.

Current Difficulties with Communicating Science

The agricultural industry is not alone in having difficulty in communicating scientific information with lay audiences. A shift in confidence and credibility has greatly affected science communications, and Benneworth (2009) contributed four key factors to this exact shift. Those four key factors include the loss of trust in scientists, changes in how knowledge is produced, a new abundance of resources for information, and the estrangement between science and the general public through the democratic deficit (Benneworth, 2009). Even though communicators and scientists alike are implementing strategies in educating the public, some research has indicated that discourse currently taking place might not be the best approach to do so. Needed

now more than ever before due to the rapid growth of social media, is the research and application of novel tactics and styles of messaging for select audiences.

A common approach applied by the scientific community in terms of communication efforts is the idea that distrust and opposition to science by nonscientific audiences is due to a lack of understanding in scientific matters. This model of thinking is referred to as the knowledge "deficit model" which in itself presents challenges in its ability to accurately explain how the public's perceptions are shaped (Simis et al., 2016). Oppositions to the knowledge deficit model acknowledge that the approach ignores the apparent biases that individual's set frames and ideological ideas have on their ability to shift their own perspectives regarding a subject matter (Druckman & Bolsen, 2009). It has even been suggested by some that specific science communication techniques actually intensify polarized attitudes in what is described as a boomerang effect. Boomerang effects can occur when purposefully constructed messages with premeditated results produces outcomes that are the antithesis of the original intention (Byrne & Hart, 2009). In a study conducted by Hart & Nisbet (2011), they demonstrated the limitations of the knowledge deficit model by communicating science related to climate change and how political partisanship effects an individual's response to information pertaining to the scientific information a message shared. Another issue pertaining to communication within the science community that scientists devotedly follow the scientific method which inherently leads to dull, technical, and meticulous methods of explaining their findings (Sand-Jensen, 2007). Even though these intentionally objective techniques are required and necessary for communications within the scientific community, they have very little impact when shared with those outside of the scientific niche. For these reasons, contemporary alternative approaches to communicating

science and research backing their efficacy are needed to ensure a renewal of trust and understanding between scientists and nonscientists alike through communication.

An example of an alternative method of science communication was outlined by Fischhoff (2013) consisting of four connected tasks. The four tasks involve: (1) pinpointing the scientific topics most relevant to the audience; (2) determining what the audience already knows about the topic; (3) constructing communications to fill the gaps in knowledge; and (4) assessing how useful the communication technique was at informing the audience and repeating the tasks as necessary. Utilizing outlines similar to the one previously mentioned would allow for the scientific community to communicate topics that matter to the general population in an efficient way that allows for the audience to learn without wasting their time on knowledge they may already have acquired. In addition to that, altering mental models is another of area of interest for science communication. A mental model has been described as existing in an individual's mind as a "small-scale model of how (a part of) the world works" (Moon et al, 2019). Based off of an individual's own unique understandings, values, and experiences, mental models help makeup the framework for perceptions of one's reality (Easterby-Smith, 1980). In an essay written by Crandall et al. (2020), actions towards altering existing mental models were outlined. The points were established as listening with acknowledgment and acceptance of beliefs that audiences may have, sharing new information that builds off of the experiences they described while explaining the differences in this reality from their own, and allowing for the audience to build new mental models of understanding that connects all of the information, past and new, together (Crandall et al., 2020). Another strategy that has been proposed is to utilize storytelling as a means to communicate scientific topics in an engaging way. Utilizing story shapes such as discovery, rescue, or mystery and employing vivid language along with tradition storytelling elements are

essential in appealing to target audiences (Green et al., 2018). All of the previously mentioned creative strategies of communication could be applied in social media content scenarios and could potentially lead to better connections with lay audiences for the agricultural industry.

Change in Media Sources

From data collected for 30 years, spanning from 1976 to 2016, Twenge et al. (2019) studied trends in media source usage of adolescents in the United States. From their research they wanted to discover if the rise of digital media usage by adolescents effected their usage of legacy media (books, magazines, newspapers, TV, and movies) (Twenge et al., 2019). For the purpose of this study, Twenge et al (2019) used two models to predict two different outcomes when determining the connection between digital media and legacy media usage. Twenge et al. (2019) results revealed a significant increase in digital media usage, with 12th graders doubling the amount of time they reported using the internet during leisure time between 2006 and 2016. This was seen similarly in other age groups with 8th graders indicating a 68% increase and 10th graders revealing a 75% increase in internet usage. Another comparison drawn was between 12th graders in 2008 and 12th graders in 2016, indicating a contrast of 52% reporting they visited social media sites "almost every day" in 2008, jump to 82% in 2016. When observing trends in legacy media usage it was discovered that of 10th graders surveyed in the 1990s, 33% claimed to read newspapers almost every day, but by 2016 only 2% of 10th graders surveyed made the same claim. Data revealed a decline across all age groups over time on reported consumption of books, magazines, and newspapers beginning in the 1980s. These discoveries led to the conclusion that the displacement model accurately portrayed the resulting trends in the data studied, meaning

that as the trend continues of more adolescents using digital media, their use of legacy media decreases proportionally.

As far as the current use of social media goes, it was reported by The Infinite Dial that in 2021 approximately 82% of the U.S. population over the age of 12 used social media, that is an estimated 233 million people (Edison Research & Triton Digital, 2021). Despite The Infinite Dial reporting that Facebook is still the most widely used social media platform in the U.S. with 63% of the total U.S. population over the age of 12 being users, the platform did experience a drop in reported use between 2020 and 2021 (Edison Research & Triton Digital, 2021). Instagram is the second most widely used social media platform with 43% of the U.S. population over the age of 12 being users, and the platform continuing to experience growth in use between 2020 and 2021 (Edison Research & Triton Digital, 2021). In a study conducted by Howard et al. (2017) looking at the effects of social media on university student's beef industry perceptions, they found that their participants' reported a range of 0-23 hours of Instagram usage a week. These studies demonstrate the widespread use of Instagram as a social media platform in the U.S.

Polarity of Agricultural Stories in Media and Agricultural Communication Efforts

In 2017, the United States Department of Agriculture (USDA) Census of Agriculture reported 3,399,834 producers in the U.S. Comparatively, for 2017 the U.S. Census Bureau reported an estimated 321,004,407 individuals in the U.S. (U.S. Census Bureau, n.d.). Considering both reportings demonstrates that roughly 1% of the U.S. populations is directly involved in producing and growing food. Without personal knowledge about or experience with the agricultural industry, the general public looks to the same sources for where they tend to

gather most of their information today: the media. Unfortunately, the media's coverage of the agricultural industry largely tends to focus on stories involving crisis (Eyck, 2000). A disconnected population combined with an inaccurate industry image produced by the media, has greatly impacted the general public's perception of agriculture (Holt & Cartmell, 2013).

The consequences of this negative agricultural media trend were demonstrated in a study conducted by Howard et al. (2017) regarding social media use and beef perceptions of college students. This study by Howard et al. (2017) reflected the negative consequences that major media events such as the report by ABC News which coined the term pink slime to describe lean finely textured beef in 2012 (Greene, 2012). That negative coverage went on to propagate throughout media and had notable consequences including: the loss of over 600 jobs in three processing plants, the USDA's end to the use of lean finely textured beef in school lunches, and producers removing it from commercial sale (Greene, 2012). Howard et al. (2017) found that 78% of university student participants reported being negatively affected by information discovered on social media about pink slime. Among those student participants, 72% reported that their short-term (0-6 months) purchasing habits were negatively affected, and 56% of students reported that their long-term (6+ months) purchasing habits were affected due to the information that they received from social media regarding pink slime (Howard et al., 2017). The results of this study specifically are significant because they indicate a direct correlation between negative messaging regarding animal protein on social media and actual purchasing habits of young adults.

Due to the rapid change in media sources and the polarity of media as it stands pertaining to agriculture, it has become more important than ever to determine which modes of communicating positive agricultural messages prove to be the best route for the industry to

pursue. This need has been acknowledged for over a decade and was illustrated by Meyer et al. (2011) when they stated that both agricultural researchers and professionals needed to explore methods to help combat the negative impacts that media has had on the industry. The focus of a study conducted by Ruth-McSwain (2008) sought to explore agricultural communications professionals' choices related to media. Findings demonstrated that overall participants believed that the agricultural industry was not utilizing mass media to tell the story of agriculture, prefers to utilize agricultural media sources with audiences that they were more comfortable with, and tend to neglect nonagricultural audiences and media sources (Ruth-McSwain, 2008). Participants even suggested that even though they understood "30 seconds on television can get you more bang for your buck," they still opted for print as their preferred outlet of communication over radio, television, and the Internet (Ruth-McSwain, 2008). Ruth-McSwain (2008) concluded with the belief that while print media may not be completely insignificant in reaching certain audience or communicating specific matters, that the tendency for agricultural communications professionals to largely focus on more traditional media formats may be a contributing factor in why the agricultural industry has an inability to connect with nonagricultural audiences.

As professional agriculture communicators are shying away from modern day media communications the general public is being exposed to negative information which often results in negative perceptions. However, based on the results of a study looking at the effect of social media on university students' perceptions regarding beef, Howard et al. (2017) produced three recommendations for agricultural communicators. Those three suggestions consisted of: (1) agricultural communicators should evaluate their current use of social media for getting information to university students; (2) identify social media platforms and outlets that could be used to get information proactively and reactively to university students; and (3) agricultural

communications programs today should seek to offer elective coursework revolving around the effective use of social media related to agriculture (Howard et al., 2017).

Erosion of the Social License to Operate

The phrase social license to operate (SLO) was reported by Boutilier et al. (2012) to have been first coined by former mining company executive, Jim Cooney, while in a meeting in 1997 with the World Bank. Since drawing a comparison between the ability for a community to limit mining projects the same way that the government could, the term first used over two decades ago has now been applied in similar contexts to other industries including in agriculture. SLO was defined by Widmar et al., (2017) as the unspoken consent of a community for a business, industry, or project to occur. Hampton & Teh-White (2018) furthered that definition by stating that, "This unwritten consent is earned through initial community support, but as public values or operating environments change may then be maintained or lost." This is reflective of the current state of the animal agriculture as we know it today. The industry, which was once as a whole respected and valued, now finds itself under critique, with a shift in societal values favoring extreme climate sustainability and animal rights campaigns. Despite SLO not holding the same tangible value as traditional legal licensing such as regulatory approvals, the loss of the intangible SLO in other industries has quickly resulted in the loss of regulatory licenses with real-world implications (Nelson, 2006; Hampton & Teh-White, 2018).

Exploring Trust In and Learning From Social Media Content

In this literature review the influx of information that individuals are now commonly being exposed to through digital technology including social media has already been discussed,

but is the content found on social media really deemed by its users a trustworthy source of information? The concept of trust is considered a complex and multifaceted construct. For example, trust has been described as relating to dispositions, decisions, behaviors, social networks, and institutions (Kramer & Tyler, 1996). However, a widely acknowledged definition of trust come from Rousseau et al. (1998) who defined trust as, "a psychological state comprising the intention to accept vulnerability based on positive expectations of the intentions or behaviors of another."

An exploratory study conducted by Warner-Søderholm et al. (2017) looked at investigating levels of trust on social media through measures of integrity, competence, benevolence, concern, and identification. This research explored whether an individual's gender, age, or their time spent on social media has an effect on their perception of trust in the hopes that as a result they will conclude with a better understanding on who trusts social media content to potentially benefit industries and politics (Warner-Søderholm et al., 2017). Overall, the study results revealed that participants that were young, female, and/or heavy users of social media were more likely to trust the content they saw shared on social media (Warner-Søderholm et al., 2017). In their conclusion Warner-Søderholm et al. (2017) stated that participants in those categories were more likely to believe that most people care about others, they are less likely to doubt others abilities, and that they have a strong sense of belonging within their social media network. Conversely, Warner-Søderholm et al. (2017) also stated that their findings included the understanding that, "it is essential to recognize that older, male, and less frequent social media users report lower levels of trust." This idea of young adults being more likely to trust information on social media is supported by research conducted by Howard et al. (2017) where it was found that among university student participants, Facebook and Twitter were perceived as

relatively trustworthy social media platforms, while Instagram and YouTube were perceived to be somewhat trustworthy.

Trust was described by Houldsworth (2020) as an essential factor in the development of bonds, especially in the bonds commonly formed between teacher and learner. Houldsworth (2020) went on to explain that trusting relationships in moments of educational opportunity help forge mutual respect, enhance occasions for collaboration, and encourage independent thinking which results from transparency and kindness during interactions. Despite it not being a traditional format of learning, social media has shown potential for accidently exposing users to information that they might not have otherwise sought out (Feezell, 2017). In a later paper, Feezell & Ortiz (2021) went on to state that incidental exposure to information may lead to the further exploration of or general curiosity regarding that information which could potentially lead to greater knowledge in that area. Incidental exposure to political information may trigger subsequent information seeking or general curiosity about politics that could manifest in higher general political knowledge as a spillover effect (Feezell & Ortiz, 2019). This idea of unintentional exposure, learning, and trust in regard to information found on social media has the possibility of including agricultural information shared by agricultural SMIs' content.

The Role of Social Media Influencers (SMIs)

As social media platforms further develop and expand, the roles of SMIs likewise become more diverse (Masuda et al., 2021). If you were to ask different individuals what they believe the term SMI means today, you would most likely receive different answers from each individual asked. Today SMIs can range from social media content creators sharing their personal reviews of products for purchase; K-12 educators sharing encouragement, products, and

approaches; and environmental, social, and public health advocates sharing information on behalf of their causes (Li, 2021; Masuda et al., 2021; Shelton et al., 2020; Yea & Chou, 2019; Zheng et al., 2021). In an article written by Enke & Borchers (2019), they sought to develop a definition for SMIs in relation to strategic communication, as well as a description of strategic SMI communication. As a result of their efforts, Enke & Borchers (2019) defined SMIs as "third-party actors that have established a significant number of relevant relationships with a specific quality for and influence on organizational stakeholders through content production, content distribution, interaction, and personal appearance on the social web." Strategic SMI communication was stated as being, "the purposeful communication by organizations or social media influencers in which social media influencers are addressed or perform activities with strategic significance to organizational goals."

In a study conducted by Freberg et al. (2010), participants were asked to rank a series of 100 attributes relating to SMIs on a scale of 1-9, one being the least characteristic and nine being the most characteristic. Participants' data indicated that they viewed SMIs as "verbal, smart, ambitious, productive, and poised," and saw SMIs least as "self-pitying, indecisive, easily frustrated, self-deprecating, and lacking meaning in life" (Freberg et al., 2010). Comparisons were made between results regarding SMIs and results regarding CEOs from a previous study using the same methodology. It was discovered that while the two were viewed by participants similarly, SMIs were seen as more likely to be asked for advice when compared to chief executive officers (CEOs), and also more likely to give advice than CEOs (Freberg et al., 2010). The value followers find in SMIs is further backed by De Veirman et al. (2017), who found that SMIs are considered opinion leaders for their followers in the social networks they are a part of.

If the similarities between industries and brands are considered, a study led by Martínez-López et al. (2020) illustrates the extent to which brand control effects an influencer's ability to impact their audiences, which may similarly reflect the results we hope to explore in our evaluation of agricultural SMIs' connections to the agricultural industry influencing their impact. The perspectives of participants were considered for the variables of trust in the influencer, the credibility of the content, the interestingness of the content, and the audiences' readiness to further search for information pertaining to the content shared (Martinez-López et al., 2020). From the data collected, Martínez-López et al. (2020) found that the greater the amount of brand influence on content shared by an influencer, the lower the audience's confidence is in the influencer. The more controlled the content shared is also proved to result in the influencer being perceived as less credible and lowered the interest of the audience in the post. Furthermore, it was found that an influencer's post content controlled by a brand results in less searches on that content by the audience.

Measuring SMIs' Engagement on Social Media Platforms

Even though consumers are showing engagement with information that is being disseminated about the agricultural industry (Holt & Cartmell, 2013), the question still stands on whether or not a non-agricultural audience would engage with content produced by an agricultural SMI on social media. As it stands, engagement on social media includes interactive elements such as likes, follows, shares, comments, and saves. The significance of those forms of engagement related to SMIs on Facebook, Twitter, and Instagram were demonstrated by Arora et al. (2019) to generate an SMI index. The data collected in this study was produced from a "data procurement process pipeline" spanning the three platforms and was composed of analytics from

900 SMIs and their social media content from the different outlets (Arora et al., 2019). From the data, Arora et al. (2019) found that likes on Instagram had the highest level of significance when compared to other engagements on other social media platforms. Following Instagram likes the next highest level of significance was engagement on Instagram posts, the average engagement on Twitter, and then the engagement on Facebook over the course of a week (Arora et al., 2019). Findings from the Arora et al. (2019) study also illustrated that the frequency of social media usage by the SMI tended to increase the SMI index in the majority of cases studied, and that overall, the results demonstrated the importance of "engagement, outreach, sentiment, and growth" in identifying SMIs.

Conclusion

To summarize, literature demonstrates that scientific communication with lay audiences has become increasingly difficult due to changes dealing with trust, the production of new knowledge, and an increase in sources for information. Additionally, the changes in media consumption by young adults in the last 30 years has revealed the need to reevaluate communication methods. From research it can also be concluded that younger audiences, such as the one this study includes, are more likely to trust what they find on social media. Among agricultural communication specialists specifically, it is evident that it is vital for old comfort zones to be abandoned and new avenues to be further explored to reach young nonagricultural audiences. This shift should be viewed as an opportunity for firsthand messages to be communicated. This would allow for direct connections with audiences to occur and further allow trust and credibility to fill the space that has formed between the agricultural industry and its consumers. Literature defined SMIs and identified characteristics that audiences believed

identified SMIs on social media platforms. The significant roles SMI voices play on social media platforms were also explored, as well as the effects that they can have on their audiences and how that can change based on perceived brand or industry control over content. It was outlined that when identifying an SMI several factors played key roles and that Instagram seemed to have greater engagement significance compared to other platforms. However, where the literature is lacking is in outlining how best agricultural voices fit into this emerging world of social media communications and their ability, or not, to impact young nonagricultural audiences.

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The following pages have been formatted to fit the style and guidelines for the peer-reviewed Journal of Applied Communications.

Chapter 4 – Manuscript 2: Measuring Agricultural Means of Influence on Young Adults via Instagram in the United States

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Abstract

Notable differences have been observed in the way that society as a whole perceives and understands the agricultural industry. Consumers today are concerned with the way their food is raised and produced, and drastic changes in how information is gathered regarding those subjects has occurred due to the rapid development of digital media. As a result, the agricultural industry has fallen behind in ensuring that accurate information is shared about the daily work that is done to feed the world. A form of digital media that has infiltrated the daily lives of society is social media (SM). This study sought to perform an evaluation of the impact established agricultural social media influencers (SMIs) on Instagram can have on changing the perceived knowledge of participants regarding several different agricultural topics. Participants were recruited through the platform Prolific and were asked to complete an anonymous Qualtrics survey. Survey questions were asked both prior to participants being shown example images of agricultural SMIs and after. Data collected were analyzed utilizing IBM SPSS (Version 28) to compare pre-image and post-image results to determine the contents' impact on participants perceived knowledge of subjects relating to agriculture. Results indicated significant differences between the pre-image and post-image perceived knowledge results, as well as between different forms of

reported engagement willingness. Future research should be conducted to determine what forms of content best reach nonagricultural target audience members and best practices for interacting on SM with those users.

Keywords: Agriculture Communications, Digital Media, Instagram, Social Media Influencer, Young Adults

Introduction

The way society consumes information has changed drastically, and the agricultural industry is fighting to remain a part of the media landscape. With the gradual death of print news and the rise of social media (SM) consumption by young adults (Twenge et al., 2019), this leaves the questions of where do young consumers get new information and how do pro-agriculture voices successfully communicate scientific agricultural topics with them? With extremist activist voices on Instagram gripping the attentions of young adult SM users, opposing voices of influence sharing scientific and pro-agriculture messages seem to be missing. Social media influencers (SMIs), of which can be found on the SM platform Instagram, were defined by Freberg et al. (2010) as "third party endorsers" who impact audiences such as young consumers' or SM users' feelings and opinions through content shared on SM. Cultivating agricultural SMIs on Instagram could give agricultural communicators the opportunity to share accurate scientific agricultural information to young adult users.

Current Difficulties with Communicating Agriculture Science

An issue pertaining to communication within the science community that scientists devotedly follow the scientific method which inherently leads to dull, technical, and meticulous methods of explaining their findings (Sand-Jensen, 2007). While these intentionally objective techniques are required and necessary for communications within the scientific community, they have little impact when shared with those outside of the scientific niche. An example of an alternative method is to utilize storytelling as a means to communicate scientific topics in an engaging way. Utilizing story shapes such as discovery, rescue, or mystery and employing vivid language along with traditional storytelling elements are essential in appealing to target

audiences (Green et al., 2018). All of the previously mentioned storytelling elements can be demonstrated through the use of SM by SMIs.

Media Source Changes, Polarity of Agricultural Stories in Media, and Agricultural Communication Efforts

From data collected spanning 30 years, Twenge et al. (2019) studied trends in media source usage of adolescents in the United States. Twenge et al. (2019) results indicated significant increases in digital media usage, with 12th graders doubling the amount of time they reported using the internet between 2006 and 2016. Another comparison drawn was between 12th graders in 2008 and 2016, demonstrated a contrast of 52% reporting they visited SM sites "almost every day" in 2008, jump to 82% in 2016. In a study conducted by Howard et al. (2017) looking at the effects of SM on university student's beef industry perceptions, they found that their participants reported a range of 0-23 hours of specifically Instagram usage alone in a week.

Based on reportings by the United States Department of Agriculture (USDA) in 2017, roughly 1% of the U.S. populations is directly involved in producing food (USDA, 2017). Without knowledge or personal experience with the agricultural industry, the general public looks to the same sources for where they tend to gather most of their information today: the media. Unfortunately, the media's coverage of the agricultural industry largely tends to focus on stories involving crisis (Eyck, 2000). A disconnected population combined with an inaccurate industry image produced by the media, has greatly impacted the general public's perception of agriculture (Holt & Cartmell, 2013).

The need to determine the best route for communicating positive agricultural messages has been acknowledged for over a decade and was illustrated by Meyer et al. (2011) when they

stated that both agricultural researchers and professionals needed to explore methods to help combat the negative impacts that media has had on the industry. Ruth-McSwain (2008) uncovered that agriculture communications professionals believed the industry was not utilizing mass media to tell the story of agriculture, prefer to utilize agricultural media sources, and tend to neglect nonagricultural audiences and media (Ruth-McSwain, 2008). Ruth-McSwain (2008) concluded with the belief that the tendency for agricultural communications professionals to largely focus on more traditional media may be a contributing factor in why the agricultural industry has an inability to connect with nonagricultural audiences.

Role of SMIs

As SM platforms further develop and expand, the roles of SMIs likewise become more diverse (Masuda et al., 2021). If you were to ask different individuals what they believe the term SMI means today, you would most likely receive different answers from each individual asked. Today SMIs can range from SM content creators sharing their personal reviews of products for purchase; K-12 educators sharing encouragement, products, and approaches; and environmental, social, and public health advocates sharing information on behalf of their causes (Li, 2021; Masuda et al., 2021; Shelton et al., 2020; Yea & Chou, 2019; Zheng et al., 2021). Enke & Borchers (2019) defined SMIs as "third-party actors that have established a significant number of relevant relationships with a specific quality for and influence on organizational stakeholders through content production, content distribution, interaction, and personal appearance on the social web."

Purpose and Research Question

Due to rapid changes in information acquisition by young adults, research is needed to determine how best to inform these audiences through the emerging world of SM. SMIs play key roles in disseminating content and in turn influencing their audiences' views. The issue at hand is understanding if utilizing SMI platforms to share accurate information related to agricultural sciences are impactful. Due to that need, the following research question is proposed:

RQ 1: Do agricultural SMIs have the ability to increase and improve the perceived knowledge of nonagricultural young adult Instagram users on the industry?

Methodology

To address the proposed research questions, quantitative data were procured from both a pre-image and post-image survey between which, participants were shown example images from agricultural SMIs that have already been established on Instagram. Participants consisted of 855 individuals from a population of age 18-30 from the United States, who use social media regularly, and majority of which were members of a nonagricultural audience. Participants were selected utilizing purposeful sampling that fit the previous description, contacted, and surveyed through the use of Prolific. Study participation was voluntary, and participants had the ability to opt out at any point if they desired to do so. The validity of this test was established through the use of Prolific to distribute surveys to a purposeful sample population and to procure data from the results of the provided survey through Qualtrics (Version 2022, Provo, Utah, U.S.).

The survey consisted of demographic and Likert scale questions. Likert scales allow for the measurement of attitudes and opinions (Privitera & Ahlgrim-Delzell, 2019) and due to the focus of this study pertaining to audience's perceived opinion of their own knowledge as a result

of agricultural SMIs, this method of data collection was deemed appropriate. Both pre-image and post-image questions gauged participant's perceived knowledge of agricultural subjects. Knowledge of agricultural subjects assessed included: genetically modified organisms (GMOs), hormone use in animal production, antibiotic use in animal production, organic farming practices, and the nutritional benefits of milk for human consumption. The data was then analyzed to determine any change in perceptions from the pre-image and post-image utilizing IBM SPSS (Version 28) to calculate descriptive statistics and within-subject data differences through paired samples t-tests (Privitera & Ahlgrim-Delzell, 2019). The alpha significance was set at 0.05 for statistical purposes. Independent variables included the two data sets collected and the dependent variable consisted of the summation of the pre-image and post-image scores operationalized by converting the Likert scale values (very poor, poor, fair, good, and excellent) to numerals (1, 2, 3, 4, and 5).

Results

The sample consisted of 855 participants equally distributed across the United States. Of those participants, 50% were between the ages of 18-24 years old (f = 430) and 50% were between 25-30 years old (f = 425). Participant demographics also revealed that 87% identified themselves to be omnivores (f = 744), 6% pescatarian (f = 48), 4% vegetarian (f = 33), 2% vegan (f = 20) and 1% other (f = 10). Additionally, 73% reported having no connection to agriculture (f = 648) and 27% reported being connected to agriculture in some capacity (f = 207). When questioned about their SM use, Instagram proved to be the most widely used among participants with 98% reporting using Instagram (f = 834).

Data was gathered in reference to the research question regarding the ability of agricultural SMIs to impact the perceived knowledge of participants based on examples of content relating to GMOs, hormone use in animal production, antibiotic use in animal production, organic farming practices, and the nutritional benefits of milk for human consumption. On average, participants exposed to content from agricultural SMIs sharing information about GMOs demonstrated greater perceived knowledge about GMOs (M = 3.36, SE = .03), than they did prior to being exposed to content (M = 3.08, SE = .03). This difference, -0.27, BCa *95%* CI [-.32, -.22], was significant, $t(846) = -11.21$, $p < .001$, and represented an effect of $d = 0.39$. Participants when exposed to the agricultural SMI content about hormone use in animal production indicated greater perceived knowledge about such hormone use (M = 3.06, SE = .03), than they did prior to exposure to said content (M = 2.70, SE = .03). The difference, -0.36, BCa *95%* CI [-.42, -.30], was significant, $t(846) = -12.27$, $p < .001$, and represented an effect of $d = 0.42$. Additionally, the results from participants when exposed to content from agricultural SMIs about antibiotics use in animal production resulted in greater perceived knowledge about antibiotic use (M = 3.09, SE = .03), than participants did prior to exposure to the content (M = 2.65, SE = .03). The difference of, -0.45, BCa *95%* CI [-.51, -.39], was significant, $t(846) = -14.53$, $p < .001$, and represented an effect of $d = 0.50$. Results of participants exposed to content from agricultural SMIs regarding organic farming practices indicated a greater perceived knowledge regarding organic farming (M = 3.01, SE = .03), than participants indicated prior to exposure to the provided SMI content (M = 2.84, SE = .03). Differences between the two groups, -0.16, BCa *95%* CI [-.22, -.11], was significant, $t(846) = -6.20$, $p < .001$, and represented an effect of $d = 0.21$. Lastly, data results revealed that when exposed to content from agricultural SMIs regarding the nutritional benefits of milk for human

consumption participants reported a greater perceived knowledge on the subject (M = 3.23, SE = .03), tan the same participants did prior to exposure to said content (M = 2.95, SE = .03). These final differences, -.28, BCa *95%* CI [-.33, -.22], was significant, $t(846) = -9.94$, $p < .001$, and represented an effect of $d = 0.34$. Even though all results were proven to be statistically significant, effect sizes ranged from weak to moderate effect ($d = 0.2$ to $d = 0.5$) according to classifications outlined by Cohen (1988).

Discussion

The results of this study indicated significant differences between all pre-image and post-image perceived knowledge results, indicating that agricultural SMIs do have the opportunity to influence and inform young adult Instagram users. This study resulted in an increase in perceived knowledge among participants based on the viewing of one Instagram post per topic area analyzed in this research. These results are promising when combined with the idea that repeated exposure allows for greater increases in perceived knowledge and understanding. The idea that repetition of exposure to scientific information allows for improved understanding in that science is supported by a study conducted by Mayer (1983). In their research Mayer (1983) found that repetition allowed for individuals to greater understand scientific concepts, as well as to reorganize scientific information that they were exposed to with their own existing prior knowledge of that science. This is what we would similarly expect to happen with individuals repeatedly exposed to pro-agricultural content on social media, allowing for those social media users to increase their own understanding and build upon their already perceived knowledge on agricultural topics. However, this study is limited in that the data collected and research of interest focuses only on 18-to-30-year old's' within the United States. Potential research

questions that remain unanswered are what forms of agricultural content on SM generate the highest reach of target audiences and which framing strategies result n greater changes in understanding of agricultural topics.

Conclusion

Study results revealed that participants perceived knowledge of agricultural topics prior to being shown example images of content from established agricultural SMIs on Instagram differed from their perceived knowledge after being shown the example images. From the results of this study, we can conclude that participants' viewing of the seven example images led to an increase in perceived knowledge on the five topic areas covered (genetically modified organisms, antibiotic and hormone use in animal production, organic farming practices, and the nutritional benefits of milk).

Tables and Figures

Table 1. ***Descriptive results of participant perceived knowledge***[1,2]

Topic	Pre-image Post-Image	Reported Level of Understanding (%)				
		Very Poor	Poor	Fair	Good	Excellent
GMOs*	Pre	5	20	43	27	5
	Post	1	13	43	35	8
Hormones	Pre	9	36	36	16	3
	Post	3	23	45	25	4
Antibiotics	Pre	10	38	32	17	3
	Post	3	20	45	27	5
Organic	Pre	7	32	37	19	5
	Post	3	26	42	24	5
Benefits of milk	Pre	6	26	40	23	5
	Post	3	16	42	32	7

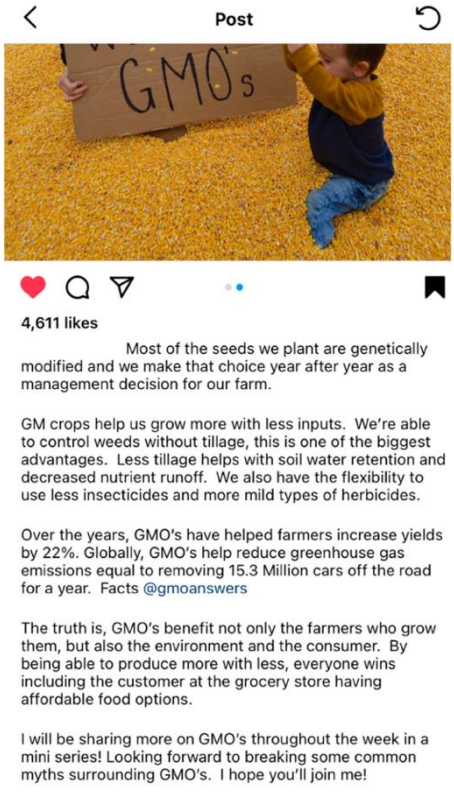
[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.
[2]Likert scale responses were analyzed using IBM SPSS (Version 28).
* Genetically modified organisms

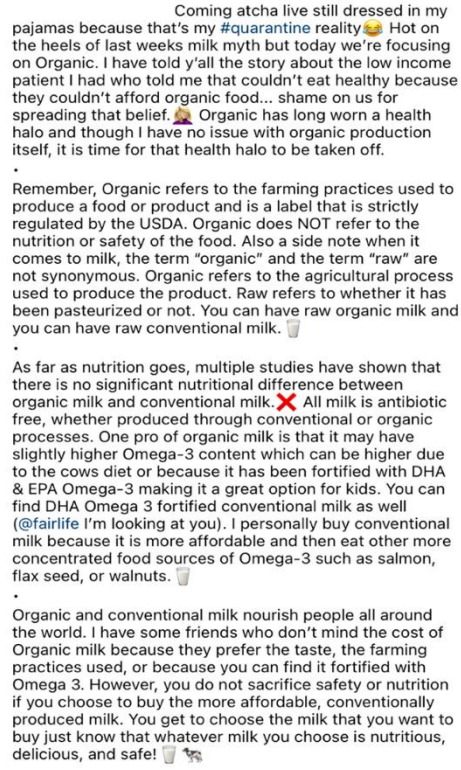
Table 2. ***Paired samples t-test results***[1,2]

	Topic	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Significance
					Lower	Upper			
Pair 1	GMOs* pre GMOs* post	-.27	.70	.02	-.32	-.22	-11.21	846	$p < .001$
Pair 2	Hormones pre Hormones post	-.36	.85	.03	-.42	-.30	-12.27	846	$p < .001$
Pair 3	Antibiotics pre Antibiotics post	-.45	.90	.03	-.51	-.39	-14.53	846	$p < .001$
Pair 4	Organic pre Organic post	-.16	.77	.03	-.22	-.11	-6.20	846	$p < .001$
Pair 5	Benefits of milk pre Benefits of milk post	-.28	.81	.03	-.33	-.22	-9.94	846	$p < .001$

[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.
[2]Likert scale responses were analyzed using IBM SPSS (Version 28).
* Genetically modified organisms

Figure 1. ***Images of example content used for this study pulled from established agriculture social media influencers on Instagram[1,2]***





Dallas, Texas

Liked by and **262 others**

Comin atcha live with a selfie bc hubby was unavailable for a photo clearly Sully was thrilled to make her debut

Comin atcha live with a selfie bc hubby was unavailable for a photo clearly Sully was thrilled to make her debut

•

I cannot tell you how many times my inner dietitian cringes when I hear someone say "I don't drink cows milk but its ok because I replaced it with almond milk..." IF YOU ONLY KNEW THE DIFFERENCES!!!! Just like no cows spots are created equal, so (almost) every plant based beverage is not created equal to real milk either.

•

I am going to keep this overview very broad since its impossible to fit the nutritional comparison between every alternative and real milk into one post. Also, this post is not to rag on alternatives as I think they are 100% appropriate in certain situations & a great option for those who need it but its to simply point out nutritional differences. They're not called "Milk equivalents" for a reason... because they are not nutritionally equivalent to milk.

•

Milk and milk products are a top source of calcium for Americans. Aside from Calcium, milk also offers high quality protein, Vitamin D, phosphorous, potassium and other nutrients. According to the Dietary Guidelines for Americans, the ONLY plant based beverage considered to be a nutritional substitute for cows milk is calcium fortified soy milk. Aside from that, plant based alternatives are NOT a recommended substitute for cows milk because they pale in comparison when it comes to nutrition. This is especially important when it comes to which one to give your kids since kids are still developing and need TONS of nutrients to help them grow. If there are other reasons why you cannot have soy milk, then other plant based beverages may be explored as options with other dietary modifications to ensure you are getting in all those nutrients.

•

In the grocery store we are surrounded by options for milk and plant based beverages. Some milk is plain. Some is chocolate. Other plant based alternatives come from soy, peas, oats, almonds, and so on. It is up to you to compare the nutrition facts label and find the product that best nourishes you and your family.

Liked by and **780 others**

Judicious means "done with good judgement" and we believe in using antibiotics in this way is important for

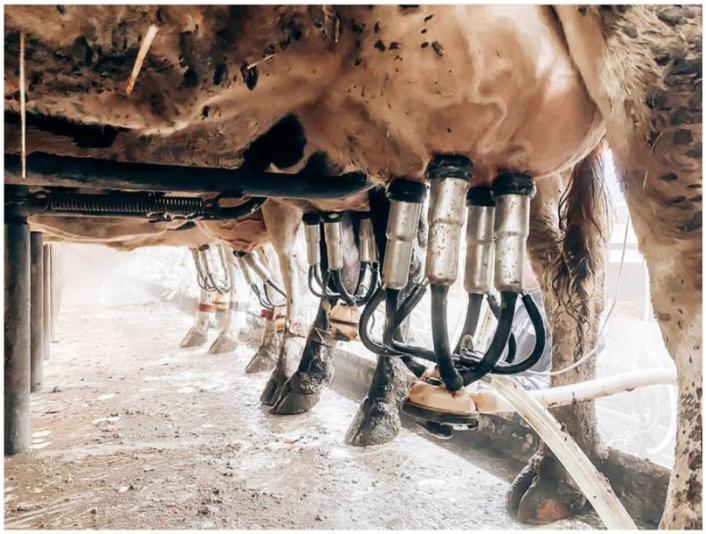
Liked by and **780 others**

Judicious means "done with good judgement" and we believe in using antibiotics in this way is important for human and animal health. This is why veterinarians are LEGALLY OBLIGATED to be involved with treatment decisions made on farms. This is called a Veterinarians-Client-Patient-Relationship (VCPR) and it means the veterinarian has assumed the responsibility for making medical judgments regarding the health of the animal, the need for medical treatment AND the client has agreed to follow the instructions of the veterinarian.

For a veterinarian to write a prescription they must know the farm and the animals. The vet should understand the farms protocols and perform diagnostic testing when appropriate. The VCPR also means the veterinarian is readily available for follow-up!

Having a good, working relationship with a veterinarian allows farms to continually develop mitigation strategies that will allow for healthier animals!

Farmers + Veterinarians = Healthy Animals



Liked by and **4,508 others**

THERE ARE NO ANTIBIOTICS IN MILK!!!!! I will never stop preaching this until everyone in the world knows this FACT.

Whether your milk label says antibiotic free or not, there are no antibiotics in the milk containers they sell at the grocery store.

We have to dump our milk if there is a trace of antibiotic residue in it. We have to pay heavy fines if our milk that is going out for consumption is found to have antibiotics in it.

Antibiotics are expensive. We use them very sparingly. For example, one bottle we use is $75! Not something we can give out like candy for no gosh dang reason. If we do have to treat a cow for something using antibiotics, we put a red band around her ankle, she's moved to the "red tag group," we add her into the computer system that she has been treated, and all of the milk from that group is dumped. She will go back into her normal group once she has reached a certain milk withholding period. Every bottle of antibiotics calls for a different amount of days.

This is not something we joke around about. Messing up could cost us thousands of dollars that we don't have. The milk we ship off is tested 3+ times before getting to the grocery store, ensuring safe, antibiotic free milk for you to enjoy.

There are no antibiotics in milk. Period.

Liked by and **3,675 others**

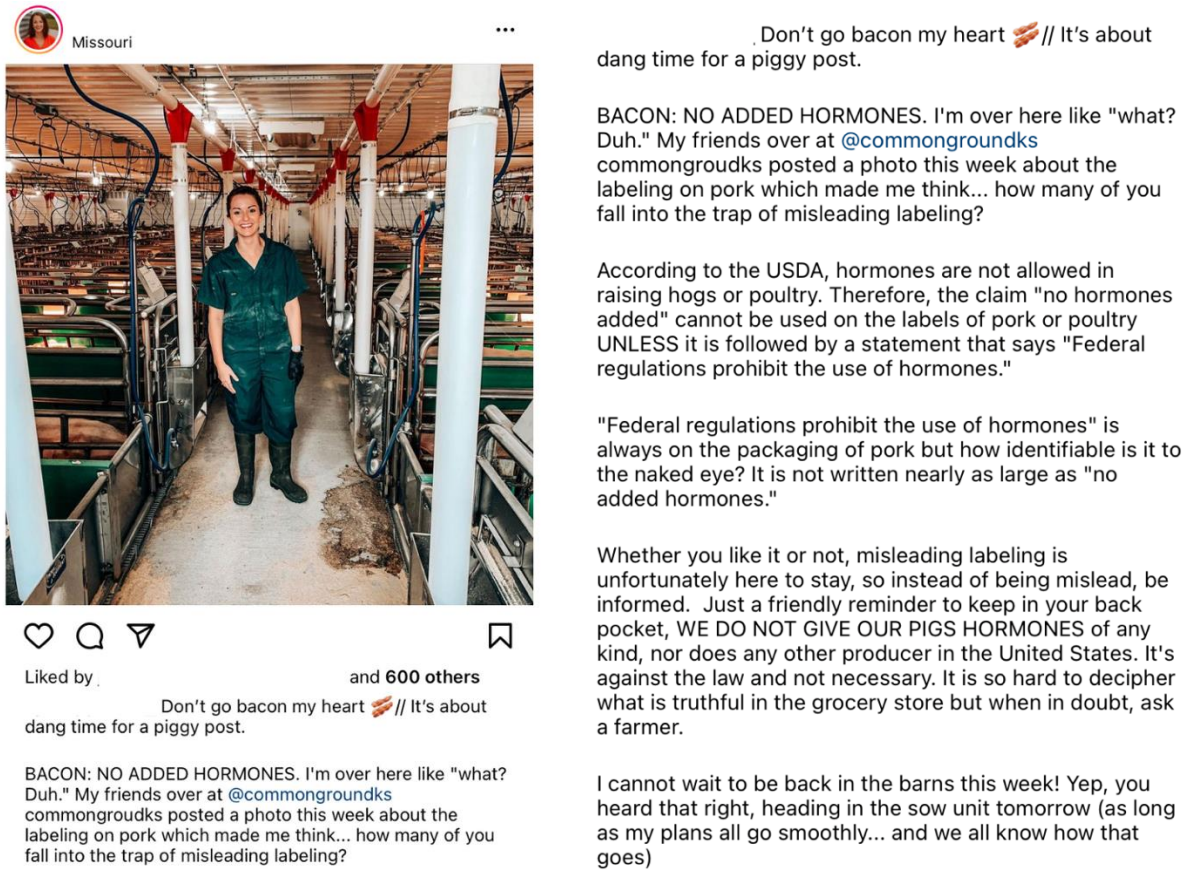
Did you know that in the US there are 10 crops that have been approved and are being continuously grown for your consumption using GMOS?

These crops include-
🌽 Corn
🌱 Soybeans
☁️ Cotton
🥔 Potatoes
🌿 Papayas
🌞 Summer squash
🌾 Canola
🪴 Alfalfa
🍎 Apples
🍠 Sugar Beets

Despite the bad wrap GMOS get from the public and marketing schemes, we would not be as advanced as a country without them! Here's a few things Genetically Modified Organisms can help us with.

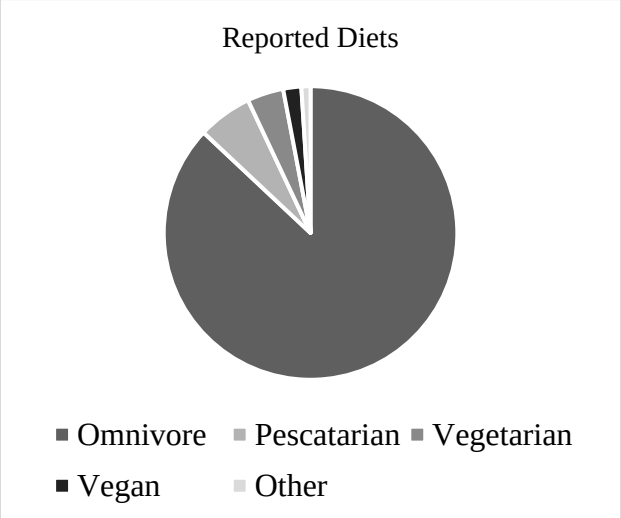
🔺 Higher Yields Per Acre (Conserving space)
🔺 Reducing Food Waste (resisting plants to brown)
🔺 Cut down on weeds (these plants can be resistant to herbicides with gmos!)
🔺 Able to resist certain viruses that are specific to the plant
🔺 Can be modified to resist insects that harm the plant
🔺 Less chemicals are used to prevent weed and insect population

Any questions? Drop them below!



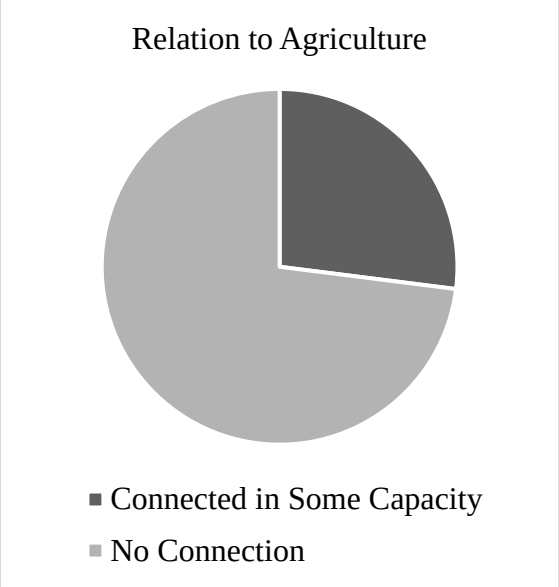
[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.
[2]The images above were the example Instagram content shown to participants for the purpose of this study.

Figure 3. ***Survey participant reported diets***[1]



[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.

Figure 4. ***Survey participant reported relation to agriculture***[1]



[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.

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Chapter 5 – Manuscript 3: Anticipating Rate of Engagement by Young Adults with Agricultural Social Media Influencers on Instagram

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Abstract

Agricultural communication strategies as they stand seem to fall short in comparison to anti-agricultural messages shared through mainstream media today. With data shared by the U.S. Census Bureau (n.d.) and the USDA Census of Agriculture (2017) supporting the fact that only 1% of the United States population is directly involved in agriculture today, consumers are less connected than ever before and as a result more curious about the industry than ever before. A prominent form of digital media that has infiltrated the daily lives of society is social media (SM). With the significance of engagement factors such as likes, comments, shares, and save on such platforms in mind, this research sought to perform an evaluation of the willingness of social media users to interact with content created by agricultural social media influencers (SMIs) on Instagram. Participants were recruited through the platform Prolific and were asked to complete an anonymous Qualtrics survey. Survey questions were asked both prior to participants being shown example images of agricultural SMIs and after about participants' willingness to engage with general content compared to agriculture SMI content on Instagram. Data collected were analyzed utilizing IBM SPSS (Version 28) to compare general content and agriculture SMI content results to determine the anticipated reach of agricultural SMIs on Instagram.

Keywords: Instagram, Digital Media, Engagement, Social Media Influencer, Agriculture Communications

Introduction

Communicating scientific topics to the public has always come with challenges. Due to the agricultural industry being a highly scientific field, communicating agricultural topics lies within the same predicament as other scientific fields in that there are difficulties in reaching lay audiences. As a result of the United States' (U.S.) shift over time from rural to urban lifestyles over the course of nearly the last century (U.S. G.P.O., 1968), there is a specific lack in the general public's understanding of agricultural sciences. Additionally, society's consumption of information has changed drastically in the last 30 years, specifically in young adults whose media consumption trends continue to shift from traditional news sources, such as print and television, to more modern news sources, such as social media (Twenge et al., 2019.). With majority of agricultural information in the past being dispersed by print news and small amounts of television news (Ruth-Mcswain, 2008), agricultural communication specialists today are left with the question of how to best spread their messages.

Social media influencers (SMIs), of which can be found on the social media platform Instagram, were defined by Freberg et al. (2010) as "third party endorsers" who impact audiences such as young consumers' or social media users' feelings and opinions through content shared on social media. Additionally, Hearn & Schoenhoff (2016) stated that, "the SMI works to generate a form of "celebrity" capital by cultivating as much attention as possible and crafting and authentic "personal brand" via social networks, which can subsequently be used." Cultivating agricultural SMIs on Instagram would give agricultural communicators the direct opportunity to share accurate scientific agricultural information to young adult users. The ability to find media outlets communicators could trust, whether in print or television, to accurately share scientific agricultural information is an issue that Ruth-Mcswain (2008) found that

specialists in the field had in spreading their messages. Social media provides the unique opportunity to remove the middleman of other media formats and offers field specific influencers the chance to accurately spread their messages and information in the exact context that they desire.

Current Difficulties with Communicating Science

The agricultural industry is not alone in engaging in the distribution of scientific information with lay audiences. A shift in confidence and credibility has greatly affected science communications, and Benneworth (2009) contributed four key factors to this exact shift. Those four key factors include the loss of trust in scientists, changes in how knowledge is produced, a new abundance of resources for information, and the estrangement between science and the general public through the democratic deficit (Benneworth, 2009). While communicators and scientists alike are implementing strategies in educating the public, research has indicated that techniques currently being use might not be the best to do so. An approach commonly used by the scientific community in their communication efforts is the belief that distrust and opposition to science by nonscientific audiences is due to a lack of scientific knowledge. This model of thinking is referred to as the knowledge "deficit model" which presents challenges in its ability to accurately explain how the public's perceptions are shaped (Simis et al., 2016). Oppositions to the knowledge deficit model acknowledge that the approach ignores the apparent biases that individual's set frames and ideological ideas have on their ability to shift their own perspectives regarding a subject matter (Druckman & Bolsen, 2009). It has even been suggested by some that specific science communication techniques actually intensify polarized attitudes in what is described as a boomerang effect (Byrne & Hart, 2009). Hart & Nisbet (2011) demonstrated the

limitations of the knowledge deficit model by communicating science related to climate change and displaying how political partisanship effects an individual's response to information pertaining to the scientific information a message shared. For these reasons, contemporary alternative approaches to communicating science and research backing their efficacy are needed to ensure a renewal of trust and understanding between scientists and nonscientists alike through communication.

An example of an alternative method of science communication was outlined by Fischhoff (2013) consisting of four connected tasks. The four tasks involve: (1) pinpointing the scientific topics most relevant to the audience; (2) determining what the audience already knows about the topic; (3) constructing communications to fill the gaps in knowledge; and (4) assessing how useful the communication technique was at informing the audience and repeating the tasks as necessary. Utilizing outlines similar to the one previously mentioned would allow for the scientific community to communicate topics that matter to the general population in an efficient way that allows for the audience to learn without wasting their time on knowledge they may already have acquired.

Change in Media Sources and Polarity of Agricultural News

Data spanning from 1976 to 2016, Twenge et al. (2019) studied trends in media source usage of adolescents in the U.S. Twenge et al. (2019) results revealed a significant increase in digital media usage, with 12th graders doubling the amount of time they reported using the internet during leisure time between 2006 and 2016. Another comparison drawn was between 12th graders in 2008 and 12th graders in 2016, revealed a contrast of 52% reporting they visited social media sites "almost every day" in 2008, jump to 82% in 2016. As far as the current use of

social media goes, it was reported by The Infinite Dial that in 2021 approximately 82% of the U.S. population over the age of 12 used social media, that is an estimated 233 million people (Edison Research & Triton Digital, 2021). While The Infinite Dial reported that Facebook is still the most widely used social media platform in the U.S. with 63% of the total U.S. population over the age of 12 being users, the platform did experience a drop in reported use between 2020 and 2021 (Edison Research & Triton Digital, 2021). Instagram is the second most widely used social media platform with 43% of the U.S. population over the age of 12 being users, and the platform continuing to experience growth in use between 2020 and 2021 (Edison Research & Triton Digital, 2021).

In a study conducted by Howard et al. (2017) looking at the effects of social media on university student's beef industry perceptions, they found that their participants' reported a range of 0-23 hours of Instagram usage a week. From that same study Howard et al. (2017) produced three recommendations for agricultural communicators. Those three suggestions consisted of: (1) agricultural communicators should evaluate their current use of social media for getting information to university students; (2) identify social media platforms and outlets that could be used to get information proactively and reactively to university students; and (3) agricultural communications programs today should seek to offer elective coursework revolving around the effective use of social media related to agriculture (Howard et al., 2017).

The Role of Social Media Influencers (SMIs)

As social media platforms further develop and expand, the roles of SMIs likewise become more diverse (Masuda et al., 2021). If you were to ask different individuals what they believe the term SMI means today, you would most likely receive different answers from each

individual asked. Today SMIs can range from social media content creators sharing their personal reviews of products for purchase; K-12 educators sharing encouragement, products, and approaches; and environmental, social, and public health advocates sharing information on behalf of their causes (Li, 2021; Masuda et al., 2021; Shelton et al., 2020; Yea & Chou, 2019; Zheng et al., 2021). In an article written by Enke & Borchers (2019), they sought to develop a definition for SMIs in relation to strategic communication, as well as a description of strategic SMI communication. As a result of their efforts, Enke & Borchers (2019) defined SMIs as "third-party actors that have established a significant number of relevant relationships with a specific quality for and influence on organizational stakeholders through content production, content distribution, interaction, and personal appearance on the social web." Strategic SMI communication was stated as being, "the purposeful communication by organizations or social media influencers in which social media influencers are addressed or perform activities with strategic significance to organizational goals."

Measuring SMIs' Engagement on Social Media Platforms

Even though consumers are showing engagement with information that is being disseminated about the agricultural industry (Holt & Cartmell, 2013), the question still stands on whether or not a non-agricultural audience would engage with content produced by an agricultural SMI on social media. As it stands, engagement on social media includes interactive elements such as likes, follows, shares, comments, and saves. The significance of those forms of engagement related to SMIs on Facebook, Twitter, and Instagram were demonstrated by Arora et al. (2019) to generate an SMI index. The data collected in this study was produced from a "data procurement process pipeline" spanning the three platforms and was composed of analytics from

900 SMIs and their social media content from the different outlets (Arora et al., 2019). From the data, Arora et al. (2019) found that likes on Instagram had the highest level of significance when compared to other forms of engagement on other social media platforms. Findings from the Arora et al. (2019) study also revealed that the frequency of social media usage by the SMI tended to increase the SMI index in the majority of cases studied, and that overall, the results demonstrated the importance of "engagement, outreach, sentiment, and growth" in identifying SMIs.

Purpose and Research Question

Due to changes in how society today interacts with and understands the agricultural industry, research is needed to determine how best to facilitate engagement with young adults on the digital platforms that they use daily. On SM today, SMIs play key roles in the creation and distribution of content in order to encourage different forms of engagement with their followers. The issue at hand is understanding if utilizing SMI platforms to share accurate information related to agricultural sciences are successful at facilitating such desired engagement on social media platforms such as Instagram. Due to that need, the following research question is proposed:

RQ: Are nonagricultural Instagram users likely to engage with content shared by agricultural SMIs?

Methodology

Researchers employed a quantitative approach for data collection comprising of questions regarding wiliness to engage with both general content and agriculture related content. Between

the two data collection sets, participants were shown example images of content from agricultural SMIs that are already well established on Instagram. Participants for this study consisted of 855 individuals from ages 18-30 from the U.S., use social media regularly, and majority of which considered themselves a part of a nonagricultural demographic. Participant selection consisted of a purposeful sampling that fit the previous description. Participants were contacted and then surveyed through the use of the platform Prolific. Participation in this research was voluntary, and participants were able to opt out at any point of the survey if they desired to do so. Validity was established through the use of Prolific to distribute surveys and procure data from a purposeful sample through a provided survey on Qualtrics (Version 2022, Provo, Utah, U.S.).

The survey completed by participants comprised of demographic and Likert scale questions. Likert scales were deemed appropriate because this study focuses on participants' viewpoints and Likert scales specifically allow for the measurement of attitudes and opinions (Privitera & Ahlgrim-Delzell, 2019). Survey questions assessed participant's opinions regarding their willingness to engage with agricultural SMIs on Instagram through likes, comments, shares, and saves. The software IBM SPSS (Version 28) was utilized for data analysis to determine descriptive statistics as well as within-subject data differences. Within-subject data differences were discovered through the use of paired samples t-tests (Privitera & Ahlgrim-Delzell, 2019). For statistical analysis purposes, the alpha significance was set at 0.05. For this study, independent variables consisted of general content versus agricultural content and the dependent variables comprised of the summation of participant reported engagement type willingness which was operationalized by converting the five-point Likert scale values (extremely unlikely,

unlikely, neither likely nor unlikely, likely, and extremely unlikely) to numerals (1, 2, 3, 4, and 5).

Results

The sample population for this study consisted of 855 participants equally distributed across the U.S. Among participants, 50% were between the ages of 18-24 years old (*f* = 430) and 50% were between 25-30 years old (*f* = 425). Demographic data indicated that 87% of participants reported being omnivores (*f* = 744), 6% pescatarian (*f* = 48), 4% vegetarian (*f* = 33), 2% vegan (*f* = 20) and 1% other (*f* = 10). Participant data also indicated that 73% had reportedly no connection to agriculture (*f* = 648) and 27% were connected to agriculture in some capacity (*f* = 207). When asked to report their social media platform use, Instagram proved to be the most widely used with 98% of participants reporting that they use Instagram (*f* = 834).

Data gathered in reference to the research question regarding the ability of agricultural SMIs content examples to impact participant's opinions towards engaging with agricultural SMIs' content on Instagram through likes, comments, shares, and saves. On average, participants reported less willingness to like content shared by agricultural SMIs on Instagram (*M* = 3.29, *SE* = .04), than they reported with general content (*M* = 3.92, *SE* = .03). This difference, 0.62, BCa *95%* CI [.54, .71], was significant, $t(853) = 14.99$, $p < .001$, and represented an effect of $d = 0.51$. Participants when asked about their willingness to engage with content through comments reported less willingness with content shared by agricultural SMIs (*M* = 2.41, *SE* = .04), than they reported with general content (*M* = 2.70, *SE* = .04). This difference, 0.29, BCa *95%* CI [.22, .36], was significant, $t(852) = 8.23$, $p < .001$, and represented an effect of $d = 0.28$. Again, the results indicated that participants were less likely to engage with agricultural SMI content on Instagram through sharing (*M* = 2.62, *SE* = .04), than they were willing to share general content

(*M* = 3.08, *SE* = .04). This difference, 0.46, BCa *95%* CI [.37, .55], was significant, *t*(850) = 10.63, *p* < .001, and represented an effect of *d* = 0.36. Finally, data results demonstrated that participants were less likely to engage with content from agricultural SMIs through saving posts (*M* = 2.77, *SE* = .04), than they were willing to save general content (*M* = 3.20, *SE* = .04). This difference, 0.42, BCa *95%* CI [.34, .51], was significant, *t*(852) = 9.70, *p* < .001, and represented an effect of *d* = 0.33. Effect sizes for all data ranged from weak to moderate effect (*d* = 0.2 to *d* = 0.5) according to categories outlined by Cohen (1988).

Discussion

The results of this study indicated significant differences between reported willingness to engage with agricultural SMI content compared to general content. This study indicates that agricultural SMIs will have more limited opportunities to facilitate engagement with young adult Instagram users than those that share general content. What these findings demonstrate and reinforce is the current dilemma that pro-agricultural content is currently having. The problem being that due to the limited engagement with this type of content, the content's capacity for reaching more individuals is limited due to ever-changing algorithms utilized by social media platforms such as Instagram. Study limitations include the fact that data collected focuses only on the perspectives of 18-to-30-year-olds located within the U.S. and only reflected engagement opportunities on the social media platform Instagram. Potential research questions that remain unanswered are what forms of agricultural content on SM generate the highest rates of engagement with target audiences and what strategies can potentially be used to increase engagement rates with agricultural content.

Conclusion

The results of this study indicated differences between participants reported willingness to engage with agricultural SMI content compared to general content. Data from study participants illustrated that on Instagram they are less willing to engage with agricultural SMIs through likes, comments, shares, and saves than with general content. However, participants did report greater willingness to interact with agricultural SMI content through likes and saves when compared to comments and shares.

Tables and Figures

Table 1. ***Descriptive results of participant reported engagement willingness on Instagram***[1,2]

		Reported Engagement Willingness (%)				
	General vs Ag SMI*	Extremely Unlikely	Unlikely	Neither Likely nor Unlikely	Likely	Extremely Likely
Likes	General	4	7	10	55	25
	Ag SMI*	10	19	15	44	12
Comments	General	13	38	19	28	3
	Ag SMI*	24	37	16	20	3
Shares	General	15	21	14	41	9
	Ag SMI*	23	29	16	27	4
Saves	General	13	20	14	42	12
	Ag SMI*	21	26	16	30	7

[1]Survey utilizing Prolific of 855 young adults and their reported engagement willingness for general content and agricultural SMI content on Instagram.
[2]Likert scale responses were analyzed using IBM SPSS (Version 28).
*Agricultural social media influencer

Table 2. ***Paired samples t-test results***[1,2]

	Topic	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Significance	d
					Lower	Upper				
Pair 1	Likes General & Likes Ag SMI *	0.62	1.215	.042	.54	.71	14.99	853	$p < .001$	0.51
Pair 2	Comments General & Comments Ag SMI*	0.29	.85	.03	.22	.36	8.23	852	$p < .001$	0.28
Pair 3	Shares General & Shares Ag SMI*	0.46	.90	.03	.38	.55	10.63	850	$p < .001$	0.36
Pair 4	Saves General & Saves Ag SMI*	0.42	.77	.03	.34	.51	9.70	852	$p < .001$	0.33

[1]Survey utilizing Prolific of 855 young adults and their reported engagement willingness for general content and agricultural SMI content on Instagram.
[2]Likert scale responses were analyzed using IBM SPSS (Version 28).
*Agricultural social media influencer

Figure 1. ***Images of example content used for this study pulled from established agriculture social media influencers on Instagram[1,2]***

4,611 likes

Most of the seeds we plant are genetically modified and we make that choice year after year as a management decision for our farm.

4,611 likes

Most of the seeds we plant are genetically modified and we make that choice year after year as a management decision for our farm.

GM crops help us grow more with less inputs. We're able to control weeds without tillage, this is one of the biggest advantages. Less tillage helps with soil water retention and decreased nutrient runoff. We also have the flexibility to use less insecticides and more mild types of herbicides.

Over the years, GMO's have helped farmers increase yields by 22%. Globally, GMO's help reduce greenhouse gas emissions equal to removing 15.3 Million cars off the road for a year. Facts @gmoanswers

The truth is, GMO's benefit not only the farmers who grow them, but also the environment and the consumer. By being able to produce more with less, everyone wins including the customer at the grocery store having affordable food options.

I will be sharing more on GMO's throughout the week in a mini series! Looking forward to breaking some common myths surrounding GMO's. I hope you'll join me!

Dallas, Texas

Liked by and **449 others**

Coming atcha live still dressed in my pajamas because that's my #quarantine reality😂 Hot on the heels of last weeks milk myth but today we're focusing on Organic. I have told y'all the story about the low income patient I had who told me that couldn't eat healthy because they couldn't afford organic food... shame on us for spreading that belief.🙅‍♀️ Organic has long worn a health halo and though I have no issue with organic production itself, it is time for that health halo to be taken off.

•

Remember, Organic refers to the farming practices used to produce a food or product and is a label that is strictly regulated by the USDA. Organic does NOT refer to the nutrition or safety of the food. Also a side note when it comes to milk, the term "organic" and the term "raw" are not synonymous. Organic refers to the agricultural process used to produce the product. Raw refers to whether it has been pasteurized or not. You can have raw organic milk and you can have raw conventional milk.🥛

•

As far as nutrition goes, multiple studies have shown that there is no significant nutritional difference between organic milk and conventional milk.❌ All milk is antibiotic free, whether produced through conventional or organic processes. One pro of organic milk is that it may have slightly higher Omega-3 content which can be higher due to the cows diet or because it has been fortified with DHA & EPA Omega-3 making it a great option for kids. You can find DHA Omega 3 fortified conventional milk as well (@fairlife I'm looking at you). I personally buy conventional milk because it is more affordable and then eat other more concentrated food sources of Omega-3 such as salmon, flax seed, or walnuts.🥛

•

Organic and conventional milk nourish people all around the world. I have some friends who don't mind the cost of Organic milk because they prefer the taste, the farming practices used, or because you can find it fortified with Omega 3. However, you do not sacrifice safety or nutrition if you choose to buy the more affordable, conventionally produced milk. You get to choose the milk that you want to buy just know that whatever milk you choose is nutritious, delicious, and safe!🥛🐄

Dallas, Texas

Liked by and **262 others**

Comin atcha live with a selfie bc hubby was unavailable for a photo🤷‍♀️ clearly Sully was thrilled to make her debut😂

Comin atcha live with a selfie bc hubby was unavailable for a photo🤷‍♀️ clearly Sully was thrilled to make her debut😂

•

I cannot tell you how many times my inner dietitian cringes when I hear someone say "I don't drink cows milk but its ok because I replaced it with almond milk..." IF YOU ONLY KNEW THE DIFFERENCES!!!! 🤯Just like no cows spots are created equal, so (almost) every plant based beverage is not created equal to real milk either.

•

I am going to keep this overview very broad since its impossible to fit the nutritional comparison between every alternative and real milk into one post. Also, this post is not to rag on alternatives as I think they are 100% appropriate in certain situations & a great option for those who need it but its to simply point out nutritional differences. They're not called "Milk equivalents" for a reason... because they are not nutritionally equivalent to milk.

•

Milk and milk products are a top source of calcium for Americans. 🥛Aside from Calcium, milk also offers high quality protein, Vitamin D, phosphorous, potassium and other nutrients. According to the Dietary Guidelines for Americans, the ONLY plant based beverage considered to be a nutritional substitute for cows milk is calcium fortified soy milk. 🌿Aside from that, plant based alternatives are NOT a recommended substitute for cows milk because they pale in comparison when it comes to nutrition. This is especially important when it comes to which one to give your kids since kids are still developing and need TONS of nutrients to help them grow.💪 If there are other reasons why you cannot have soy milk, then other plant based beverages may be explored as options with other dietary modifications to ensure you are getting in all those nutrients.

•

In the grocery store we are surrounded by options for milk and plant based beverages. Some milk is plain. Some is chocolate. Other plant based alternatives come from soy, peas, oats, almonds, and so on. It is up to you to compare the nutrition facts label and find the product that best nourishes you and your family.💛

Liked by and **780 others**

. Judicious means "done with good judgement" and we believe in using antibiotics in this way is important for

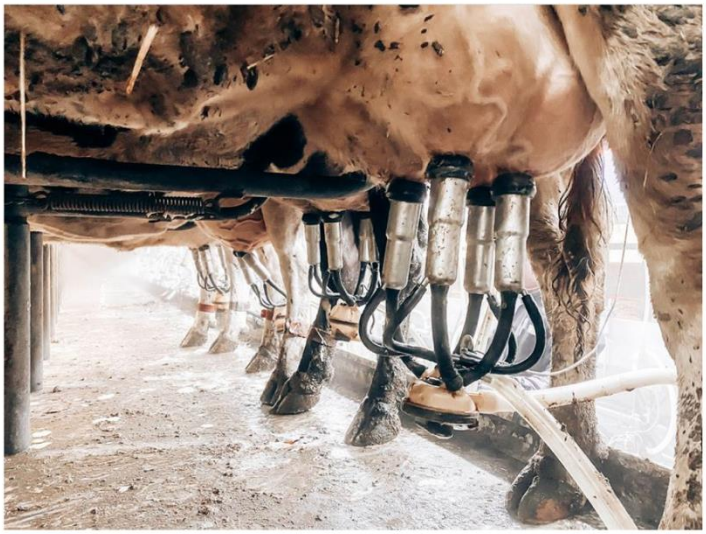
Liked by and **780 others**

. Judicious means "done with good judgement" and we believe in using antibiotics in this way is important for human and animal health. This is why veterinarians are LEGALLY OBLIGATED to be involved with treatment decisions made on farms. This is called a Veterinarians-Client-Patient-Relationship (VCPR) and it means the veterinarian has assumed the responsibility for making medical judgments regarding the health of the animal, the need for medical treatment AND the client has agreed to follow the instructions of the veterinarian.

For a veterinarian to write a prescription they must know the farm and the animals. The vet should understand the farms protocols and perform diagnostic testing when appropriate. The VCPR also means the veterinarian is readily available for follow-up!

Having a good, working relationship with a veterinarian allows farms to continually develop mitigation strategies that will allow for healthier animals!

Farmers + Veterinarians = Healthy Animals



Liked by and **4,508 others**

THERE ARE NO ANTIBIOTICS IN MILK!!!!! I will never stop preaching this until everyone in the world knows this FACT.

Whether your milk label says antibiotic free or not, there are no antibiotics in the milk containers they sell at the grocery store.

We have to dump our milk if there is a trace of antibiotic residue in it. We have to pay heavy fines if our milk that is going out for consumption is found to have antibiotics in it.

Antibiotics are expensive. We use them very sparingly. For example, one bottle we use is $75! Not something we can give out like candy for no gosh dang reason. If we do have to treat a cow for something using antibiotics, we put a red band around her ankle, she's moved to the "red tag group," we add her into the computer system that she has been treated, and all of the milk from that group is dumped. She will go back into her normal group once she has reached a certain milk withholding period. Every bottle of antibiotics calls for a different amount of days.

This is not something we joke around about. Messing up could cost us thousands of dollars that we don't have. The milk we ship off is tested 3+ times before getting to the grocery store, ensuring safe, antibiotic free milk for you to enjoy.

There are no antibiotics in milk. Period.

Liked by and **3,675 others**

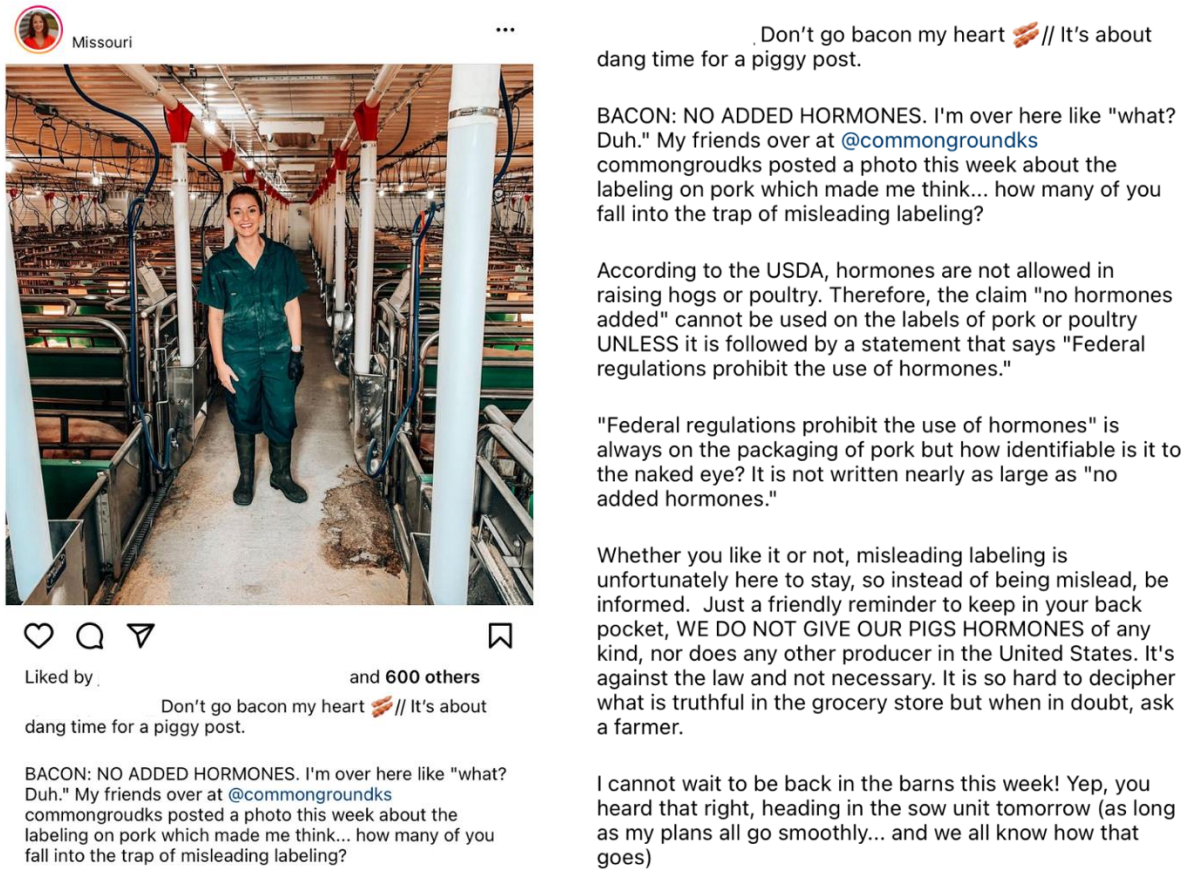
Did you know that in the US there are 10 crops that have been approved and are being continuously grown for your consumption using GMOS?

These crops include-
🌽 Corn
🌱 Soybeans
☁️ Cotton
🥔 Potatoes
🌿 Papayas
🌞 Summer squash
🌾 Canola
🪴 Alfalfa
🍎 Apples
🍠 Sugar Beets

Despite the bad wrap GMOS get from the public and marketing schemes, we would not be as advanced as a country without them! Here's a few things Genetically Modified Organisms can help us with.

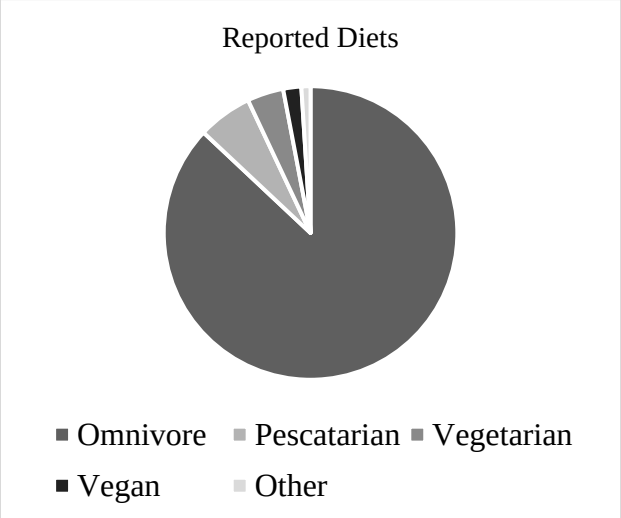
🔺 Higher Yields Per Acre (Conserving space)
🔺 Reducing Food Waste (resisting plants to brown)
🔺 Cut down on weeds (these plants can be resistant to herbicides with gmos!)
🔺 Able to resist certain viruses that are specific to the plant
🔺 Can be modified to resist insects that harm the plant
🔺 Less chemicals are used to prevent weed and insect population

Any questions? Drop them below!



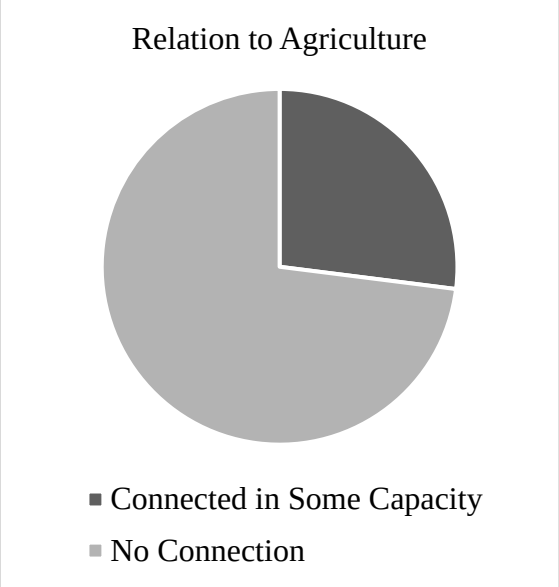
[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.
[2]The images above were the example Instagram content shown to participants for the purpose of this study.

Figure 3. ***Survey participant reported diets***[1]



[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.

Figure 4. ***Survey participant reported relation to agriculture***[1]



[1]Survey utilizing Prolific of 855 young adults and their perceived knowledge of topics prior to and after the viewing of example Instagram content.

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Appendix

Appendix 1. *"Podcasting As an Extension Tool" CES Personnel Survey Material*

Information Letter for a Research Study Entitled "Podcasting as an Extension Tool "

If you are 18 years old or older and currently work for or have previously worked for the United States Cooperative Extension System (CES), you are invited to participate in a research survey exploring CES personnel's perceptions regarding the use of podcasting as an Extension tool. The study is being conducted by Samantha Bennett, graduate student in the Department of Animal Sciences which is housed within the College of Agriculture at Auburn University.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to complete an electronic survey consisting of questions regarding your perceptions regarding the use of the use of podcasting as an Extension tool. Your total time commitment will be approximately 15 minutes.

Are there any risks or discomforts? This is a completely voluntary, anonymous study which can be exited at any time. There are no anticipated risks or discomfort associated with taking this survey. The subject matter you as participant will be questioned on should not cause any strong physical or emotional responses. At any time during the duration of the survey you may choose to stop completing the survey or may choose to skip any questions that you may find uncomfortable to answer.

Are there any costs? If you decide to participate, there are no costs to you other than the estimated 15 minutes required to complete the survey.

Will you receive compensation for participating? There will be no form of compensation for participating in this research survey.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by maintaining all data on single password-protected computers accessible only by study approved personnel. Information collected through your participation may be used for presentations at academic conferences or for publication in academic journals.

If you have questions about this study, please contact Samantha Bennett, graduate student in the Department of Animal Sciences at 334-806-9677 or at spb0026@auburn.edu, or Dr. Donald Mulvaney, Associate Professor in the Department of Animal Sciences at 334-844-1514 or at mulvadr@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334) 844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Having read the information above, you must decide if you want to participate in this

research project. If you decide to participate, please click on the arrow below. You may create a copy of this letter to keep.

We would like to know a little about you. Please answer to the best of your abilities the following demographic questions.

What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

What is your age?

_____

Which of the following best describes your ethnicity?

- ○ Caucasian/ White (1)
- ○ Hispanic/ Latino (2)
- ○ Black/ African American (3)
- ○ Asian/ Pacific Islander (4)
- ○ Native American/ American Indian (5)
- ○ Other (6) _____

If you live in the United States, what is your zip code?

_____

What is the highest degree or level of schooling that you have completed?

- ○ Some high school, no diploma (1)
- ○ High school graduate, diploma, or the equivalent (GED) (2)
- ○ Some college credit, no degree (3)
- ○ Trade/technical/vocational training (4)
- ○ Associate degree (5)
- ○ Professional degree (6)
- ○ Bachelor's degree (7)
- ○ Master's degree (8)
- ○ Doctorate (9)

Do you currently, or have you previously, worked for the U.S. Cooperative Extension System (CES)?

- ○ Yes, I currently work for CES. (1)
- ○ Yes, I have previously worked for CES. (2)
- ○ No, I have never worked for CES. (3)

Skip To: End of Survey If Do you currently, or have you previously, worked for the U.S. Cooperative Extension System (CES)? = No, I have never worked for CES.

Which of the following best describes your position with CES?

- ○ Extension Specialist (1)
- ○ Assistant/ Associate Professor (2)
- ○ Assistant Director (3)
- ○ Regional Extension Agent (4)
- ○ County Extension Coordinator (5)
- ○ County Extension Agent (6)
- ○ Agent Assistant (7)
- ○ Administrative Assistant/ Associate (8)
- ○ Administration/ Business Office (9)
- ○ Other (please specify below) (10)

_____

Which of the following best describe your area of work within CES? Select all that apply.

- ☐ 4-H/ Youth Development (1)
- ☐ Agriculture, Forestry, and Natural Resources (2)
- ☐ Human Sciences (3)
- ☐ County Office Operations (6)
- ☐ CES Administration/ Business Offices (4)
- ☐ Other (please specify below) (5)

_____

Display This Question:

If Which of the following best describe your area of work within CES? Select all that apply. = Agriculture, Forestry, and Natural Resources

Which program area do you currently serve in Agriculture and Natural Resources? Select all that apply.

- ☐ Agronomic crops (1)
- ☐ Animal Sciences and Forages (2)
- ☐ Poultry Science (3)
- ☐ Aquatic Resources (4)
- ☐ Commercial Horticulture (5)
- ☐ Farm and Agribusiness Management (6)
- ☐ Food Safety and Quality (7)
- ☐ Forestry, Wildlife, and Natural Resources (8)
- ☐ Home Grounds, Gardens, and Home Pests (9)
- ☐ Other (please specify below) (10)

_____

In your Extension work, which of the following tools do you use the most often? Please rank the following in terms of 1 - being the used the most and 9 - being used the least.

- ☐ _____ In-person meetings (1)
- ☐ _____ Live virtual meeting (i.e. Zoom, Microsoft Teams, etc) (2)
- ☐ _____ Blog posts (3)
- ☐ _____ Publications (4)

☐ _____ Podcasts (5)

☐ _____ One-on-one, in-person interactions (6)

☐ _____ Webinars (i.e. YouTube, recorded Zoom meetings, etc) (7)

☐ _____ Personal communication (i.e. phone calls, text messaging, and emails) (8)

☐ _____ Other (please specify) (9)

Which of the following Extension tools do you believe stakeholders currently benefit from the most? Please rank the following in terms of 1 - being the most beneficial for stakeholders and 9 - being used the least.

☐ _____ In-person meetings (1)

☐ _____ Live virtual meetings (i.e. Zoom, Microsoft Teams, etc) (2)

☐ _____ Blog posts (3)

☐ _____ Publications (4)

☐ _____ Podcasts (5)

☐ _____ One-on-one, in-person interactions (6)

☐ _____ Webinars (i.e. YouTube, recorded Zoom meetings, Facebook video, etc) (7)

☐ _____ Personal communication (i.e. phone calls, text messaging, and emails) (8)

☐ _____ Other (please specify) (9)

Do you currently listen to podcasts?

○ No (1)

○ Yes (2)

○

Display This Question:

If Do you currently listen to podcasts? = Yes

If so, which genre(s) of podcasts do you listen to?

- ☐ Comedy (1)
- ☐ News and Politics (2)
- ☐ True Crime (3)
- ☐ Sport (4)
- ☐ Health/ Fitness (5)
- ☐ Religion/ Faith (6)
- ☐ Politics (7)
- ☐ Self-Help/ Productivity (8)
- ☐ Society and Culture (9)
- ☐ Education (10)
- ☐ TV and Film (11)
- ☐ Other (please specify below) (12)

_____

Have you participated in the creation or production of a podcast as a guest before?

- ○ No (1)
- ○ Yes (2)

Display This Question:

If Have you participated in the creation or production of a podcast as a guest before? = Yes

If so, what was your experience like? Please describe what you liked and disliked about your experience participating in a podcast.

_____

_____

Display This Question:

If Have you participated in the creation or production of a podcast as a guest before? = Yes

Based on your experience as a previous podcast guest, please read the statements below and indicate the level of which you agree or disagree with the following.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely are you to serve as a guest on another podcast if asked? (1)	○	○	○	○	○
How likely are you to reach out to a podcast and ask to serve as a guest? (2)	○	○	○	○	○
How likely do you believe it is that because you served as a guest on a podcast a new stakeholder was connected to/ learned about CES? (3)	○	○	○	○	○

Have you considered creating a podcast for CES?

- ○ No (1)
- ○ Maybe (2)
- ○ Yes (3)
- ○ I have already created a podcast or am in the process of creating one. (4)

Display This Question:

If Have you considered creating a podcast for CES? = I have already created a podcast or am in the process of creating one.

Because you indicated that you have already created a CES podcast or are planning to in the future, please specify the podcast's name and content focus area.

_____

_____

Display This Question:

If Have you considered creating a podcast for CES? = I have already created a podcast or am in the process of creating one.

Since you already have created an Extension podcast or in the process of creating one, please describe what the process has been like so far below.

What are some of the challenges you have faced in creating the podcast? What aspects have you enjoyed about the process? Do you believe that CES stakeholders are finding value in the podcast, why or why not? How have you assessed your stakeholders use?

_____

_____

Display This Question:

If Have you considered creating a podcast for CES? = No

Or Have you considered creating a podcast for CES? = Maybe

Or Have you considered creating a podcast for CES? = Yes

Which of the following are reasons why you would not create a podcast for CES? Select all that apply.

- ☐ I have no interest in utilizing podcasts as an Extension tool. (1)
- ☐ I think that podcasts as an Extension tool are too much work. (2)
- ☐ I am intimidated by the idea of creating a podcast. (3)
- ☐ I do not believe that I have the means necessary to create a meaningful CES podcast. (4)
- ☐ I do not believe that podcasts can serve as an effective CES tool. (8)
- ☐ I do no think that CES stakeholders would listen to a podcast. (9)
- ☐ I do not think that there is a need for CES produced podcasts. (5)
- ☐ I do not have the time to create an Extension podcast on top of all of my other current responsibilities. (7)
- ☐ Other (6) _____

Please read the statements below and indicate the level of which you agree or disagree with the following.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Podcasting can be utilized as an effective Extension tool. (1)	○	○	○	○	○
Podcasting as an CES tool offers stakeholders a unique learning opportunity. (2)	○	○	○	○	○
Podcasting as an CES tool is too much work. (3)	○	○	○	○	○
Podcasting as an CES tool will go unused by stakeholders. (4)	○	○	○	○	○

Display This Question:

If Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool is too much work. [Strongly agree]

Or Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool is too much work. [Somewhat agree]

Or Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool is too much work. [Neither agree nor disagree]

Or Which of the following are reasons why you would not create a podcast for CES? Select all that ap... = I think that podcasts as an Extension tool are too much work.

Why do you believe that podcasting as an CES tool is too much work?

_____

_____

Display This Question:

If Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool will go unused by stakeholders. [Strongly agree]

Or Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool will go unused by stakeholders. [Somewhat agree]

Or Please read the statements below and indicate the level of which you agree or disagree with the f... = Podcasting as an CES tool will go unused by stakeholders. [Neither agree nor disagree]

Why do you believe that an CES podcast would go unused by stakeholders?

_____

_____

Appendix 2. ***"Podcasting As an Extension Tool" CES Stakeholder Survey Material***

Information Letter for a Research Study Entitled "Podcasting as an Extension Tool "

If you are 18 years old or older and currently use, or have previously used, Cooperative Extension System (CES) programming, you are invited to participate in a research survey exploring CES stakeholders' perceptions regarding the current use of podcasting as an Extension tool. The study is being conducted by Samantha Bennett, graduate student in the Department of Animal Sciences which is housed within the College of Agriculture at Auburn University.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to complete an electronic survey consisting of questions regarding your perceptions towards and current use of Extension podcasts. Your total time commitment will be approximately 15 minutes.

Are there any risks or discomforts? This is a completely voluntary, anonymous study which can be exited at any time. There are no anticipated risks or discomfort associated with taking this survey. The subject matter you as participant will be questioned on should not cause any strong physical or emotional responses. At any time during the duration of the survey you may choose to stop completing the survey or may choose to skip any questions that you may find uncomfortable to answer.

Are there any costs? If you decide to participate, there are no costs to you other than the estimated 15 minutes required to complete the survey.

Will you receive compensation for participating? There will be no form of compensation for participating in this research survey. Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by maintaining all data on single password-protected computers accessible only by study approved personnel. Information collected through your participation may be used for presentations at academic conferences or for publication in academic journals.

If you have questions about this study, please contact Samantha Bennett, graduate student in the Department of Animal Sciences at 334-806-9677 or at spb0026@auburn.edu, or Dr. Donald Mulvaney, Associate Professor in the Department of Animal Sciences at 334-844-1514 or at mulvadr@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334) 844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Having read the information above, you must decide if you want to participate in this research project. If you decide to participate, please click on the arrow below. You may create a copy of this letter to keep.

We would like to know a little about you. Please answer to the best of your abilities the following demographic questions.

What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

What is your age?

_____

Which of the following best describes your ethnicity?

- ○ Caucasian / White (1)
- ○ Hispanic / Latino (2)
- ○ Black / African American (3)
- ○ Asian / Pacific Islander (4)
- ○ Native American / American Indian (5)
- ○ Prefer not to say (7)

If you live in the United States, what is your zip code?

_____

What is the highest degree or level of schooling that you have completed?

- ○ Some high school, no diploma (1)
- ○ High school graduate, diploma, or the equivalent (GED) (2)
- ○ Some college credit, no degree (3)
- ○ Trade / technical / vocational training (4)
- ○ Associate degree (5)
- ○ Professional degree (6)
- ○ Bachelor's degree (7)
- ○ Master's degree (8)
- ○ Doctorate (9)

Do you currently, or have you previously, utilized Extension learning tools?

- ○ Yes, I currently utilize Extension programs. (1)
- ○ Yes, I have previously used Extension programs. (2)
- ○ No, I have never used Extension programs. (3)

Skip To: End of Survey If Do you currently, or have you previously, utilized Extension learning tools? = No, I have never used Extension programs.

Which of the following university Extension programs have you used? Please select all that apply.

- [ ] Alabama Cooperative Extension (1)
- [ ] University of Alaska Fairbanks Cooperative Extension (2)
- [ ] University of Arizona Cooperative Extension (3)
- [ ] University of Arkansas Cooperative Extension (4)
- [ ] University of California System Cooperative Extension (5)
- [ ] Colorado State University Extension (6)
- [ ] University of Connecticut Extension (7)
- [ ] Delaware State University Cooperative Extension (8)
- [ ] University of Delaware Cooperative Extension (9)
- [ ] Florida A&M University Cooperative Extension (12)
- [ ] University of Florida Extension (13)
- [ ] Fort Valley State University Outreach/Extension (14)
- [ ] University of Georgia Extension (15)
- [ ] University of Hawaii Cooperative Extension (16)
- [ ] University of Idaho Extension (17)
- [ ] University of Illinois Extension (18)
- [ ] Purdue University Extension (19)

- [ ] Iowa State University Extension and Outreach (20)
- [ ] Kansas State University Research and Extension (21)
- [ ] Kentucky State University Cooperative Extension (22)
- [ ] University of Kentucky Cooperative Extension Service (23)
- [ ] Louisiana State University Extension (24)
- [ ] University of Maine Cooperative Extension (25)
- [ ] University of the District of Columbia Cooperative Extension (66)
- [ ] University of Maryland Extension (26)
- [ ] University of Massachusetts Extension (27)
- [ ] Michigan State University Extension (28)
- [ ] University of Minnesota Extension (29)
- [ ] Alcorn State University Extension Program (30)
- [ ] Mississippi State University Extension Service (31)
- [ ] Lincoln University Cooperative Extension (32)
- [ ] University of Missouri Extension (33)
- [ ] Montana State University Extension (34)
- [ ] University of Nebraska Extension (35)
- [ ] University of Nevada Cooperative Extension (36)

- [ ] University of New Hampshire Cooperative Extension (37)
- [ ] Rutgers New Jersey Cooperative Extension (38)
- [ ] New Mexico State University Extension (39)
- [ ] Cornell University Cooperative Extension (40)
- [ ] North Carolina Cooperative Extension (41)
- [ ] North Dakota State University Extension Service (42)
- [ ] Ohio State University Extension (43)
- [ ] Langston University Research and Extension (44)
- [ ] Oklahoma Cooperative Extension Service (45)
- [ ] Oregon State University Extension Service (46)
- [ ] Pennsylvania State University Extension (47)
- [ ] University of Rhode Island Cooperative Extension (48)
- [ ] Clemson University Cooperative Extension (49)
- [ ] South Carolina State University Extension (50)
- [ ] South Dakota State University Extension (51)
- [ ] Tennessee State University Cooperative Extension (52)
- [ ] University of Tennessee Extension (53)
- [ ] Prairie View A&M University Cooperative Extension Program (54)

- [ ] Texas A&M AgriLife Extension (55)
- [ ] Utah State University Extension (56)
- [ ] University of Vermont Extension (57)
- [ ] Virginia Cooperative Extension (58)
- [ ] Washington State University Extension (59)
- [ ] West Virginia University Extension Service (60)
- [ ] West Virginia State University Extension Service (61)
- [ ] University of Wisconsin-Madison Cooperative Extension (62)
- [ ] University of Wyoming Extension (63)
- [ ] University of Guam Cooperative Extension Service (64)
- [ ] American Samoa Extension (65)

How many **years** have you utilized Extension programs for?

_____

Which of the following titles best describes you in relation to your use of Extension programs? Please select all that apply.

- ☐ Producer / Farmer / Rancher (1)
- ☐ Family resource (7)
- ☐ Hobbyist (2)
- ☐ University student (3)
- ☐ Youth programs coordinator (4)
- ☐ Community programs coordinator (5)
- ☐ Other (please specify) (6) _____

Display This Question:

If Which of the following titles best describes you in relation to your use of Extension programs? P... = Hobbyist

Because you indicated that you use Extension programs as a hobbyist, would you say that the COVID-19 Pandemic inspired and/or increased your use of Extension programming?

- ○ Yes (1)
- ○ No (2)

Which of the following Extension tools do you believe that currently use the most? Please rank the following in terms of 1- being the most used and 9 - being the least used.

_____ In-person meetings (1)
_____ Live virtual meetings (i.e. Zoom, Microsoft Team, etc) (2)
_____ Blog posts (3)
_____ Publications (4)
_____ Podcasts (5)
_____ One-on-on, in-person interactions (6)
_____ Webinars (i.e. Youtube, recorded Zoom meetings, Facebook video, etc) (7)
_____ Personal communication (i.e. phone calls, text messaging, and emails) (8)
_____ Other (please specify) (9)

Do you currently listen to podcasts?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Do you currently listen to podcasts? = Yes

If so which genres of podcasts do you listen to? Please select all that apply.

- [ ] Comedy (1)
- [ ] News and Politics (2)
- [ ] Education (10)
- [ ] True Crime (3)
- [ ] Sport (4)
- [ ] Health / Fitness (6)
- [ ] Religion / Faith (7)
- [ ] Self-Help / Productivity (8)
- [ ] Society and Culture (9)
- [ ] TV and Film (11)
- [ ] Other (please specify) (12) _____

Display This Question:

If Do you currently listen to podcasts? = Yes

Do you currently listen to any Extension podcasts?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Do you currently listen to any Extension podcasts? = Yes

Because you indicated that you currently listen to at least one Extension podcast, please list below which Extension podcast(s) you currently listen to.

_____

_____

Display This Question:

If Do you currently listen to any Extension podcasts? = No

Because you indicated that you currently do not listen to at least one Extension podcast, which of the following are reasons why you do not listen to Extension podcasts?

- ○ I was unaware that Extension podcasts existed. (1)
- ○ I am uninterested in listening to Extension podcasts. (2)
- ○ I am not sure how to listen to a podcast. (3)
- ○ I do not have the time to listen to an Extension podcast. (4)
- ○ Other (please specify) (5) _____

Display This Question:

If Do you currently listen to any Extension podcasts? = Yes

Because you indicated that you listen to at least one Extension podcast, which of the following are reasons why you might choose to listen to an Extension podcast? Please select all that apply.

- ☐ Extension programs are a trustworthy source of information. (1)
- ☐ Podcasts are an easily accessible way for me to learn from Extension programs. (2)
- ☐ I just enjoy listening to Extension podcasts (entertaining). (3)
- ☐ I multitask while listening to and learning from Extension podcasts. (4)
- ☐ I consider myself an auditory learner and Extension podcasts allow for me to easily learn Extension information. (5)
- ☐ Extension podcasts allow for me to learn timely information in an easy way. (6)
- ☐ Other (please specify) (7) _____

Display This Question:

If Do you currently listen to any Extension podcasts? = Yes

Because you indicated that you listen to at least one Extension podcast, in a sentence or two please explain what you enjoy about the Extension podcast(s) that you listen to.

_____

_____

Display This Question:

If Do you currently listen to any Extension podcasts? = Yes

Because you indicated that you listen to at least one Extension podcast, in a sentence or two please explain what changes you would suggest (if any) about the Extension podcast(s) that you listen to.

_____

Appendix 3. ***"Measuring Agricultural Means of Influence on Young Adults on Instagram in the United States" Survey Material***

Information Letter for a Research Study Entitled "Measuring Agricultural Means of Influence on Young Adults on Instagram in the United States"
You are invited to participate in a research study to provide insight into the ability of agricultural social media influencers to impact the perceptions of those not affiliated with agriculture through Instagram. The study is being conducted by Dr. Donald Mulvaney, Associate Professor in the Department of Animal Sciences which is housed within the College of Agriculture. You are invited to participated because you are 19-25 years old and live within the United States.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to complete an electronic pre-survey, look through curated content pulled from Instagram, and complete a post-survey. Your total time commitment will be approximately 15 minutes.

Are there any risks or discomforts? This is a completely voluntary, anonymous study which can be exited at any time. There are no risks or discomfort associated with taking this survey and the subject matter you as a participant will be questioned on should not cause any strong physical or emotional responses. At any time during the duration of the survey you may choose to stop completing the survey or may choose to skip any questions that you may find uncomfortable to answer.

Are there any costs? If you decide to participate, there are no costs to you other than the estimated 15 minutes required to complete the survey.

Will you receive compensation for participating? To thank you for your time, you will be monetarily reimbursed by the company Cint, through which you are being contacted to complete this survey.

If you change your mind about participating, you can withdraw at any time by closing your window browser. Once you've submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Animal Sciences.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by maintaining all data on single password-protected computers accessible only by study approved personnel. Information collected through your participation may be used for presentations at academic conferences or for publication in academic journals.

If you have questions about this study, please contact Dr. Donald Mulvaney, Associate

Professor in the Department of Animal Sciences at 334-844-1514 or at mulvadr@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334) 844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Having read the information above, you must decide if you want to participate in this research project. If you decide to participate, please click on the arrow below. You may create a copy of this letter to keep.

We would like to know a little about you. Please answer to the best of your abilities the following demographic questions.

What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

What is your age?

_____

Which of the following best describe your ethnicity?

- ○ Caucasian/ White (1)
- ○ Hispanic/ Latino (2)
- ○ Black/ African American (3)
- ○ Asian/ Pacific Islander (4)
- ○ Native American/ American Indian (5)
- ○ Other (6) _____

If you live within the United States, please indicate your zip code.

_____

Which of the following best describes your dietary habits?

- ○ Omnivore (I consume plant, animal, and dairy products) (1)
- ○ Vegetarian (I consume plant and dairy products) (2)
- ○ Vegan (I consume only plant products) (3)
- ○ Pescatarian (I consume a mostly plant based diet, but do consume some animal and dairy products) (4)
- ○ Other (please specify) (5) _____

Which of the following social networking websites are you a user of? Please select all that apply.

- [ ] Facebook (1)
- [ ] LinkedIn (2)
- [ ] Twitter (3)
- [ ] Instagram (4)
- [ ] YouTube (5)
- [ ] Pinterest (6)
- [ ] Tumblr (7)
- [ ] Other (please specify) (8) _____

Do you follow any so-called social media "influencers"?

- ○ More than I can think (1)
- ○ More than 50 (2)
- ○ More than 25 (3)
- ○ More than 15 (4)
- ○ More than 5 (5)
- ○ Less than 5 (6)
- ○ None (7)

In what ways are you connected to agriculture?

- ☐ I study agricultural topics in school. (1)
- ☐ I have a degree related to agricultural topics. (2)
- ☐ I work in agriculture. (3)
- ☐ I have no connection to agriculture. (4)
- ☐ Other (please specify) (5) _____

Display This Question:

If Do you follow any so-called social media "influencers"? = More than I can think
Or Do you follow any so-called social media "influencers"? = More than 50
Or Do you follow any so-called social media "influencers"? = More than 25
Or Do you follow any so-called social media "influencers"? = More than 15
Or Do you follow any so-called social media "influencers"? = More than 5
Or Do you follow any so-called social media "influencers"? = Less than 5

Do you currently follow any social media "influencers" that are related to agriculture?

- ○ Yes, I do currently follow social media influencer(s) related to agriculture. (2)
- ○ I do not currently follow any social media influencers related to agriculture. (1)

Display This Question:

If Do you currently follow any social media "influencers" that are related to agriculture? = Yes, I do currently follow social media influencer(s) related to agriculture.

Since you do currently follow social media influencer(s) related to agriculture, please specify which influencer(s) you follow and on what social media platform(s).

_____

_____

Please read the following statements below and indicate if you disagree or agree with the statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I trust most of the information I get from social media influencers. (1)	○	○	○	○	○
I have been influenced by a social media influencer. (2)	○	○	○	○	○
I have purchased products recommended by a social media influencer. (3)	○	○	○	○	○
I have changed my opinion towards an issue because of the perspective offered by a social media influencer. (4)	○	○	○	○	○

Please read the following and indicate how unlikely or likely you regard the statement.

	Extremely unlikely (1)	Unlikely (2)	Neither likely nor unlikely (3)	Likely (4)	Extremely likely (5)
I am likely to **engage with general content** shared on Instagram **through likes**. (1)	○	○	○	○	○
I am likely to **engage with general conten**t shared on Instagram **through comments**. (2)	○	○	○	○	○
I am likely to **engage with general content** shared on Instagram **through sharing either on my Instagram story or private messages**. (3)	○	○	○	○	○
I am likely to **engage with general content** shared on Instagram **through saving posts**. (4)	○	○	○	○	○

Please read the following and indicate if you disagree or agree with the statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I have mostly positive opinions regarding **agriculture in general.** (1)	○	○	○	○	○
I have mostly positive opinions regarding **animal agriculture.** (2)	○	○	○	○	○
I have mostly positive opinions regarding **plant-based agriculture.** (3)	○	○	○	○	○
I am interested in **agriculture in general.** (4)	○	○	○	○	○
I am interested in **animal agriculture.** (5)	○	○	○	○	○
I am interested in **plant-based agriculture.** (6)	○	○	○	○	○
I have a desire to learn more about how food is produced. (7)	○	○	○	○	○
I have a desire to understand agricultural sciences. (8)	○	○	○	○	○

Please read the following and indicate if you disagree or agree with the statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I would follow a social media influencer that uses their platform to talk about agriculture. (1)	○	○	○	○	○
I would trust what an influencer says on Instagram about agriculture. (2)	○	○	○	○	○
I would enjoy learning from an influencer on Instagram that is connected to agriculture. (3)	○	○	○	○	○
I would be more likely to believe a social media influencer talking about agriculture if they were connected to agriculture directly. (4)	○	○	○	○	○
I would be more likely to believe a social media influencer talking about agriculture if they had no connection to it. (5)	○	○	○	○	○

I could see myself being influenced by someone on social media that is connected to agriculture and shares content related to it. (6)	○	○	○	○	○
I have no desire to learn more about agriculture on Instagram. (7)	○	○	○	○	○

Please indicate your **current level of understanding** of the following agricultural related topics.

	Very poor (1)	Poor (2)	Fair (3)	Good (4)	Excellent (5)
Genetically Modified Organisms (GMOs) (1)	○	○	○	○	○
Hormone use in animal production (2)	○	○	○	○	○
Antibiotic use in animal production (3)	○	○	○	○	○
Organic farming practices (4)	○	○	○	○	○
Nutritional benefits of milk for human consumption (5)	○	○	○	○	○

Please review the following **images and corresponding captions of posts** obtained from established agricultural social media influencers on Instagram.

Taking into account the previous images obtained from established social media influencers on Instagram, please answer the following questions. Some questions may be the same/ similar to questions answered earlier, but please answer the following with the images previously shown in mind.

Please read the following and indicate how unlikely or likely you regard the statement.

	Extremely unlikely (1)	Unlikely (2)	Neither likely nor unlikely (3)	Likely (4)	Extremely likely (5)
I am likely to **engage with agriculture related content** shared on Instagram **through likes**. (1)	○	○	○	○	○
I am likely to **engage with agriculture related content** shared on Instagram **through comments**. (2)	○	○	○	○	○
I am likely to **engage with agriculture related content** shared on Instagram **through sharing either on my Instagram story or private messages**. (3)	○	○	○	○	○
I am likely to **engage with agriculture related content** shared on Instagram **through saving posts**. (4)	○	○	○	○	○

Please read the following and indicate if you disagree or agree with the statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I would follow a social media influencer that uses their platform to talk about agriculture. (1)	○	○	○	○	○
I would trust what an influencer says on Instagram about agriculture. (2)	○	○	○	○	○
I would enjoy learning from an influencer on Instagram that is connected to agriculture. (3)	○	○	○	○	○
I would be more likely to believe a social media influencer talking about agriculture if they were connected to agriculture directly. (4)	○	○	○	○	○
I would be more likely to believe a social media influencer talking about agriculture if they had no connection to it. (5)	○	○	○	○	○

I could see myself being influenced by someone on social media that is connected to agriculture and shares content related to it. (6)	○	○	○	○	○
I have no desire to learn more about agriculture on Instagram. (7)	○	○	○	○	○

Please indicate your **level of understanding** of the following agricultural related topics **after viewing the previous images** obtained from established social media influencers on Instagram.

	Very poor (1)	Poor (2)	Fair (3)	Good (4)	Excellent (5)
Genetically Modified Organisms (GMOs) (1)	○	○	○	○	○
Hormone use in animal production (2)	○	○	○	○	○
Antibiotic use in animal production (3)	○	○	○	○	○
Organic farming practices (4)	○	○	○	○	○
Nutritional benefits of milk for human consumption (5)	○	○	○	○	○

Thank you for your time spent taking this survey. Your response has been recorded.

Please use the following URL to redirect to the Prolific website as evidence of survey completion.
https://app.prolific.co/submissions/complete?cc=2B19B08B