Journal of International Agricultural and Extension Education

Volume 28 | Issue 1 Article 6

2-15-2021

Agricultural Professionals' Perceptions of COVID-19 and Occupational Health and Safety

Traci Irani
University of Florida

Beatrice Fenelon Pierre
University of Florida

Tyler S. Nesbit
University of Florida

Recommended Citation

Irani, T., Pierre, B. F., & Nesbit, T. S. (2021). Agricultural Professionals' Perceptions of COVID-19 and Occupational Health and Safety. *Journal of International Agricultural and Extension Education, 28*(1), 69-82. DOI: https://doi.org/10.5191/jiaee.2021.28106

Agricultural Professionals' Perceptions of COVID-19 and Occupational Health and Safety

Abstract

The spread of the COVID-19 pandemic has brought tremendous challenges to citizens and industries worldwide. The present study contributed to efforts underway toward developing alternatives to combat COVID-19 in the agricultural industry, including the farm and forestry sectors. The study utilized qualitative interviews to assess the perceptions of agricultural stakeholders in the Southeastern United States on the impact of the pandemic to occupational health and safety and the likelihood of implementation of safety guidelines established by the Centers for Disease Control and Prevention (CDC). Eleven individuals, purposefully selected, were interviewed. The results suggested that despite its challenging aspects, the pandemic offers an array of opportunities to the industry to revamp operations and adjust approaches. The challenges related more to the uncertainties due to the unfolding elements of the pandemic. Transportation, housing, and culture were the top three barriers identified to implementing CDC guidelines. These barriers depend on the size of the companies, the types of operations, and the amount of required labor. Agricultural stakeholders' positive behavior, the availability of incentives, and the use of innovation, including technology, were revealed to be the three main supportive factors relating to the execution of the CDC guidelines. These results could evolve as the pandemic continues to unfold. Therefore, we suggest that continuing assessments be conducted to capture shifting perceptions and attitudes as they change to reflect updated information. Further investigations about the side effects of mask-wearing on heat-related illnesses were also advised to explore in terms of guidelines for agricultural workers

Keywords

COVID-19; agriculture; health; safety; guidelines

Funding Source

This research was conducted by the Southeastern Coastal Center funded by the Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) Agricultural Health and Safety Initiative. The project is managed by the University of Florida. The contents are the responsibility of the authors and do not necessarily reflect the views of CDC nor NIOSH

doi: 10.5191/jiaee.2021.28106

Agricultural Professionals' Perceptions of COVID-19 and Occupational Health and Safety

Tracy Irani
Beatrice Fenelon Pierre
Tyler S. Nesbit
University of Florida

Abstract

The spread of the COVID-19 pandemic has brought tremendous challenges to citizens and industries worldwide. The present study contributed to efforts underway toward developing alternatives to combat COVID-19 in the agricultural industry, including the farm and forestry sectors. The study utilized qualitative interviews to assess the perceptions of agricultural stakeholders in the Southeastern United States on the impact of the pandemic to occupational health and safety and the likelihood of implementation of safety guidelines established by the Centers for Disease Control and Prevention (CDC). Eleven individuals, purposefully selected, were interviewed. The results suggested that despite its challenging aspects, the pandemic offers an array of opportunities to the industry to revamp operations and adjust approaches. The challenges related more to the uncertainties due to the unfolding elements of the pandemic. Transportation, housing, and culture were the top three barriers identified to implementing CDC guidelines. These barriers depend on the size of the companies, the types of operations, and the amount of required labor. Agricultural stakeholders' positive behavior, the availability of incentives, and the use of innovation, including technology, were revealed to be the three main supportive factors relating to the execution of the CDC guidelines. These results could evolve as the pandemic continues to unfold. Therefore, we suggest that continuing assessments be conducted to capture shifting perceptions and attitudes as they change to reflect updated information. Further investigations about the side effects of mask-wearing on heat-related illnesses were also advised to explore in terms of guidelines for agricultural workers.

Keywords: COVID-19; agriculture; health; safety; guidelines

Acknowledgement: This research was conducted by the Southeastern Coastal Center funded by the Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) Agricultural Health and Safety Initiative. The project is managed by the University of Florida. The contents are the responsibility of the authors and do not necessarily reflect the views of CDC nor NIOSH.

Introduction

Agriculture, is, by nature, a complex industry. It includes the farming, fishery, and forestry sectors. Some countries even add hunting, as well. Agriculture employs over a billion people, namely about one-third of the world's workforce (International Labor Office, 2017). At the same time, it is one of the most hazardous occupations worldwide for hired workers as well as for farm operators (Villarejo et al., 2010). The International Labor Office (ILO) reported in 2017 that up to 170,000 agricultural workers die at work each year, representing approximately half of all fatal occupational accidents. In the U.S., farming, forestry, fishery, and hunting combined account for 574 fatal work injuries, namely 23.4 fatalities per 100,000 workers as opposed to 6.62 fatalities per 100,000 workers in all industries (U.S. Bureau of Labor Statistics, 2018). The intensive use of machinery, such as tractors and harvesters, and of pesticides and other agrochemicals have raised agricultural workers' risks. Additionally, biological hazards such as the potential for allergic reaction to plants, pollen, and insect bites, particularly in the forest industry, constitute additional risks for agricultural workers.

On top of the already fragile state of occupational health and safety implementation in agriculture, the coronavirus pandemic, baptized as COVID-19 by the World Health Organization (WHO), has aggravated the situation. The impacts of the coronavirus outbreak at the time of writing in 2019 and 2020 continue to unfold, creating challenges for the public in general. Per the Centers for Disease Control and Prevention (CDC), COVID-19 is spread from person to person by respiratory droplets (2020). While there is a wide range of outcomes for those contracting the disease, people with underlying medical conditions and older individuals are at an increased risk of experiencing more severe symptoms. As of June 14, 2020, preliminary WHO statistics (2020) revealed 7.69 million confirmed cases of coronavirus, with 428,000 deaths worldwide. The United States alone registered 2.14 million confirmed cases with 117,000 deaths. Many sectors of daily public life have shut down to slow the spread of the virus. However, there are certain sectors of the economy deemed as essential in which workers continue to operate to provide basic needs, including the agricultural sector. In fact, during the week of April 12 – 18, 2020, about a month into the shutdown for many areas in the U.S., total farmworkers hired directly by farm operators were 9% greater than the same week in April 2019. This includes 38,000 workers in Florida alone, and an additional 30,000 workers in the Southeast Region (Alabama, Georgia, and South Carolina) (National Agricultural Statistics Service, 2020). The health and safety of these workers are vital for their own wellbeing and dignity, as well as that of their families and coworkers. Furthermore, the continued availability of nutritious and affordable food depends on the continued production of these agricultural workers. A national survey conducted in March 2020 by the University of Florida / IFAS Center for Public Issues Education (2020) reported that 75.6% of participants were concerned that there would be an increase in food prices due to COVID-19. Ullrich and Mueller (2020) reported that 12.3% of registered cases and 9.5% of COVID-19 deaths came from non-metropolitan areas. This means that rural areas are also affected, although to lesser degrees than urban areas. Therefore, the agricultural industry is not exempt from the impact of the pandemic.

Preliminary research on the impacts of COVID-19 covers mainly economic losses provoked by the pandemic and resources available to keep the agricultural industry moving, but nothing specific to workers and business owners' health and safety implementation during the pandemic. A study conducted in April 2020 at the outset of the pandemic with 140 farmer leaders serving on the boards of the American Soybean Association (ASA), United Soybean Board (USB), and U.S. Soybean Export Council (USSEC) addressed concerns and reactions to both employee safety and sustaining operations during the outbreak. The results suggested high levels of stress and anxiety that farmers experienced because of the pandemic. Most of the participants (82%) reported that they were practicing social distancing, washing hands, and other practices to minimize exposure, 14.6% were in the process of putting together a plan to reduce exposure to the virus, and 3% of them declared not making any changes in their operations. However, at the time of the study, 43.5% of the participants reported their operations to have been already affected by the virus, 32.9% expected to be affected soon, and 23.5% reported not affected and did not expect to be affected (American Soybean Association, 2020).

In the midst of these health and safety conditions, those existing prior to COVID-19, and those emerging in its spread, this study seeks to assess the perspective of farm owners, operators, workers, and educators on occupational health and safety, and to determine the likelihood of implementation of safety guidelines as established by the CDC. These two research questions provide the framework for our analysis: 1) How do farm and forestry stakeholders located in the Southeastern United States perceive the pandemic from an occupational health and safety standpoint? and 2) To what extent are the CDC COVID-19 guidelines implementable or likely to be implemented by farmers and foresters?

Methods

To examine the research questions, we used the qualitative semi-structured approach, which allowed us to flesh out and dig more into the responses provided by the participants. Bernard (2013) advanced that "If you are trying to understand a behavioral process, then focus on qualitative data" (p. 604). We used both purposive and snowball sampling methods to select the participants (N = 11), which provided the focus and depth needed to explore the research questions. However, from the outset, we established one inclusion criterion that was in line with the purpose of the study. We required that all participants be involved in the agricultural industry and located in one of the six Southeastern coastal states of the United States, as these are the states covered by the grant funding the study.

We secured approval from the University of Florida Institutional Review Board for both the pre-testing and the final phases of the interview protocol. We assigned only one member of the team to conduct the interviews to avoid bias that could be due to voice tones, types of probes, etc. The data collection process lasted about one month, namely, August 2020. We interviewed a total of 11 people. Patton (2002) suggested that more in-depth information could be obtained with a smaller sample than the broad findings of larger samples. To start, we purposefully selected five participants from the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS)’s board member list. Using the snowball technique, the participants recommended six other people they deemed eligible, considering the inclusion criteria. Overall, the participants included extension agents, farmworker's

advocates, a forestry association's representative, a fruit and vegetable association's representative, a worker safety program's representative, growers, and farm labor contractors. The bulk of them were over 50 years of age and had a minimum of four years of college. Seven represented the farm industry, and the remaining four were from the forestry sector. The breadth of knowledge of the participants allowed fruitful conversations that, combined, led to a broad understanding of the virus' impacts on the agricultural industry from a health and safety standpoint, and the barriers to implementing the CDC COVID-19 guidelines.

We used the semi-structured approach, interviewing each participant separately, except for one case where we interviewed two participants together. With the semi-structured interviews, we could use open-ended questions in an order that worked best for the interviewees (Bernard, 2013). It also allowed us to probe as needed and ensure consistency in terms of inquiries investigated across the interviews (Patton 2002). The interview protocol contained eight questions divided into three sections (see Appendix 1 for the instrument). The first section, with two items, addressed farmers and foresters' working environment. The second segment, with five questions, covered the barriers and the enablers to implementing COVID-19 guidelines, and the final section asked for suggestions of anything that the participants thought was worth addressing based on the research questions.

With the participants' verbal consent, we conducted the interviews via Zoom, an online video conferencing platform. Thanks to some built-in features in Zoom, we both recorded and transcribed all the interviews. The latter took the form of guided conversations. They lasted between 45 minutes and one-and-a-half hours. The interview times were based on the availability of the interviewees. Therefore, many of the interviews happened at night when the participants felt more relaxed to talk.

The absence of a universally accepted analytic routine renders qualitative research highly vulnerable to critique related to selectivity bias (Yin, 2016). Therefore, the team ensured from the outset a sound data management system, which followed the five analytical stages recommended by Yin (2016). Overall, we analyzed the data using the constant comparative method (Glaser & Strauss, 1967; Strauss & Corbin, 1990). First, the interviewer revised each interview's transcript generated by Zoom while watching the recordings to ensure fidelity in the verbatim transcriptions. The latter was consolidated into one table to form the dataset, which was shared with all the other members for initial coding. It is recommended to have more than one person be involved in qualitative data analyses to increase internal validity (Patton, 2002; Bernard & Ryan, 2006; Richards, 2005) and to cast a wider analytic net and provide a "crowd-sourcing reality check" for each other (Harding, 2019). Second, we conducted parallel coding guided by the research questions. The process required multiple readings of the dataset and constant comparison among data. That facilitated the exploration for patterns and the rationale for such patterns. We used color coding, where codes contributing to the same idea were assigned the same color. The coders met to compare and discuss their initial codes and to agree on adopted codes. Third, we regrouped similar codes into themes or categories (Bernard & Ryan, 2006; Miles et al., 2014). Fourth, we revised and refined the categories. Fifth, we defined and named the themes. Thus, for the first research question, we had two themes: challenges and opportunities, and for the second

research question, we identified three themes: barriers, enablers, and incentives. Finally, we analyzed the themes, and the results are presented in the findings section below. It is worth noting that we used Microsoft Word and Excel for the coding because we found it ample for such a limited dataset.

Trustworthiness enhances the credibility of findings (Lincoln & Cuba, 1985). We sought internal validity through peer debriefing. As mentioned earlier, we started with a parallel inter-team coding schema before we sat down to compare our codes and came up with agreed-upon primary codes. We sought feedback throughout the stages of the process by consulting the team leader. We created an audit trail using Microsoft Excel and group emails.

Findings

Findings are presented below per research question. Overall, the participants acknowledged that occupational health and safety in agriculture remains a big concern, particularly aggravated by the COVID-19 outbreak. Participants were unanimous in recognizing that while there is a long way to go, there have been improvements in occupational health and safety in the industry. Had it not been for such improvements, the pandemic might have impacted the industry more. For example, new generations of producers and growers that have been taking over the industry are more educated, most of them with college degrees. The findings suggested that they are more conscious of the necessity for health and safety. Also, there has been an increase in the number of companies that hired health and safety officers as opposed to 5 – 10 years before this study. So, the industry has been taking health and safety more seriously. One participant said:

> Many of the people that are working now, they are the sons of that old farmer no longer in charge of the operations. But at least it's more on the side of this new generation that is undertaking the operation, and he's more into the safety and this kind of thing.

Considering these findings as the broader context of occupational health and safety trends in agriculture, we now present the findings specifically pertaining to our two guiding research questions.

RQ1: How do Farm and Forestry Business Owners Perceive the Pandemic from an Occupational Health and Safety Standpoint?

Certain participants describe the pandemic as challenging for the agricultural industry in general. However, others think that the requirements developed to face it is in the realm of things possible, particularly with farmers who are used to the Food Security Modernization Act (FSMA) and Good Agricultural Practices (GAP). That means, for the latter, the safety precautions will be a continuation of what they are already doing. Pertaining to this question, two overarching themes emerged from the participants' discussion: challenges and opportunities.

Challenges

One somewhat obvious finding that emerged from the data is that agriculture business owners perceive the emergence of the COVID-19 pandemic as a challenge from the standpoint of occupational health and safety. This finding is not surprising, and yet there are some interesting considerations that arise from examining these statements. For example, the labor-intensive nature of agricultural work precludes the strategies that other industries may employ, such as working remotely.

While many participants described specific challenges, discussed below, some also expressed a broad perception of the pandemic as a challenge more generally:

> It became very clear that if we, as farmers, are going to continue to supply food to the country there is a limited amount we can do. We can't work remotely. Our pickers can't work from home... there are [a] limited amount of things that we can do and continue to produce food.

One particular aspect of the challenge is the ongoing nature of the pandemic. This gives rise to uncertainty with respect to health and safety priorities and best practices as mandates, guidelines, and attitudes continue to evolve. Further, many agriculture professionals do not have a clear sense of how markets, both domestic and global, will respond and what types of support they may expect to receive moving forward:

> They are having a very difficult time trying to figure out what the right business decision is going forward. They have for years had knowledge of needing to produce this much lettuce or other. What's that contract going to be next year, what is it going to be next year. We don't know! We don't know where this COVID is going to be. We don't know where the restaurant will be, school lunch programs, you know, what is it going to be, you know. The business decisions are very difficult decisions to make right now because you're trying to project into the unknown.

There are three types of needed assistance identified – coverage of lost produce, health and safety equipment coverage, and paycheck protection. These forms of assistance are needed to maintain economic viability for farm owners.

Participants indicated that for many operations, there are very thin profit margins to begin with, and therefore the combination of lost revenues and increased expenses for safety equipment that was called for in the CDC guidelines impacted overall profitability. These include the direct costs of safety equipment. One participant observed:

> You're talking about $1 a mask, you're talking about a packet that get 30 masks, 20 masks for $29.99. … This is expensive. That is the paper type, you know, blue, green, whatever. That doesn't last too much. And that's another thing that people don't realize.

Decreased efficiency and productivity due to social distancing practices, for example, is another impact on profitability, expressed here by another participant, "We're working as hard as we've ever worked, … but our production is down, probably around 60%. … We're doing … all we can do, but the safety precautions and measures are just causing a decrease in production." Finally, the revenue lost to decreased demand from traditional purchasers like restaurants and schools challenges the overall profitability of agriculture operations during this pandemic:

> We've seen a huge impact from a business standpoint. [Our farmers have] lost millions of dollars this year because of the food service industry shutting down. That's the restaurants and hotel and so on. We lost a significant amount of business. … I suspect we'll see some places, certainly not planting as much as they once did just to try to make sure they're not losing part of what they plant.

Another element of the overall productivity loss is the availability of labor. Because a large proportion of farmworkers immigrate

from other countries and move to follow the production and harvesting seasons within the U.S., there is a question of a sufficient labor supply to maintain production levels.

Aside from the uncertainty and economic hurdles posed by the COVID-19 pandemic, farm owners also perceive that workers may not take the necessary precautions to follow safety guidelines. For instance, they may not wear masks as required, may not change them frequently, or mishandle them. There is a concern as well that workers do not follow proper social distancing guidelines after hours and off the farm, which is outside the purview of supervisors and farm owners. Finally, some workers may disregard safety guidelines while working in order to maximize output and wages, and even seek to evade proper quarantine standards when exposed to COVID-19 in order to continue working and earning an income, thereby putting others at risk:

> The thing is, many people actually get ... the virus ... but realize … they never expressed the symptoms and that's another thing that we have to fight and letting people know. ... People pay for a negative test so they can present it to the farmer or whoever and they have no issues because they want to keep working, even though they know maybe they are... I hear all kind of story because people don't want to be off two weeks.

Another challenge to health and safety is a dismissive attitude of some farm owners themselves, as captured by participants' comments indicating that some farm owners initially reacted to the pandemic with skepticism, that they would prefer to follow traditional family practices, that worker health and safety is the workers' and labor contractors' responsibility, and even that worker health is not a priority, or put more bluntly, that workers are expendable.

With respect to occupational health and safety, these are some of the challenges perceived by farm owners related to the COVID-19 pandemic, namely the uncertainty of an unprecedented situation, lack of clarity of needed assistance programs, overall profitability, worker availability and reliability in following safety guidelines, and in some cases, an abdication of responsibility for worker health.

Opportunities

While some people attributed COVID-19 to politics, the agricultural industry, overall, took it seriously and admitted that it would not go away soon. Therefore, agricultural companies, as the entire business world, would need to adjust to the new paradigm shift because businesses would not be able to operate as before. The pandemic offered unprecedented opportunities to do business differently and more efficiently. According to participants, taking care of workers and protecting them was a guaranteed investment for the companies and an asset for the whole country. Therefore, they anticipated short, mid, and long-term changes expressed as opportunities for a new agricultural business model. First, some companies, to improve their labor force, might start implementing H2A programs and those who already had such a program in place might improve it. One participant declared:

> There was a … shortage of these workers in the United States, so … I think, what has happened with COVID-19 has just exposed more to the reality that some of these [agriculture] companies highly depend on these foreign workers to carry on their business. That leads to many companies to really either

> improve their H2A program or to start implementing an H2A program in their farm. So, I would say that growers now, they're going to expand or they're going to keep, maintain their production level.

Second, they might, in the long run, try to move many operations from the mechanical to the industrial phase, which would eventually reduce the workforce. Third, big companies might end up using technology for distance learning, marketing, and sales. One participant revealed that "Virtual meetings may become a staple." Fourth, business owners might become more alert to the sanitation part of their program operations even after the pandemic is over and include additional training on their priority list. Fifth, business owners might change their harvesting scheme by adopting specific workers' dispatching layouts conducive to social distancing. They might also modify their processes. Sixth, companies might do more to protect and educate their labor force. Finally, with the pandemic, we might observe a new reengineering of the agricultural sector, particularly with modern design tools and equipment.

RQ2: To What Extent are the CDC COVID-19 Guidelines Implementable or Likely to be Implemented by Farmers and Foresters?

Agriculture is fundamentally an outdoor activity and requires physical presence. Therefore, people involved in agriculture do not have the luxury to work remotely during the pandemic as other industries do. According to participants, farmworkers, for the most part, come from diverse cultures and backgrounds and are nomadic because their job depends on harvesting seasons and moving from one place to another. Additionally, on the farming side, some farmers are GAP certified and follow the FSMA guidelines and others don't. Both GAP and FSMA provide sanitation training that could contribute to the implementation of the CDC COVID-19 guidelines. Analyzing all these different factors from the participants' responses, we came up with two themes and sub-themes to explain the likelihood for the CDC COVID-19 guidelines to be implemented. The first theme, barriers, contains two sub-themes: culture and cost factors. The second theme is enablers and includes three sub-themes: innovation, behavior, and incentives. They are all developed below.

Barriers

Although participants generally expressed that following the CDC guidelines was achievable, certain barriers did emerge. These barriers seemed to be determined by the size of the businesses, the type of operations, and the amount of required labor. That means the bigger a company, the stronger it was financially, the more capable it was to implement the CDC COVID-19 guidelines. Also, the less labor-intensive the business was, the fewer challenges. However, besides these common determinants, there existed some general crosscutting barriers, which related to culture and cost factors generated by the implementation of the guidelines. These costs fall on both the farm owners and the workers, as indicated below.

Culture. Culture included education, attitudes, beliefs, and stigmas that prevent a full embrace of safety guidelines. Culture had often been identified as an impediment to broader occupational health and safety besides COVID-19. The study revealed that some cultural issues impacted the CDC COVID-19 guidelines' implementation. For example, there is a cultural stigma that men must not show any form of so-called weakness, including taking a day off due to

illness or wearing a mask as a safety precaution. So, according to the participants, wearing a mask might symbolize weakness. Therefore, male workers seemed reluctant not only to wear a mask but also even to admit that they were sick. Additionally, the lack of workers' education about wearing masks and their irresponsibility made it difficult for them to comply with the guidelines. For example, participants observed that in the field, workers did not handle the masks well nor changed them as necessary. Also, off farms, which seemed the most critical for the spread of the disease, workers did not seem to take enough precautions. A participant added that "It's difficult to get them [workers] to wear masks and part of that was due to cultural differences and reliance on workers to follow and implement guidelines on and off-site." Further, some people were not totally convinced about the importance of certain guidelines such as wearing masks for outdoor activities and having to wash hands that would get dirty again continually. Others thought because they were by themselves in their truck, they did not need to wear a mask, and that shaped the behavior of others when they saw this.

Cost Factors. The participants recognized that applying CDC COVID-19 guidelines engendered additional costs in terms of loss in revenues and extra expense on the farmers' side. The unavailability of workers led to production loss, which impacts farmers' revenues. Also, safety practices limited the efficiency and productivity of the operations. Additional disinfecting procedures took extra time, which slowed down operations. Therefore, the lack of profit from an industry, which operates under slim margins, might provide disincentives to follow the CDC guidelines. Furthermore, there were various logistical challenges, most often transportation and housing, that created barriers to implementing the CDC guidelines.

Transportation. Generally, the conditions of the buses which carry the workers and the way the passengers were crammed into the buses did not help in the implementation of the guidelines. Therefore, investing in additional transportation facilities was a big financial hit on farmers, particularly the smaller ones. At the same time, such an investment was important because the danger in contamination for workers did not seem to be so much in the workplace but after work, during transportation, and at home.

Housing. The lack of affordable housing, particularly in Florida, leads workers who rent to live in a high level of proximity that, in a sense, might constitute a vector for the multiplication of the virus. It also generated additional cost to businesses, which used H2A and H2B workers, and to low-income farmworkers renting together. One participant said that "Housing is an issue as well because non H2A workers have to rent and live in proximity. There is no possibility for isolation if one gets sick."

Finally, the economic burden to follow the guidelines did not fall on the farm owners' shoulders only but also on the workers. The implementation of the CDC guidelines generates costs for the workers as well. One participant reported that "the masks are expensive; whatever you will use will be like over $20." The companies did not provide enough masks for workers to be able to change them as needed. Some community organizations have distributed masks but not in sufficient quantity to totally fill the gap because of their financial limitations. Finally, workers' financial insecurity sometimes pushed them to prioritize work over their health. They might be reluctant to get tested for two main reasons: 1) they did not want to know their status, because a positive test meant a

minimum of 14 days out of work while they got paid by the piece and 2) they did not have health insurance to cover the test. They could not afford such expenses because they must provide for both their immediate and extended families, particularly for the guest workers who must take care of themselves and their overseas families.

The themes captured in our interviews and identified as culture and cost factors above summarize most of the perceived barriers to implementing the CDC safety guidelines to prevent the spread of COVID-19. However, one additional concern emerged that might require further study. That was the potential for mask wearing in the field to aggravate heat-related illnesses. Some participants felt that because of the high temperature it may be uncomfortable for workers to wear masks. Mask wearing might also increase conditions for heat stroke, especially when considering the quality of the materials used.

Enablers

As discussed above, there are many barriers to the successful implementation in agricultural operations of the CDC guidelines for maintaining health and safety in the presence of COVID-19. However, there were also factors that emerged from participant interviews that we call "enablers," which can facilitate the successful adoption of safety guidelines. The three sub-themes that surfaced are described below: innovation, behavior, and incentives.

Innovation. This sub-theme includes developments in online trainings, adaptive education and outreach techniques, and increased use of technology in the short and long-run. One participant captured the energy around trainings when they stated, "there's an opportunity, a teachable moment here." The use of online trainings has become more popular during the pandemic and participants indicate that they are being met with a receptive audience:

> We got the zoom meeting for the 19th. I think we have to open a second for the 25th, because they are so many people already. We are close to 200 [farmers] already …. We're talking about supervisors. We are not talking about farmworkers. We're talking about people in charge, interested to get that training.

Another enabling element of innovation is the application to adapting education and outreach to use the most effective mediums for communication and information dissemination, such as social media and radio:

> We have to be more creative in the way that we do outreach. Many people now have phone with like WhatsApp for communication with the family abroad, you know, so maybe creating small clips, no more than 30 seconds, you know, after all talking about health and safety. ... But WhatsApp, Facebook, believe me, I mean that people are using them all the time, especially WhatsApp. They're using for communication. So, if you can start spreading that information to the leaders on the community, the leaders on a farm, and they can start spreading it to the phone list that's going to be wonderful, ... Of course, you can use radio stations, local radio stations, you know.

Finally, the increased use of technology for harvesting and other agricultural processes may improve the ability to follow safety guidelines, though some of these technologies are not quite production ready, indicating this is a longer-term solution.

Behavior. In this category of enabling elements for following guidelines,

strategies to influence farm worker behavior were identified. These include seeking to popularize and improve the acceptability of wearing masks and providing strong leadership. In order to overcome barriers to mask-wearing (described above), there is a suggestion to brand the masks by improving the appearance and referencing popular sports teams and athletes. Also, the idea to identify and recruit leaders among the labor force to model the desired behavior was discussed by a participant. Similarly, the influence of leadership was discussed as a positive example of engaging people in following the safety guidelines. For example, one participant discussed exceeding the guidelines in their operation, "We go further than CDC in those areas. And do these protocols that we developed on our own [a] step further." Additional leadership strategies include maintaining strict standards and designating a supervisor in the role of health and safety manager.

Incentives. Participants indicated a favorable view towards the forms of government assistance that have been provided to date. These include USDA assistance programs that enable producers to receive reimbursement for lost crops and products due to the reduced demand from mandatory shutdowns, stimulus response and paycheck protections.

Despite the challenges presented by the pandemic, some bright spots did present themselves throughout this study. The innovations in online education, adaptive outreach, advancing technology, strategies to engage and influence safer behaviors, and available incentives all provide much-needed hope to meet the guidelines as recommended by the CDC.

Conclusions, Implications, Limitations & Recommendations

The present study assessed the perceptions of farm owners, operators, workers, and educators on the impact of the pandemic on occupational health and safety, and on the likelihood of implementation of safety guidelines as established by the CDC.

Results revealed that the CDC guidelines to cope with the pandemic seemed feasible despite the identification of specific barriers. To the first question, the results indicated that besides its inherent challenges, the pandemic offered a lot of opportunities for agricultural stakeholders to adapt their interventions and strategies. The challenges pertained to the ongoing nature of the virus, which created uncertainties as to when businesses could resume their operations. This includes worker availability, finding government assistance for health and safety, and paycheck protections. On the opportunity side, the findings suggest that the pandemic creates a unique opportunity for a paradigm shift for training providers, extension specialists, and business owners to revamp their services and to adapt their approach. The results suggested many anticipated novelties in the industry. For example, big companies might end up using technology for distance learning, marketing, and sales there may be a higher use of H2A workers we might observe a new reengineering of the agricultural sector, particularly with newly designed tools and equipment, and business owners might do more to protect and educate their labor force. These findings overlap with those of other researchers, particularly with respect to the evolving role of technology in agriculture extension education, which is applicable internationally due to the global spread of internet and mobile technology. For example, Moonsammy & Moonsammy found that social media and other information communication technologies (ICTs) were viable tools for extension agents to use in their efforts to serve farmers in Trinidad and Tobago (2019). The

increased use of H2A workers is also internationally relevant as these workers travel from many countries to earn a living in the U.S. agriculture market.

To the second question, the participants identified both key barriers and enablers to implementing the CDC guidelines. The barriers seemed to vary with the size of the companies, the types of operation and the amount of required labor. With respect to the barriers, as reported by other studies (Morris, 2020), transportation and housing, because of their additional incurred cost factors, were highlighted as the main bottlenecks to implementing the CDC guidelines. They were followed by culture, which had often been identified as an impediment to broader occupational health and safety compliance. In parallel, the agricultural stakeholders' positive behavior, the availability of incentives, and the use of innovation, including technology, were mentioned as the three main supportive factors to the execution of the CDC guidelines. Participants also pointed to education, financial assistance, and affordable healthcare as three pivotal points to help overcome the challenges associated with this unprecedented situation. They stressed the necessity to immediately start conversing with growers, using local radio stations, community leaders, social networks, etc., as the fall growing season is approaching.

These findings need to be considered within the context of a few limitations that are worth mentioning. First, although the study targeted agricultural stakeholders, there were no workers among the interviewees. Their perspectives could add another layer to the understanding of the topic being studied. Further studies need to take that aspect into account. Additionally, these results might be evolving because of the unfolding nature of the pandemic. Therefore, continuing assessments would be necessary to capture shifting perceptions or attitudes as they change to reflect updated information. Further investigations about the side effect of the mask-wearing on heat-related illnesses might be worth looking at in terms of guidelines for agricultural workers.

A key implication of this study is the potential to inform future practice with respect to helping decision-makers, community leaders, extension services, and agricultural stakeholders, including advocacy groups, understand how to shape their health and safety plans and strategies to find the best way possible to face and combat this challenging plague. Directions for further research include adapting this study's instrumentation for use in other countries, conducting longitudinal studies to look at how response to the pandemic evolves over time, and utilizing quantitative survey design to examine perceptions of different agricultural sectors and compare across sectors and countries.

This snapshot on how COVID-19 has affected agriculture in the Southeastern U.S. also has several significant potential implications for international agricultural and extension educators. COVID-19 is a global pandemic, affecting global food systems, markets and economies, agriculturalists, and workers around the world. As discussed by Stephens et al., the pandemic's impact in the global agricultural sector impacts food security, labor availability, farm system resilience, and agricultural system connectivity as well as a host of additional compounding concerns like disrupted supply chains and increased competition for essential inputs (2020). As the country with the highest incidence of cases, the perceptions and concerns of those involved in the U.S. food system about this agricultural health issue can inform the practices of international agricultural and extension educators in terms of

understanding the importance of and adapting educational efforts to address barriers, insure implementation of health and safety guidelines and influence culture and behavior in international settings. Further, the results of this study show the effects of long-term educational efforts to improve health and safety issues generally. Participants perceived that the more educated producers and growers were more likely to implement health and safety practices, which helped them be better prepared for the pandemic than they might have been otherwise. From a global perspective, a focus on education and training related to agricultural health and safety could serve to enhance the resilience of our global food system.

References

American Soybean Association. (2020, April 20). *ASA Survey: Soy farmers concerned about COVID-19 share impacts and needs* [Press release]. https://soygrowers.com/news-releases/asa-survey-soy-farmers-share-c-19-impacts-cfap-well-timed/

Bernard, H. R. (2013). *Social research methods: Qualitative and quantitative approaches* (2nd ed.). Sage Publications.

Bernard, H. R. & Ryan, G. W. (2006). *Analyzing qualitative data: Systematic approaches.* SAGE Publications.

Center for Public Issues Education. (2020). *Public perceptions of COVID-19* [Fact sheet]. University of Florida / Institute of Food and Agricultural Sciences. https://piecenter.com/wp-content/uploads/2020/03/COVID-19_keyfindings-2.pdf

Centers for Disease Control and Prevention. (2020, September). *How COVID-19 spreads.* U.S. Department of Health & Human Services. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html

Glaser, B.G., & Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine.

Harding, J. (2018). *Qualitative data analysis from start to finish* (2nd ed.). Sage Publications.

International Labor Office. (2017). *Working together to promote a safe and healthy working environment.* (International Labour Conference 106th Session). https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_543647.pdf

Lincoln, Y., & Guba, E. (1985). Naturalistic inquiry. Beverly Hills, CA: Sage Publications.

Miles, M., Huberman, M. & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publications.

Moonsammy, S. & Moonsammy, D. M. R. (2019). Social media application in agriculture extension programming for small scale rural farmers: Is knowledge impeding lack of adoption? *Journal of International Agricultural and Extension Education,* 27(3), 27 – 42. https://doi.org/10.5191/jiaee.2020.27327

Morris, J.G. (2020, September 11). *SARS-CoV-2: Transmission and human health* [Conference presentation]. Southeastern Coastal Center for Agricultural Health and Safety 2020 State of the Science Meeting. http://www.sccahs.org/wp-content/uploads/2020/09/SOS-GlennMorris.pdf

National Agricultural Statistics Service. (2020). *Farm labor*. (ISSN: 1949-0909). United States Department of Agriculture. https://www.nass.usda.gov/Publications/Todays_Reports/reports/fmla0520.pdf

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage Publications.

Richards, L. (2005). *Handling qualitative data: A practical guide.* Sage Publications.

Stephens, E. C., Martin, G., van Wijk, M., Timsina, J., & Snow, V. (2020). Editorial: Impacts of COVID-19 on agricultural and food systems worldwide and on progress to the sustainable development goals. *Agricultural systems*, 183, 102873. https://doi.org/10.1016/j.agsy.2020.102873

Strauss, A.L., & Corbin, J.M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications.

Ullrich, B. A., & Mueller, K. (2020). *Rural data brief: Confirmed COVID-19 cases, metropolitan and nonmetropolitan counties* [Policy Brief No. 2020-2]. RUPRI Center for Rural Health Policy Analysis. https://rupri.public-health.uiowa.edu/publications/policybriefs/2020/COVID%20Data%20Brief.pdf

U.S. Bureau of Labor Statistics. (2018). *Census of fatal occupational injuries (final data)*. U.S. Department of Labor. https://www.bls.gov/iif/oshcfoi1.htm

Villarejo, D., McCurdy, S. A., Bade, B., Samuels, S., Lighthall, D., & Williams III, D. (2010). The health of California's immigrant hired farmworkers. *American Journal of Industrial Medicine*, 53(4), 387-397. https://doi.org/10.1002/ajim.20796

World Health Organization. (2020). *Coronavirus disease (COVID-19)* [Situational Report 146] https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200614-covid-19-sitrep-146.pdf?sfvrsn=5b89bdad_6

Yin, R. K. (2016). *Qualitative Research from start to finish* (2nd ed.). The Guilford Press.