

INTRODUCTION

Florida growers are responsible for supplying the world with fresh produce, with many commodities ranking 1st or 2nd, nationally in terms of production. The Food Safety Modernization Act (FSMA) was signed into law in 2011 and was the first legislation of its kind that set minimum standards for growing, harvesting, and holding fresh produce. With compliance dates passed, produce growers, harvesters, and packers are faced with the challenge of navigating and complying with federal food safety regulations for the first time. This has established a demand for food safety education and outreach activities to help farms meet the standards of the PSR, before their initial inspection. Since 2016, University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) has offered Produce Safety Alliance (PSA) Grower Trainings in order to train farm personnel on Good Agricultural Practices (GAPs) and the requirements of the PSR. Beginning in 2018, UF/IFAS collaborated with the Florida Department of Agriculture and Consumer Services (FDACS) to conduct On-Farm Readiness Reviews (OFRRs). Faced with new challenges presented by COVID-19, PSA trainings are presently being offered remotely and On-Farm Readiness Reviews have adapted to follow CDC guidelines. These education and outreach activities are intended to improve food safety knowledge and prepare growers for PSR inspections.

OBJECTIVE

The objective is to determine if the PSA training was successful in improving the level of knowledge of the PSR and foundational food safety principals that Florida growers have, and to determine the level of farm preparedness for FSMA PSR compliance. Produce Safety Alliance trainers and lead trainers were developed throughout the state to serve as resources for Florida growers.

METHODS

PSA Grower Trainings

1. Trainings are conducted using standardized curriculum developed by the Produce Safety Alliance. In order to deliver training materials, several UF/IFAS faculty and extension associates have achieved PSA Trainer or Lead Trainer status (Figure 1).
2. UF/IFAS extension personnel, FDACS employees, and other trained volunteers have conducted PSA Grower Trainings since 2016 at locations across the state of Florida (Figure 2).
3. Pre- and post-assessments from the Southern Center were developed and given to each PSA Grower Training attendee in order to measure knowledge gained in the areas of food safety practices (GAPs) and the Produce Safety Rule requirements (Table 1).

On-Farm Readiness Reviews

1. On-Farm Readiness Review materials were developed by National Association of State Departments of Agriculture, state Departments of Agriculture, FDA, and extension personnel in order to provide personalized discussions about the PSR to farmers.
2. Upon request, a pair of UF/IFAS and FDACS employees will travel to the farm and meet with the farmer to review their growing, harvesting, and packing practices, water sources, and other relevant topics.
3. At the end of the review, the assessors provide their top three areas of need for the farm to improve food safety practices in order to meet the requirements of the PSR and also leave the OFRR educational resources at the operation.
4. After each OFRR is completed, the assessors fill out an anonymous on-line survey developed by Rutgers University to record information about Florida farms' areas of need in terms of GAPs and PSR Requirements and their overall readiness for PSR compliance.

DISTRIBUTION AND EFFECTIVENESS OF PSA TRAININGS AND OFRR'S

Figure 1. Distribution of UF and FDACS PSA Trainers Throughout Florida Counties (n=53).

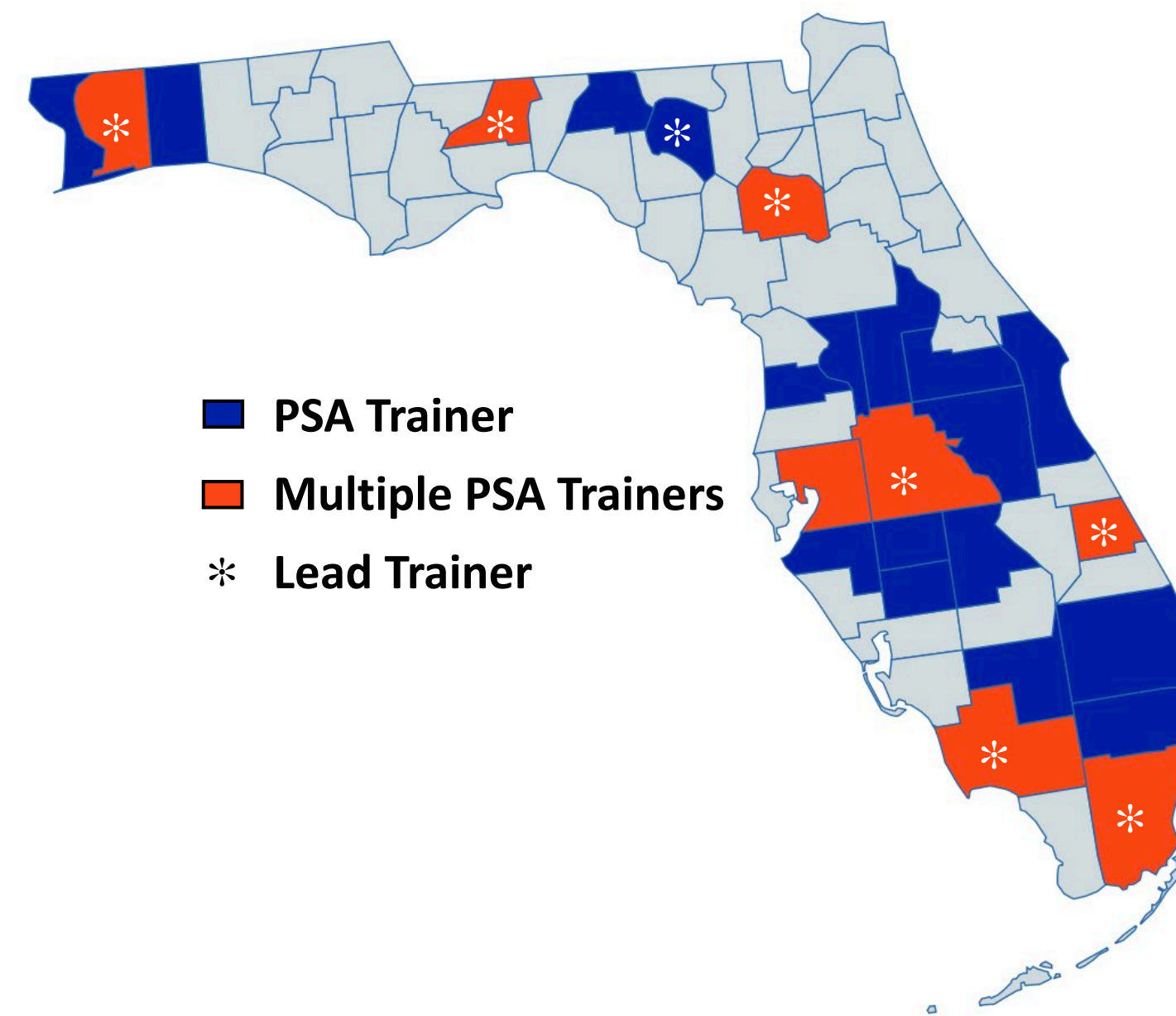


Figure 2. PSA PSR Grower Training Locations by Florida County Conducted Since 2016 (n=72).

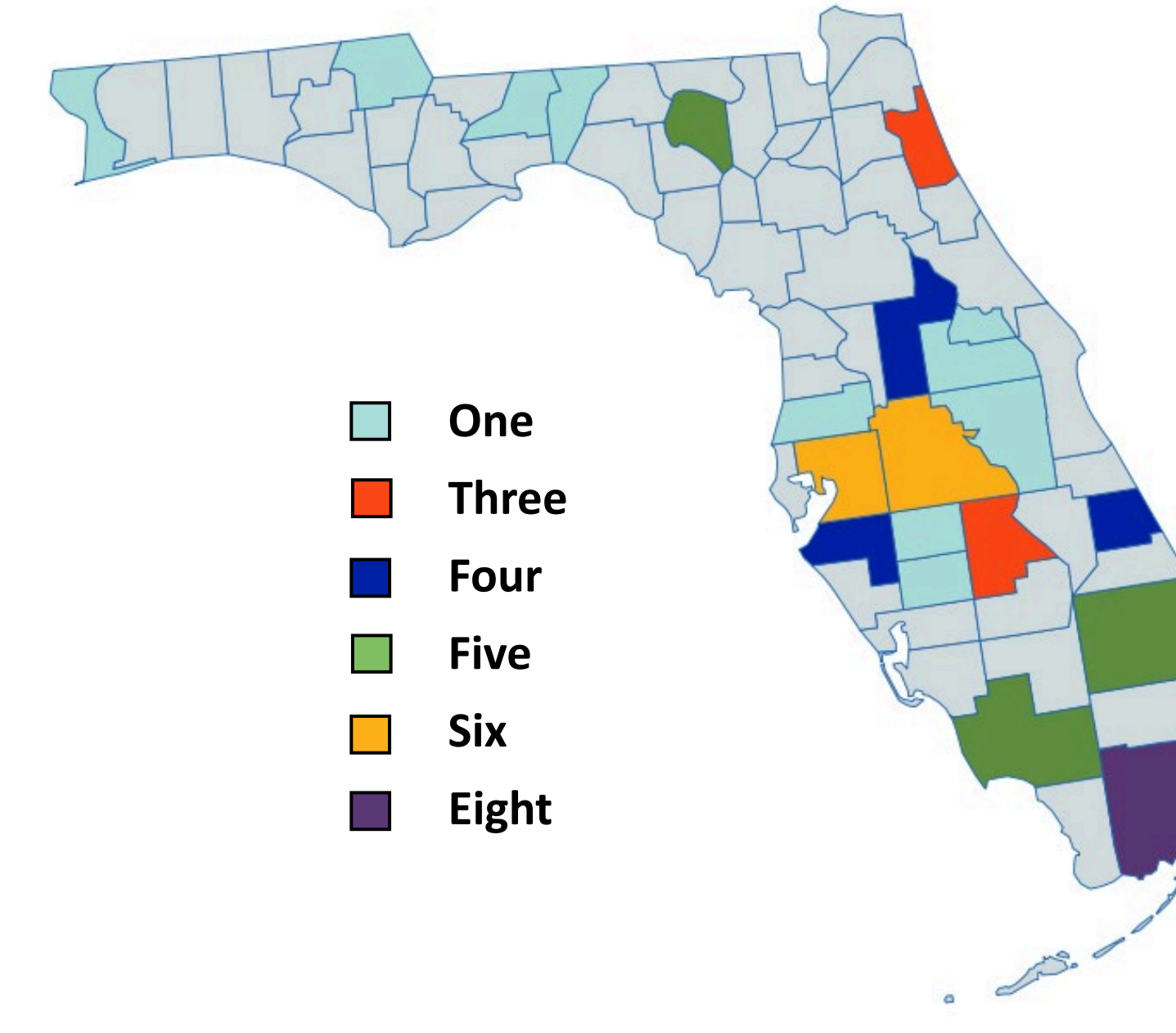


Figure 3. OFRR's Conducted by Florida County Since 2016 (n=50).

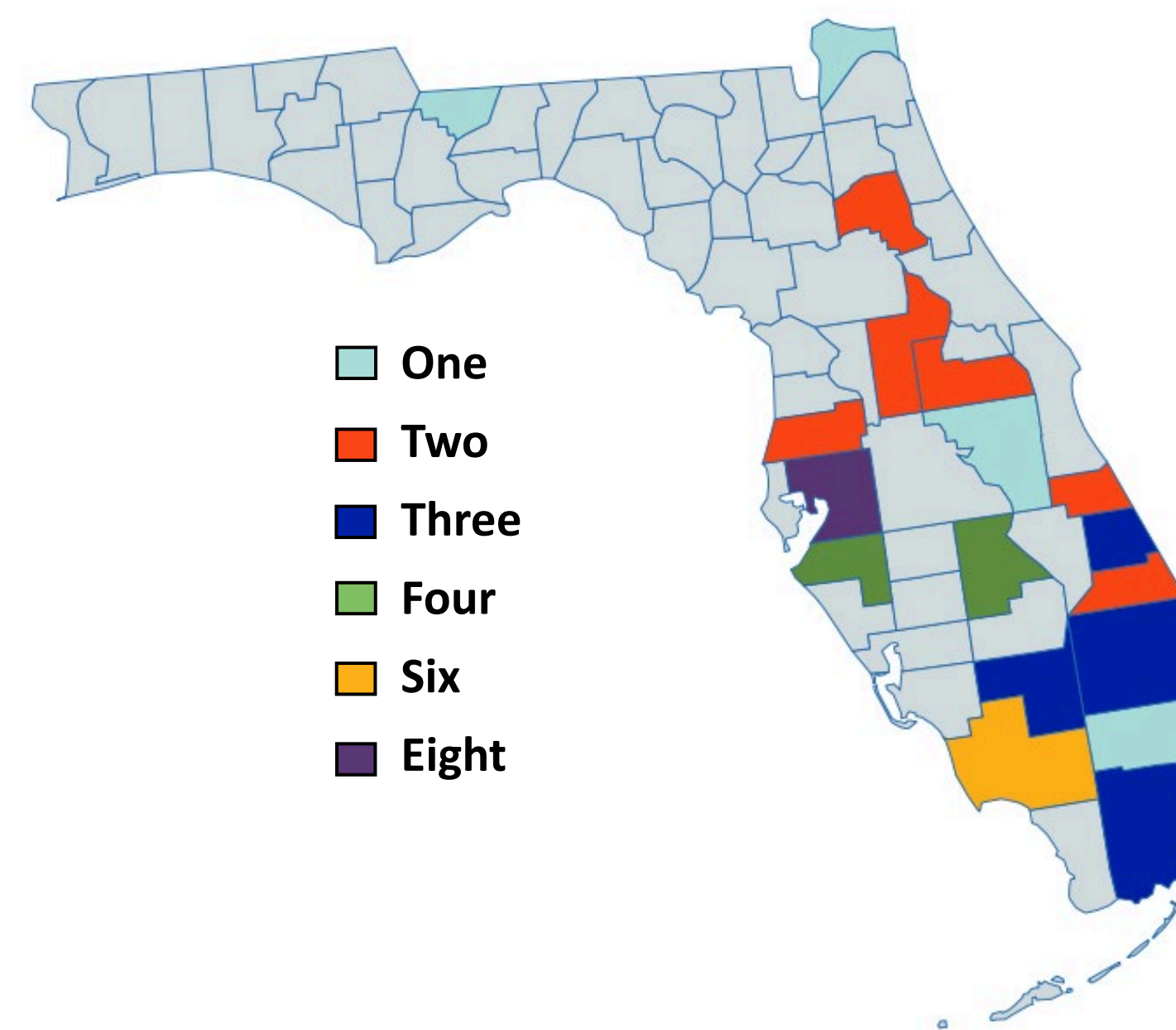


Figure 4. Readiness of the Farm to Meet Minimum FSMA Produce Safety Rule Requirements (n=43).

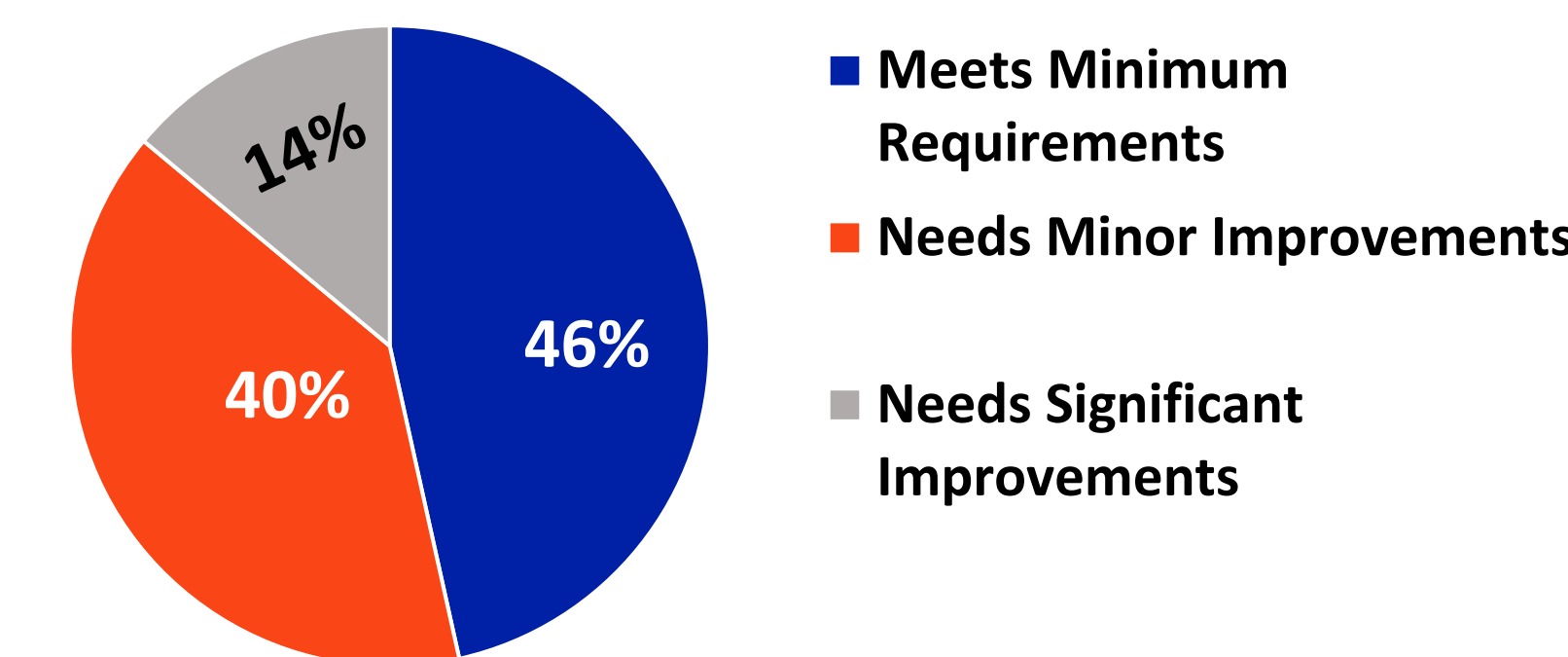


Figure 5. What Type of Assistance Does this Farm Need to Meet the Minimum Requirements of the FSMA PSR?

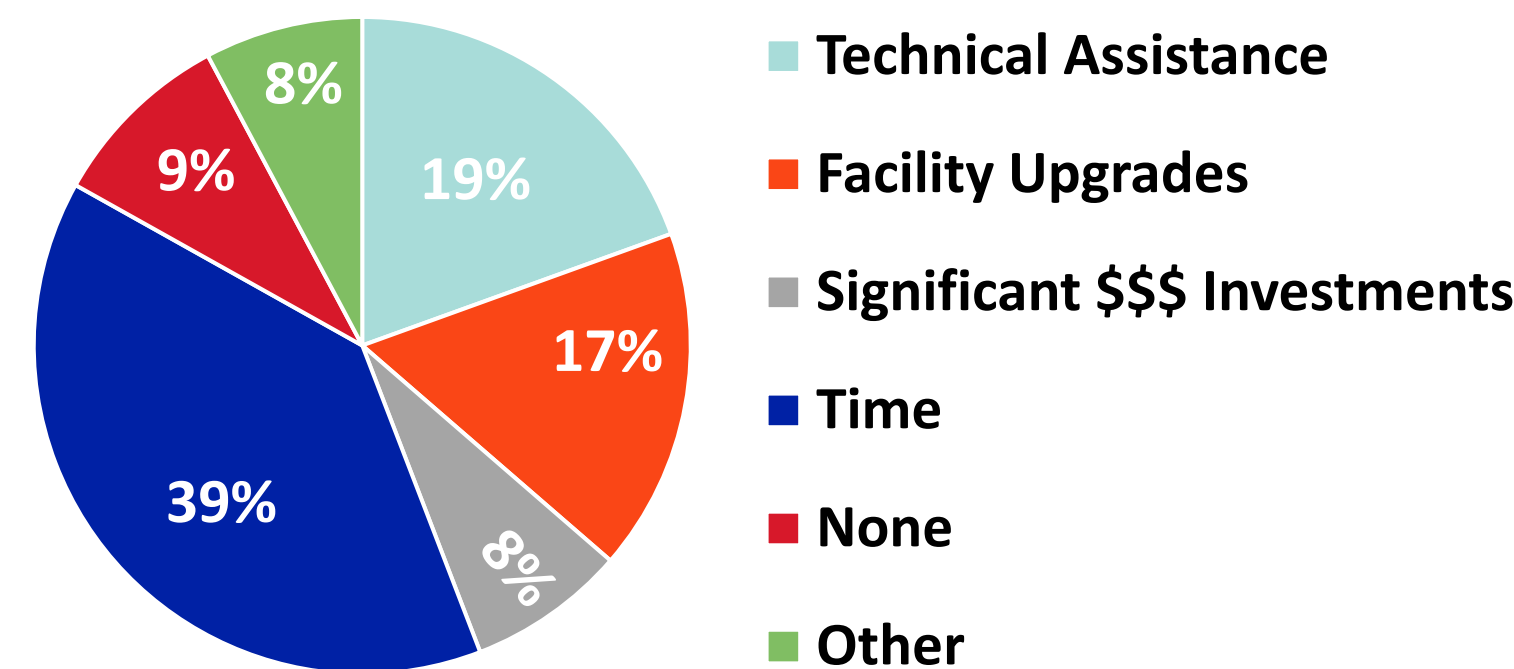
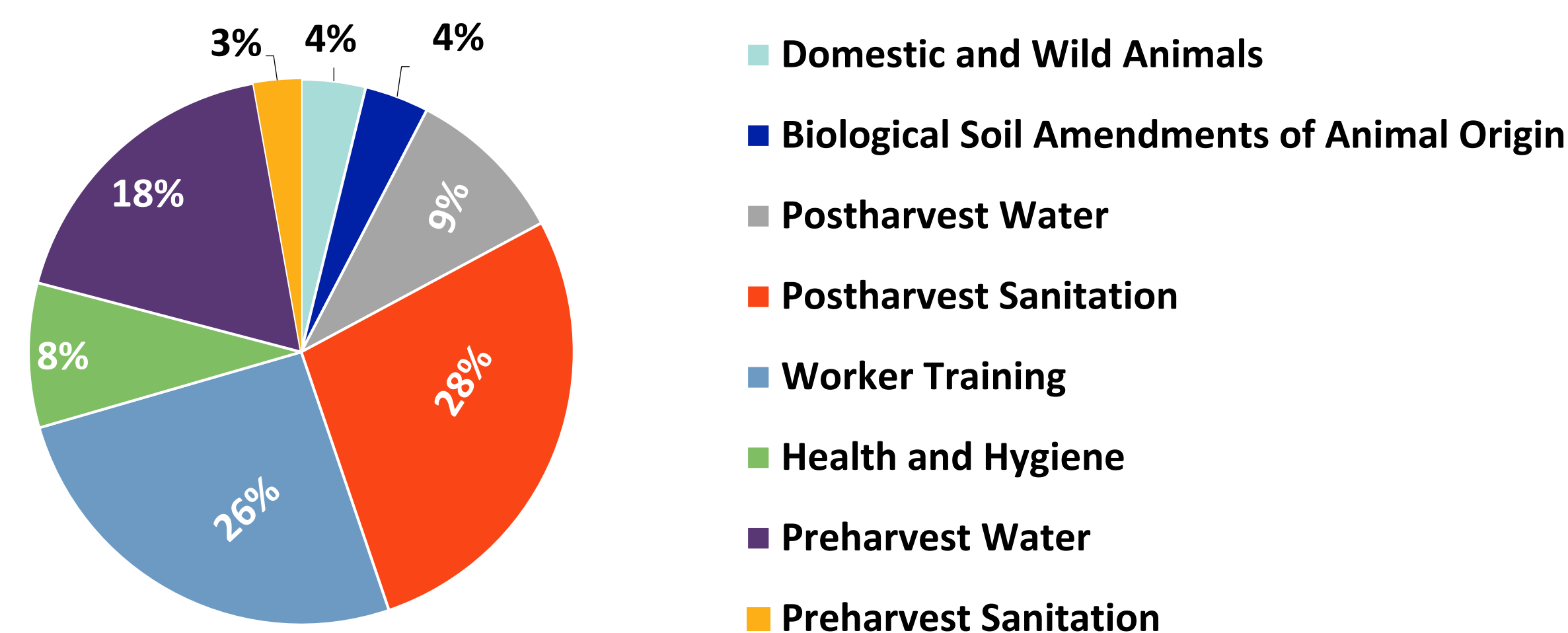


Figure 6. Areas in which Farm Requires the Most Improvement to Satisfy FSMA PSR Minimum Requirements.



RESULTS

PSA Grower Trainings

For PSA trainings (n=72), post-test scores were statistically and significantly higher than pre-test scores ($t = -1.72, p < 0.05$), indicating a significant increase in knowledge after participation in the training. Out of 25 points, participants scored an average of 16.46 on the pre-test and 20.26 on the post-test.

Table 1. PSA Knowledge Scores

# of Trainees	Pre-test	Post-test	P
1473	19.24	21.58	<0.05

OFRR Survey Results in Florida

Post OFRR surveys (n=43) have been submitted by assessors and data is displayed in Figures 4, 5, and 6. Many of the farms receiving OFRR's in Florida (46%) met the minimum FSMA PSR requirements during review and only 14% of farms needed significant improvements in order to meet these minimum requirements. Assistance required by the farms to meet these requirements were mainly time (39%), technical support (19%), and facility upgrades (17%).

The top three areas on farms that require the most improvement to satisfy PSR minimum requirements are (all areas combined) (19%), harvest sanitation (15%), and postharvest sanitation (15%).

Trainer Resource

A total of 108 PSA trainers and 20 lead trainers have been developed geographically across the state. A total of 53 trainers have been developed by UF and FDACS and distribution is depicted in Figure 1.

DISCUSSION AND CONCLUSIONS

PSA Trainings are positively impacting the level of PSR and general food safety knowledge of Florida Produce Growers. In addition, Pre-test scores have increased over time, indicating initial food safety knowledge is higher among participants.

Generally, farms who have received an OFRR already meet the minimum requirements or only need minor improvements to be in compliance with the Produce Safety Rule. The majority of farms requiring improvements require time and technical assistance to become in compliance. Florida is also well-equipped to provide resources to farmers requiring technical assistance due to the distribution of PSA trainers throughout the state. The PSA Grower Trainings and the OFRR programs have facilitated improvement of the knowledge and compliance levels of Florida farms regarding the FSMA PSR.

Next Steps

The compliance dates for all farm sizes have passed. As inspections expand throughout the state, demand for PSA trainings and OFRR's continue to increase. UF/IFAS faculty will continue to conduct several PSA Grower remotely until in-person trainings can resume.. UF/IFAS will continue to collaborate with FDACS to conduct OFRRs for no charge to Florida produce farmers.

ACKNOWLEDGEMENTS

This work is supported in part by FDA CAP U18FD005909 and awarded by Florida Department of Agriculture and Consumer Services, as well as, USDA NIFA: 2015-70020-24397 and 2018-70020-28930. Survey data for On-Farm Readiness Reviews was collected by Meredith Melendez at Rutgers Cooperative Extension.

Growers' Awareness of On-Farm Food Safety and Conservation Practices in the Southeastern United States



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INTRODUCTION

- On-farm conservation practices are known to increase local biodiversity and promote agricultural sustainability, and they can also play an important role in reducing food safety risks.
- However, many growers are not aware on how these practices can be beneficial as a part of their farm food safety program.
- The objective of this survey was to estimate the level of awareness of growers and producers related to on-farm food safety, conservation practices, and programs to identify grower educational deficiencies and knowledge gaps.

METHODS

A survey was distributed among growers from the Southeastern U.S. Key questions included geographical location of the farm, type of business, on-farm food safety and conservation management practices, grower's awareness of conservation programs, local authorities, and information sources of food safety and conservation practices.

RESULTS

Table 1. Farm location and method of farming of survey respondents.

Farm location	N = 111	%
Georgia	67	60.4
Alabama	26	23.4
Florida	9	8.1
Mississippi	3	2.7
Other	6	5.4
Method of farming		
Conventional	53	47.8
Mixed (organic and conventional)	20	18.0
Certified Naturally Grown	15	13.5
Certified organic	11	9.9
Regenerative	6	5.4
Other	8	7.2

RESULTS

Table 2. Management practices used on farm operation to address food safety and conservation concerns in the last 5 years.

Management practices	n	%
<i>Food Safety</i>		
Use of deterrents to prevent animal intrusion in the field	55	49.5
Partial vegetation removal from ditches or farm ponds	32	28.8
Irrigation water treatment	29	26.1
Stopped using contaminated water sources for preharvest use	21	18.9
Cleared vegetation to create bare ground buffers	20	18.0
Relocation of domesticated animals	19	17.1
Complete vegetation removal from ditches or farm ponds	14	12.6
Relocation of wild animals	7	6.3
Other	3	2.7
<i>Conservation</i>		
Crop rotation	65	58.5
Integrated pest management	54	48.6
Cover cropping	46	41.4
Composting or manure treatment	30	27.0
Direct planting	25	22.5
Use of hedgerows or windbreaks	20	18.0
Use of native plants to attract natural pest predators	16	14.4
Grassed waterways	13	11.7
Riparian-zone restoration	3	2.7
Other	5	4.5

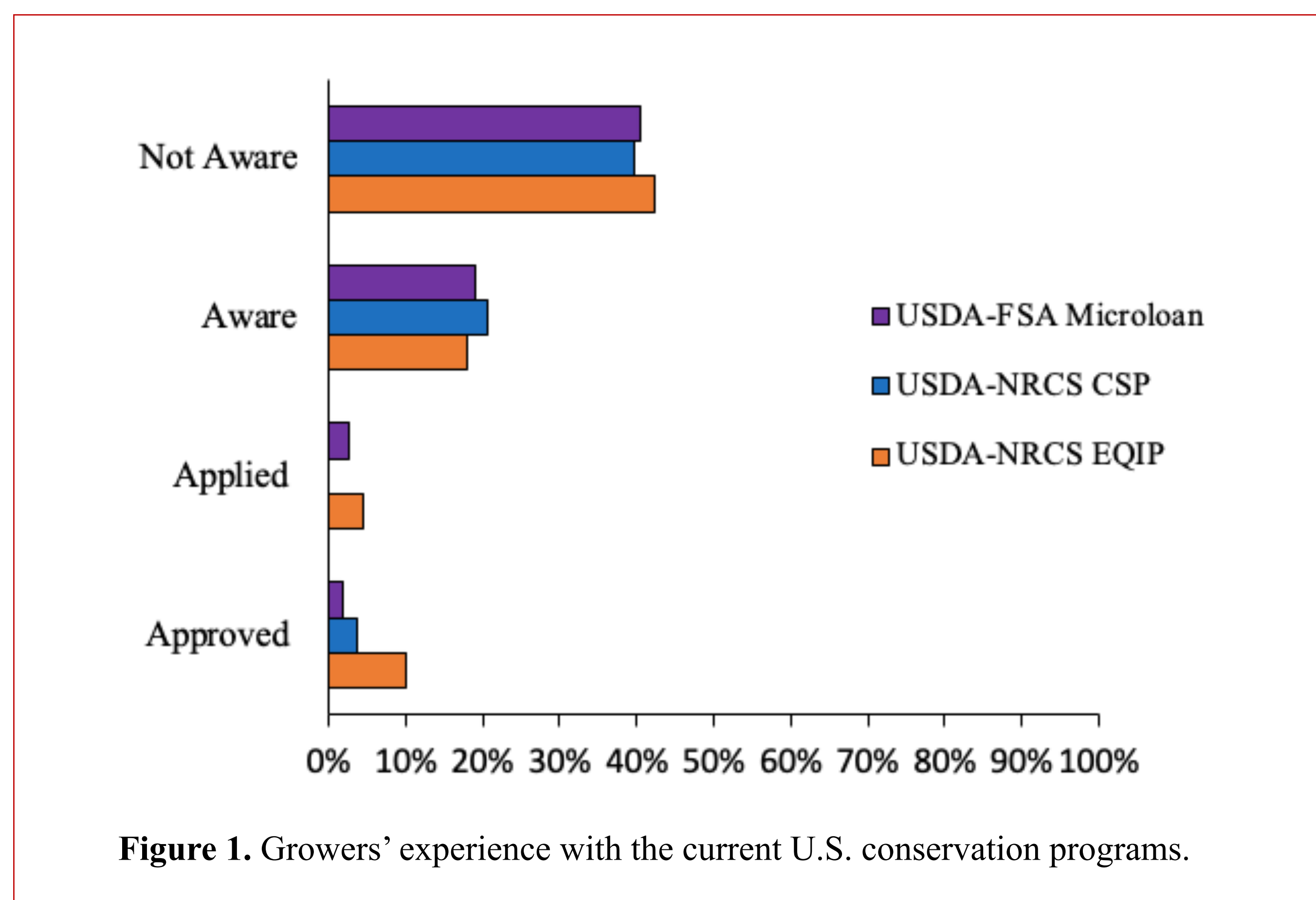


Figure 1. Growers' experience with the current U.S. conservation programs.

RESULTS

Based on respondents' perception:

- 20% of growers perceive that food safety and conservation practices are in conflict.
- 35% of growers perceive that developing a whole farm plan that incorporates food safety and conservation is difficult.
- 64% of growers report that food safety and conservation have an impact on land management decisions.

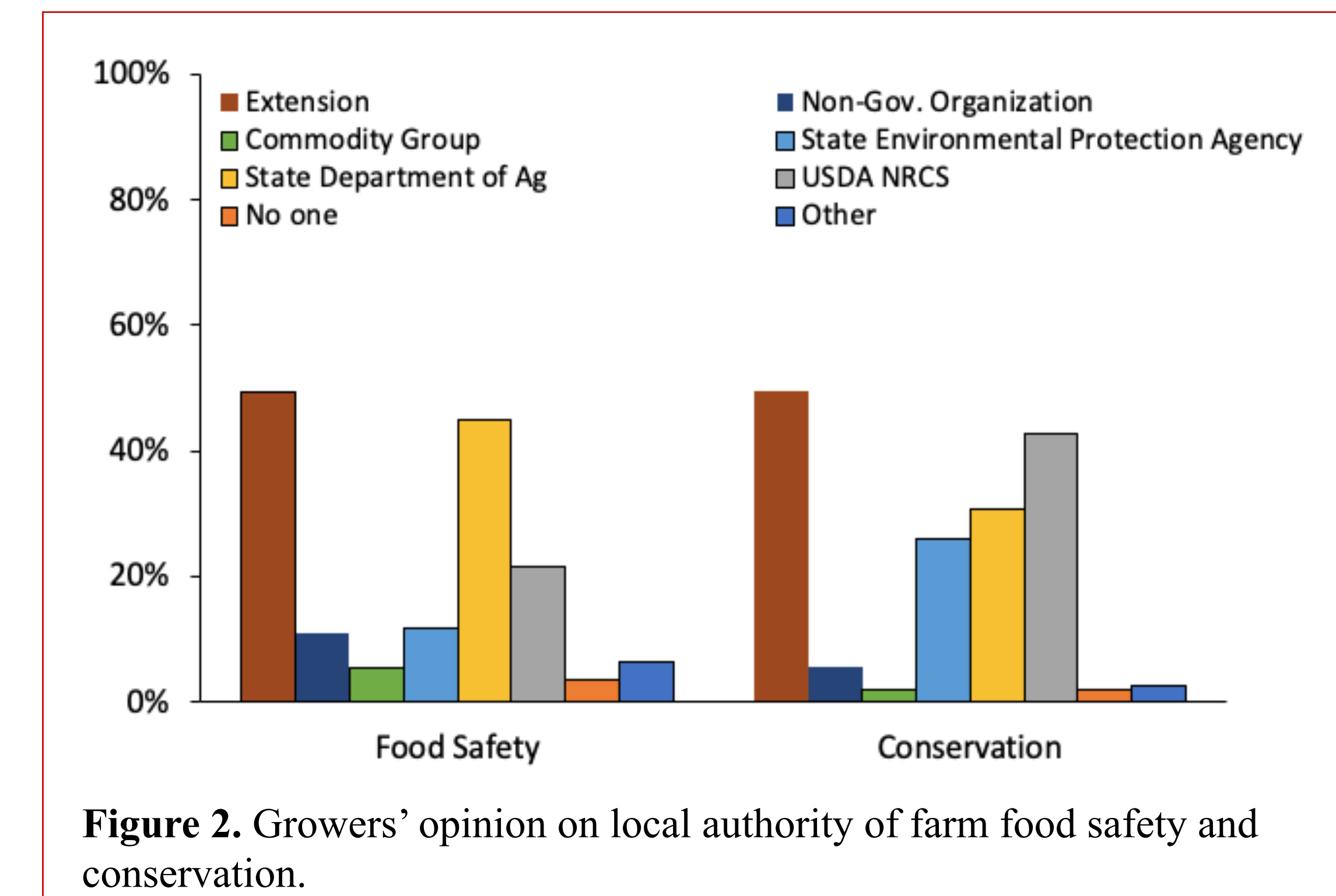


Figure 2. Growers' opinion on local authority of farm food safety and conservation.

CONCLUSION

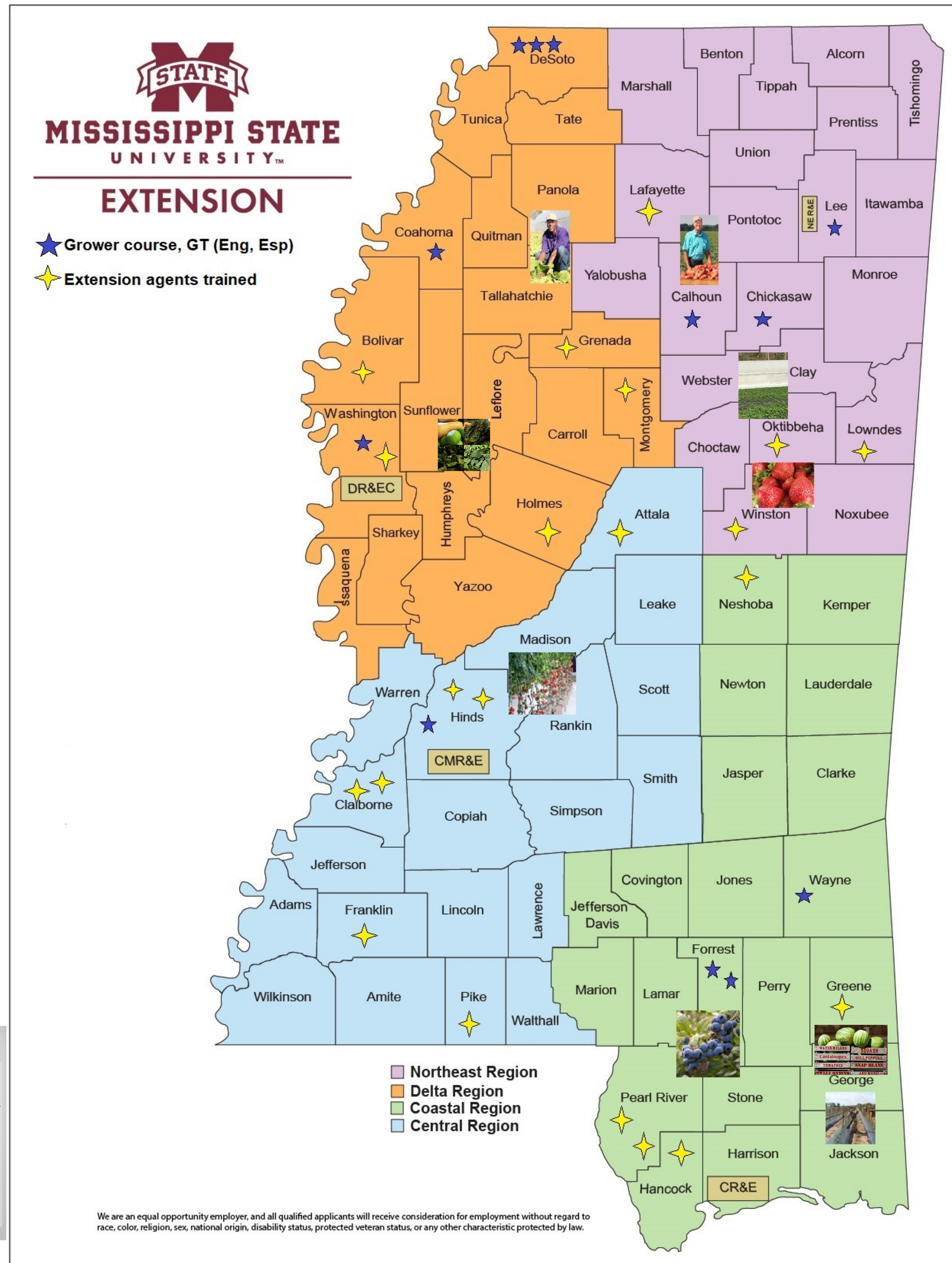
- Although both food safety and conservation directly impact land management decisions, the complexities of implementing a whole farm plan integrating these two interests is an educational gap for grower in the southeastern U.S.
- Information obtained from this survey will be useful to understand the growers' perceptions of the relationship between food safety and conservation practices and to develop strategies to better address and incorporate both practices on the farm plan.

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Davis Edward, Mississippi Department of Agriculture and Commerce (MDAC); Collaborator: Alcorn State University (ASU)

INTRODUCTION

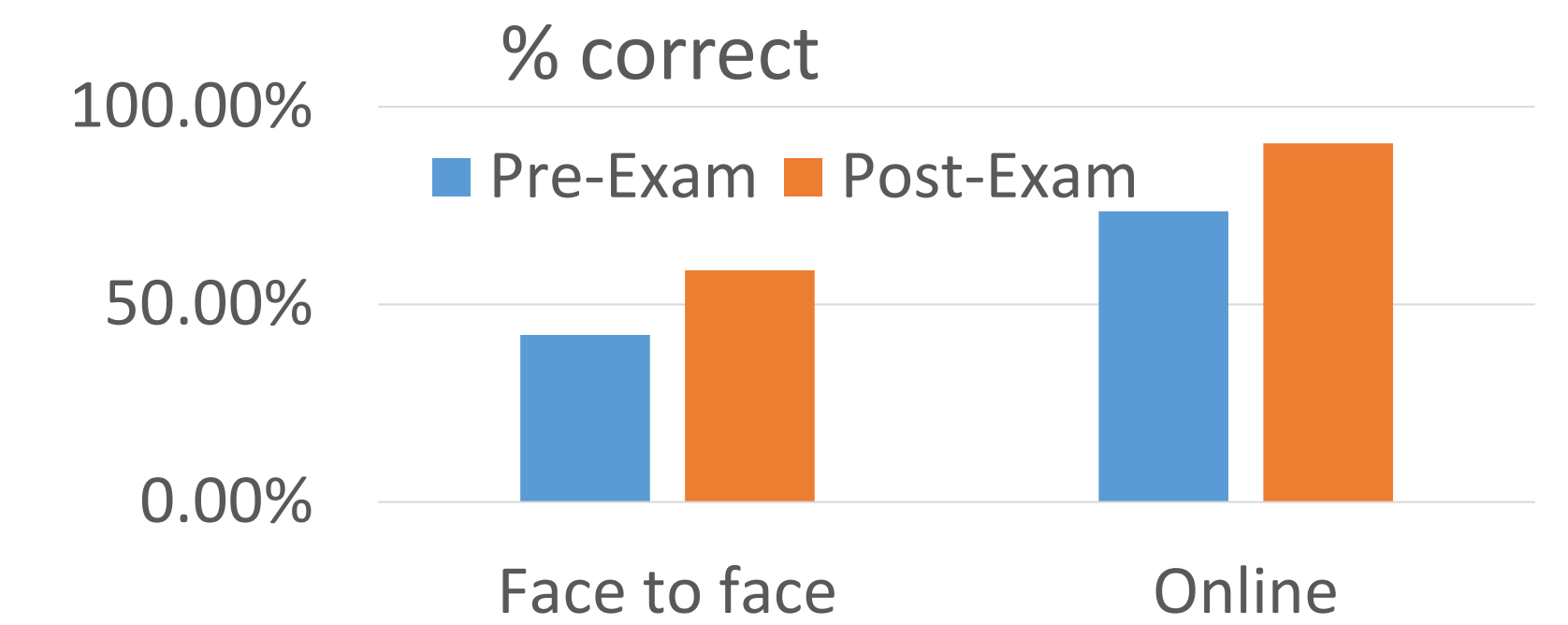
Prior to Mississippi State University training clients in the Produce Safety Rule (PSR), it developed and conducted training in Good Agricultural Practices for over 20 years. The curriculum delivery moved to the PSR in 2016. Since then 3 PSA Train the Trainer (TTT) and over 30 PSA Grower trainings have been delivered. Since May 2020 we have changed to Virtual delivery and have conducted three courses. Thus far, MS has 2 PSA Lead Trainers and 22 PSA Trainers and have trained nearly 300 clients. About 20 of the trainees are MSU extension agents, an effort to train them so they can assist farmers. This work presents data from 106 respondents (87%). It also attempts to compare data between face-to-face (60% participants) and virtual courses, but this is limited thus far.

MAPPED Activities

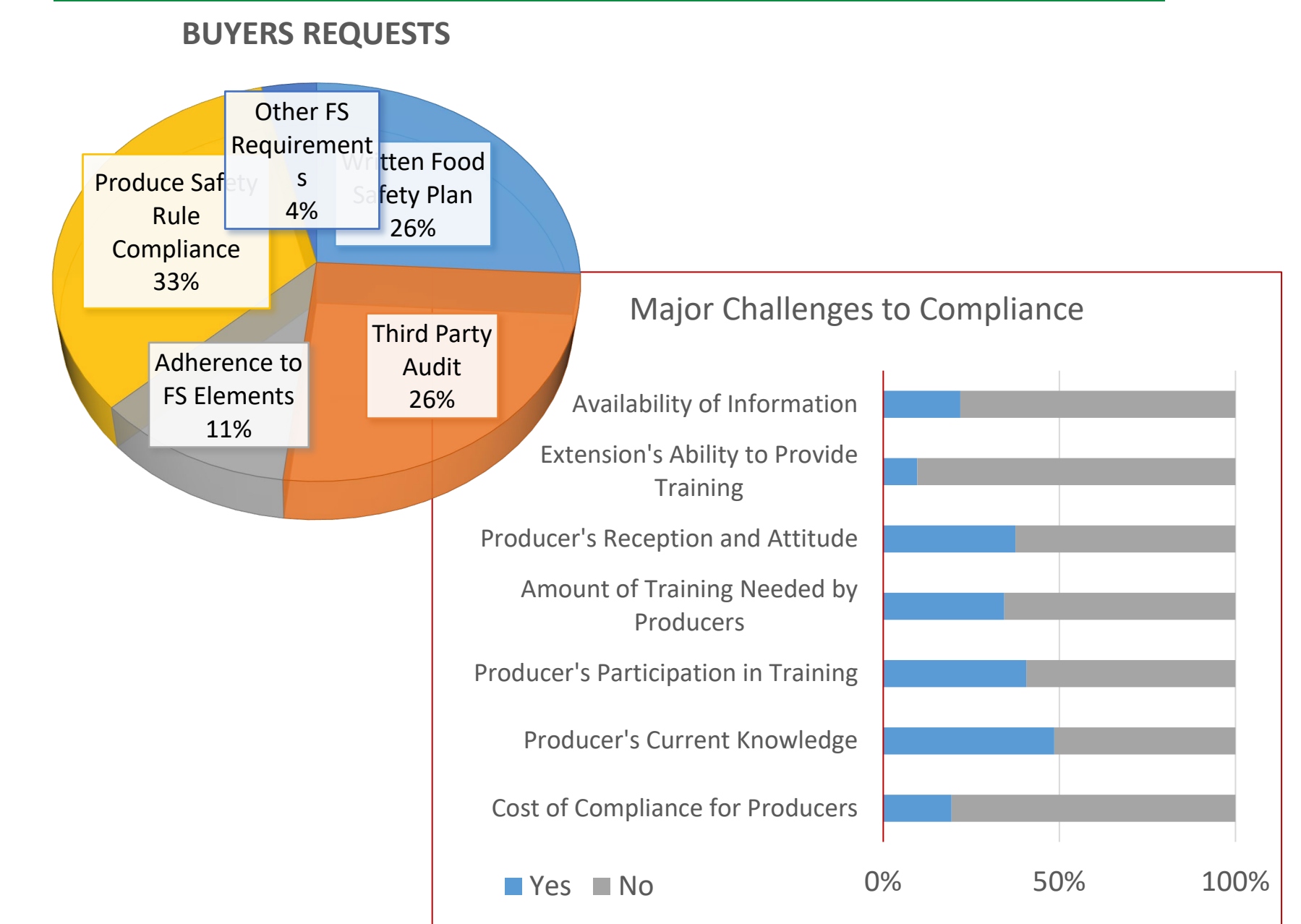


Evaluations

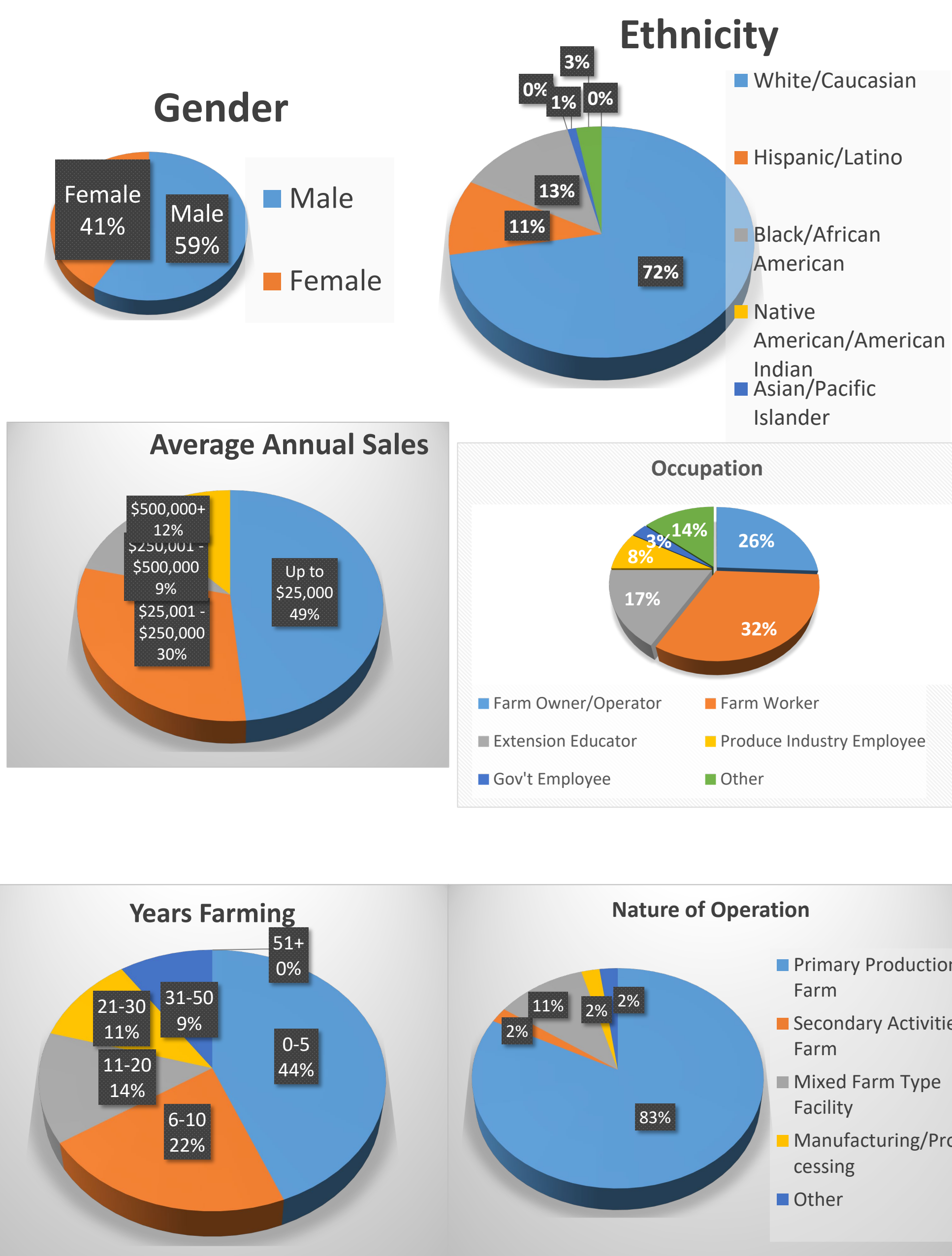
Short-term Outcomes – Knowledge Change



Challenges & Buyers



Participant Demographic Data



CONCLUSIONS

- Most participants were Caucasian, 59% male
- Almost half had < 5 years farming, while 20% had > 11 years farming
- ~60% were farm workers or owners and 17% were extension agents
- More than 80% were in primary farms and ~50% had sales < \$25,000
- Virtual participants gained in knowledge similar to face to face
- About 33% had to take training to comply with the rule and 26% for third party audit (GAP)
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Acknowledgements & Collaborators/Partners

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Increasing Engagement and Learning during PSA Grower Training Courses

ABSTRACT

The one-day standardized PSA Grower Training has received mixed reviews from small-scale growers who would like additional support and technical assistance implementing Produce Safety Rule (PSR) requirements. The 2019 North Central Region Center for FSMA Training, Extension, and Technical Assistance report shows that special populations of growers (minority, plain cloths, and limited English proficiency) generally score lower on the standardized pre-test and show less improvement than growers who do not identify with a special population when confronted with the traditional lecture based PSA Grower Training (Bhullar et al, 2019). Training that incorporates simulation, demonstration, discussion, peer-to-peer, and experiential learning is likely to better meet the cultural needs of the given audience and is consistent with the USDA Guide: Best Practices for Better Serving Socially Disadvantaged and Limited Resource Beginning Farmers and Ranchers.

Several two-day PSA Grower Training Courses that incorporated experiential learning and other interactive elements have been conducted across the southern region. Growers who attended these courses report a high level of enjoyment and engagement. Analysis of the PSA evaluations shows that growers attending these courses believe they have improved their knowledge and have greater confidence implementing food safety practices.

Incorporating hands-on activities into PSA Grower Training increases engagement and it is theorized that the increased engagement offered by the interactive course elements will lead to greater long-term learning outcomes and improved on farm food safety practices.

ANDRAGOGY

In 1973, Malcom Knowles published, *The Adult Learner: A Neglected Species*, in which he described how teaching adults is different from teaching children.

Knowles went on to further develop the theory of Adult Education as have many researchers since him, but the general principals of adult education have remained constant. Consider the way your fingers type your name on a keyboard without any effort. This skill was learned long ago and practiced for many years until the neuronal pathways developed so that you no longer consciously tell your fingers how to move. Now consider trying to type your name backward. From this short analogy, it becomes clear that it takes more than being presented with new information to motivate an adult to change practices or beliefs that have been long held. From typing to making it a habit to wash hands when one enters a packinghouse, a considerable amount of effort must go into making that change. As food safety educators, we must remember that asking a grower to change long held practices is literally like asking them to type their name backward. Knowles principals of adult education are summarized as:



- Adults are autonomous and self-directed. As produce safety educators, we can capitalize on this characteristic by involving growers in the development of training and providing them with options throughout the training.
- Adults have a lifetime of experiences to draw from in the creation of new knowledge. As produce safety educators, we can help them connect what they already know by asking them to share experiences and knowledge on a topic
- Adults are goal-oriented and practical. Unlike children, most adults are not seeking out educational opportunities unless they need the new knowledge or the credential to address a real challenge in their lives.
- Adults must be shown respect. Produce safety educators can show growers respect early on in the training by acknowledging the abundance of experiences and knowledge participants bring to the classroom.

OBJECTIVE

Determine if there are differences in self-reported knowledge gain and/or confidence implementing produce safety practices using aggregate data from PSA Grower Training Courses nationwide and for courses including elements of experiential learning.

METHODS

Evaluation data from four PSA Grower Trainings (n=63) that included hands-on learning were compared to unpublished nationwide data from the PSA (n>15,700). The courses including hands-on activities were held from June of 2018 to February of 2020. Specifically, Likert scores from self-perceived knowledge gain and confidence in implementing practices were analyzed using a simple t-test.



Photo from the first two-day PSA Training hosted by the Alabama A&M University Small Farms Research Center, June 13 & 14, 2018

RESULTS

- Analysis revealed no statistical differences when compared to national averages.
- Although the differences were not statistically significant, courses that incorporated hands-on learning tended to have higher self-perceived knowledge gain (6 out of 7 subjects analyzed) and higher confidence in implementing practices (6 out of 7 subjects analyzed). (See Table: Differences between self-perceived knowledge gain and confidence implementing



Photo from a two-day PSA Training hosted by Alcorn State University, March 13 & 14, 2019. Participants demonstrate how to use aseptic procedure to collect a water sample.

RESULTS

Table: Differences between self-perceived knowledge gain and confidence implementing practices

	Hands-on Learning Courses	PSA National Average (unpublished data)	Standard Deviation
Self-perceived Knowledge Gain			
General requirements in the PSR	4.44 (n=63)	4.47	.963
Worker health, hygiene, and training	4.6 (n=63)	4.44	.814
Soil amendments	4.56 (n=62)	4.47	.917
Wildlife, domesticated animals, and land use	4.56 (n=63)	4.44	.894
Production water	4.65 (n=63)	4.54	.786
Postharvest water	4.67 (n=63)	4.54	.783
Postharvest handling and sanitation	4.6 (n=63)	4.53	.853
Food safety plan	4.54 (n=63)	4.44	.895
Confidence Implementing Practices			
Committed to implementation of the PSR	4.62 (n=61)	4.6	.897
Worker health, hygiene, and training	4.52 (n=63)	4.52	.913
Soil amendments	4.49 (n=63)	4.47	.948
Wildlife, domesticated animals, and land use	4.46 (n=63)	4.4	.964
Production water	4.6 (n=63)	4.43	.794
Postharvest water	4.57 (n=63)	4.44	.856
Postharvest handling and sanitation	4.57 (n=63)	4.43	.875
Food safety plan	4.63 (n=63)	4.45	.809

CONCLUSIONS

- Actively involving growers in the learning process, allowing them to share their expertise, and providing opportunities for hands-on learning has the potential to achieve greater learning outcomes for growers attending the standardized PSA Grower Training.
- The small sample size in this study may have impacted the ability to identify to detect differences in self-perceived knowledge and confidence implementing practices. More research is needed to assess the impact to applying the principals of Adult Education to PSA grower Training.
- As a result of this analysis and to support the work of the Local Food Safety Collaborative, Woods and Brannon will develop a How to Guide to support trainers who wish to incorporate interactive elements for the development of effective produce safety training for small-scale growers and processors.

REFERENCES

- Bhullar, M., Enderton, A., and Perry, B. (2019). North Central Region Center for FSMA Training, Extension and Technical Assistance Annual Report.
- Knowles, M. (1973). The adult learner : a neglected species. Houston : Gulf Pub. Co.
- Produce Safety Alliance (personal communication, unpublished data)

Authors: Julia Fryer, Dr. Natacha Cureau, Dr. Amanda Philyaw Perez, Rip Weaver, and Angela Gardner

INTRODUCTION

As businesses, schools, and farmers markets closed due to the COVID-19 pandemic, produce farmers faced new challenges including market loss, increased public scrutiny of food safety practices, and the need to shift to an online presence. In response to these new challenges, the Local, Regional, and Safe Foods (LRSF) team at the University of Arkansas System Division of Agriculture Cooperative Extension Service developed resources for farmers to help them navigate through these unprecedented times.

METHODS

Survey of Stakeholder Challenges and Needs

Stakeholders provided feedback on new challenges, opportunities, and resource needs through a Qualtrics survey consisting of open-ended questions. The survey was distributed through social media, listserv emails, and a public link on our website.

Local Foods Open Space Discussion Webinars

The LRSF team hosted a series of webinars to collaborate with stakeholders that included:

- Guest speaker presentations
 - Open discussion with farmers and local foods community
- Archived recordings are accessible on our webpage and YouTube channel.

COVID-19 Resources

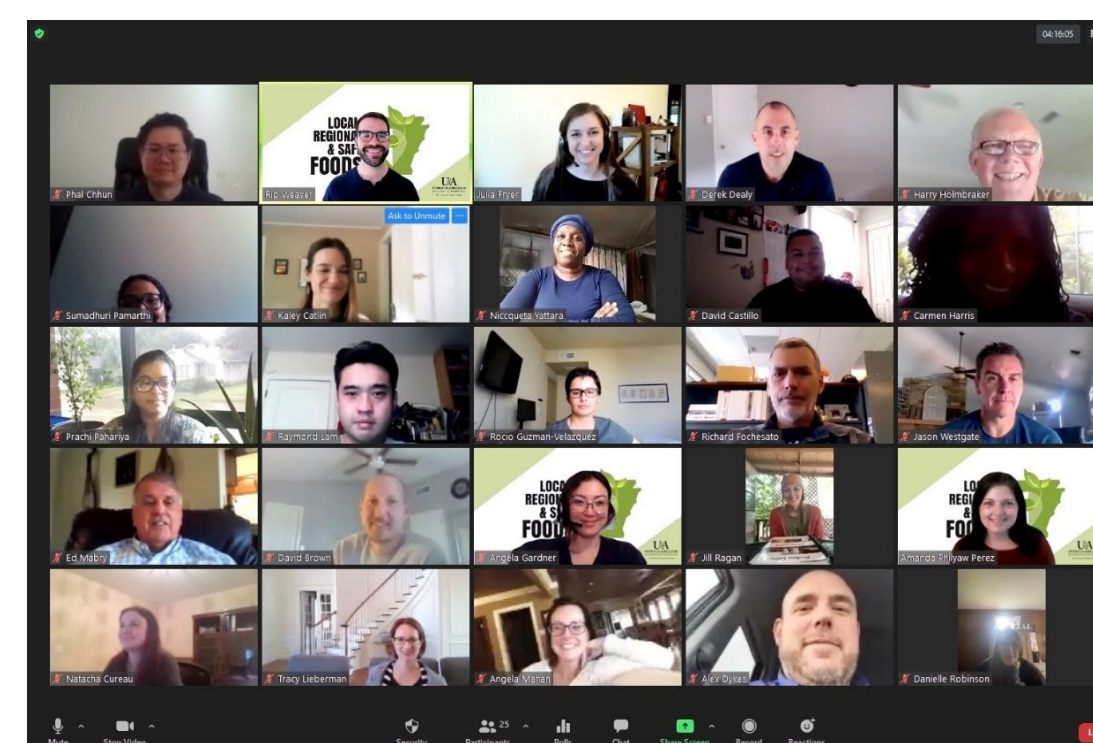
A new webpage was developed to share COVID-19 resources with Extension's stakeholders. Resources developed by the LRSF team were housed on this webpage and shared through Facebook, Instagram and email listservs.

Remote PSA Grower Trainings

Two remote Produce Safety Alliance Grower Trainings were hosted via Zoom. Many logistical aspects shifted due to the remote delivery:

- Training divided over two consecutive mornings
- Zoom technology test meetings with each participant
- Poll questions and other activities to increase engagement
- Trainers designated to monitor attendance, moderate the training, and monitor the chat box

Three more trainings are scheduled for 2020.



Resource Development Results

Written Materials

- Produce Safety Best Practices
- Worker Health and Hygiene
- Agritourism
- Shifting Markets
- Selling Safely at Farmers Markets
- CSA Programs
- Fall Farm Activity Guidance & COVID-19
- Small Business Resources

Remote PSA Grower Training

- May 11th & 12th
- September 23rd & 24th

Local Foods Open Space Discussion Topics

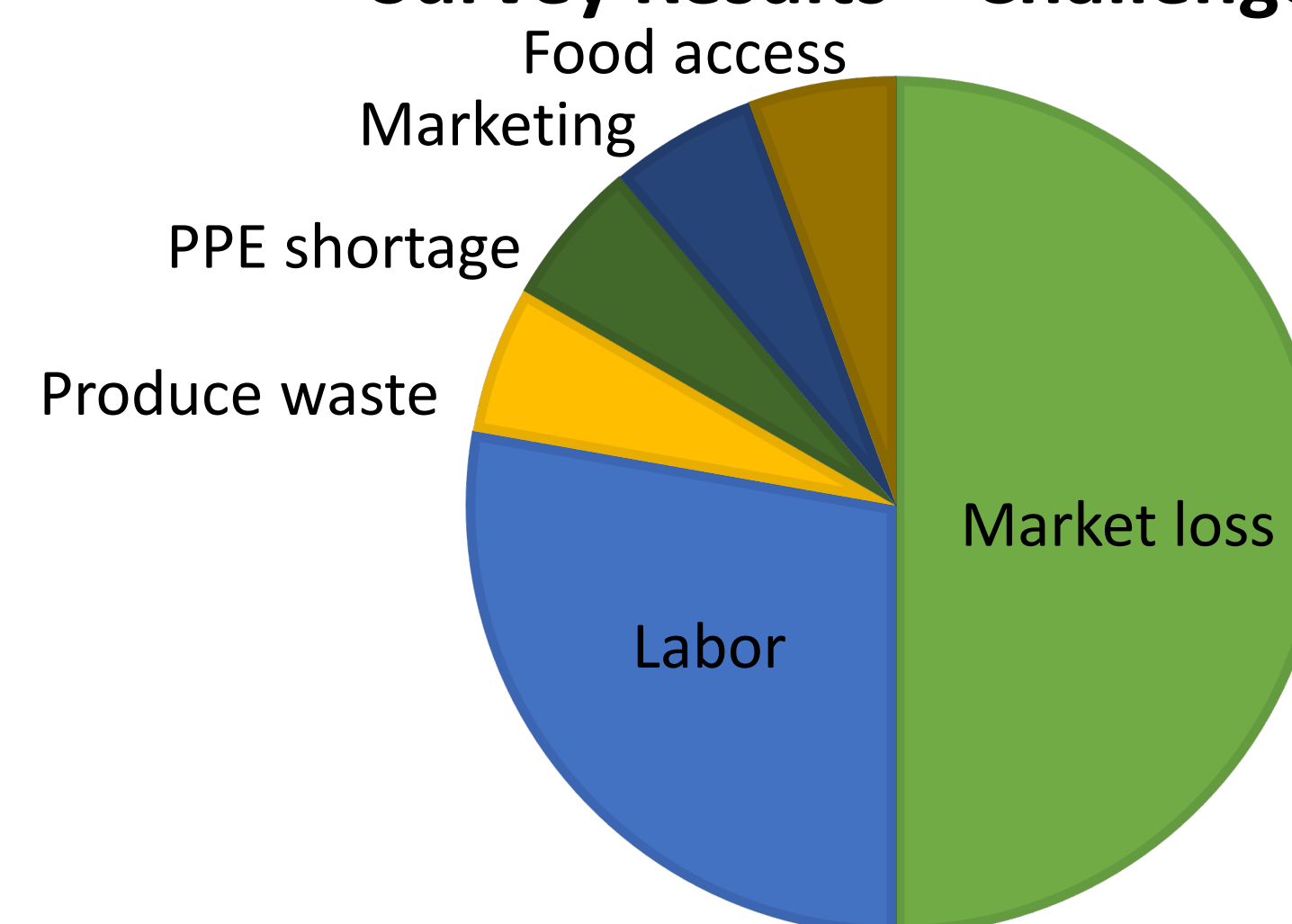
- U-Pick Farm Operations & Farmers Markets Guidance Update
- Taking Your Business Online & Safe Delivery and Pick-up Methods
- Farmers Market Response SNAP Benefits Expansion & Double-Up Food Bucks
- School Meals/Nutrition & Local Food Access
- Fall Farm Activities Amidst COVID-19

OUTCOMES

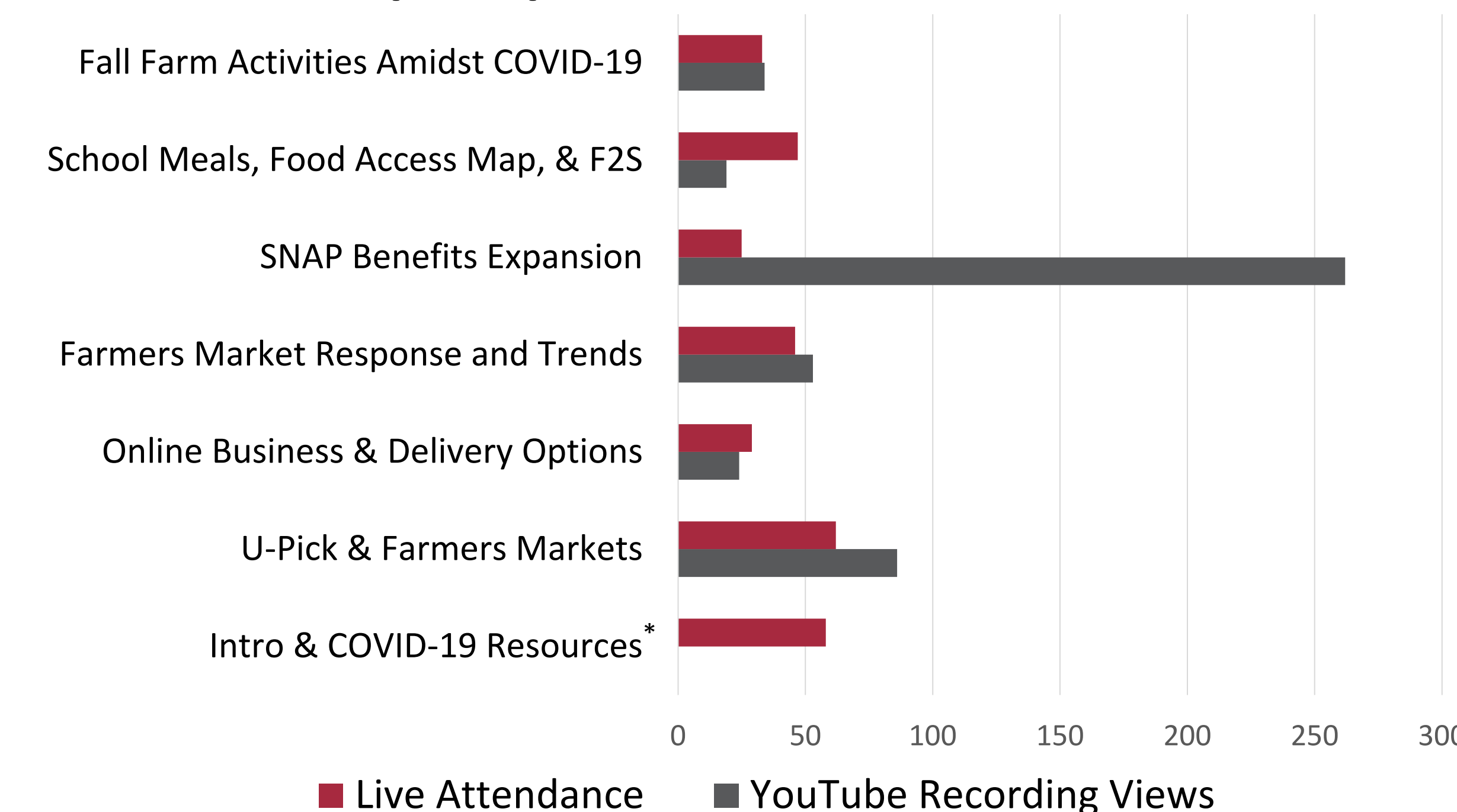
Survey Results

- 20 responses
- 16 requests for additional technical assistance
- 1,644 web resource views as of July 2nd

Survey Results – Challenges

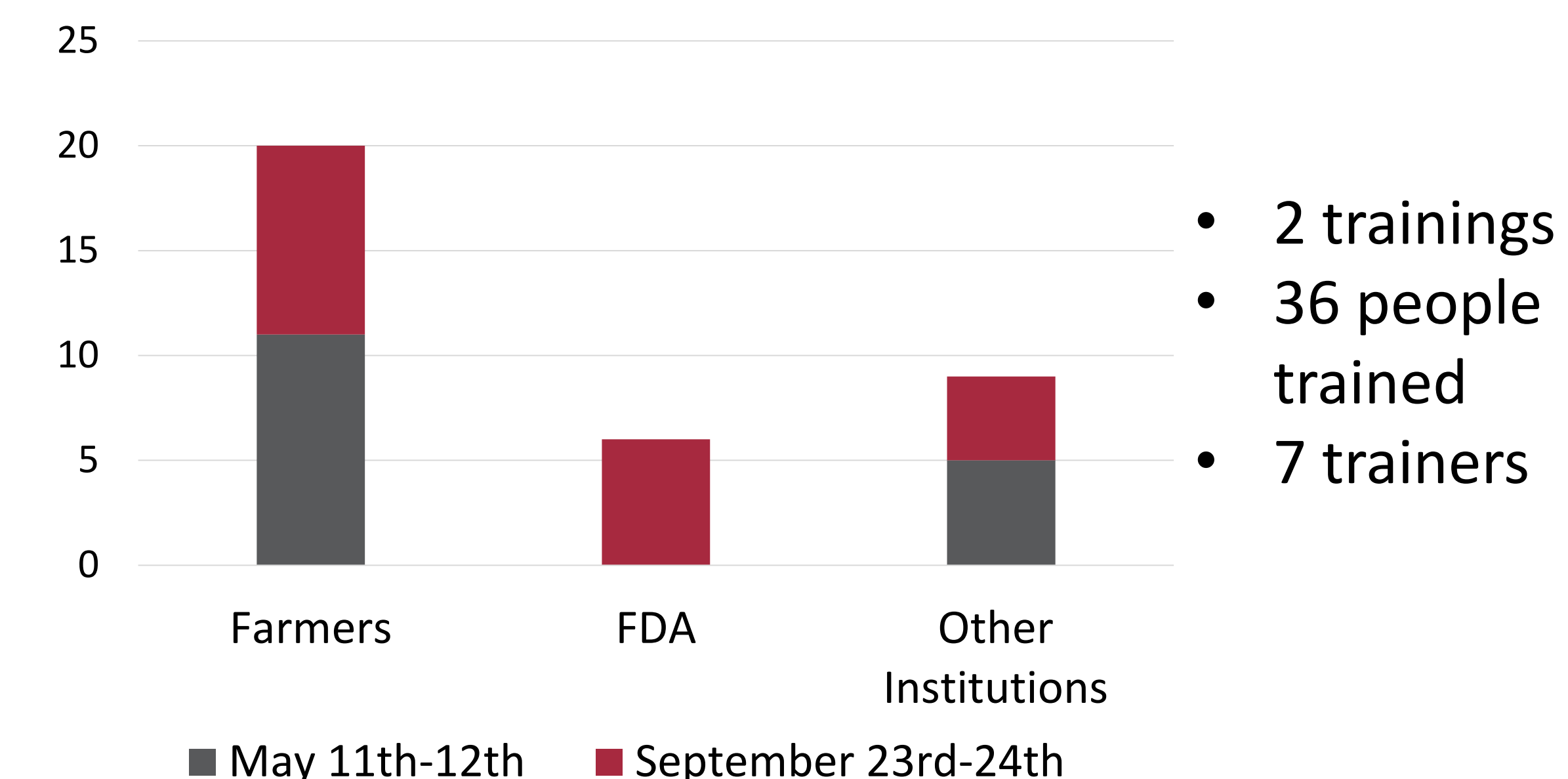


Local Foods Open Space Discussion Results



*This webinar was not recorded and uploaded to YouTube

Remote PSA Grower Training Results



- 2 trainings
- 36 people trained
- 7 trainers

CONCLUSION

By providing constant information and technical assistance, we were able to provide information to thousands of people and help farmers to continue running their operations safely during these uncertain times.

Resources

- www.uaex.edu/covid-19
- www.uaex.edu/localfoods
- www.facebook.com/localfoodsUAExtension

Factors Associated with the Implementation and Documentation of Risk Management Practices

on Strawberry Farms in the Southeastern United States

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Introduction

From 1998 to 2012, 10 foodborne disease outbreaks (FBDO) attributed to contamination of U.S.-grown fresh strawberries were reported in the U.S. A previous study identified four risk factors for increased prevalence of generic *E. coli* in the production of strawberries. Of particular interest was the identification of differences among growers suggesting specific farm factors influence the microbiological quality and safety of the strawberries. The majority of strawberries for commercial use come from two states—California and Florida—while the remainder are spread across the U.S. In the Southeastern U.S., the average strawberry farm is less than 5 acres with the exception of Florida. However, even within a high strawberry-producing state such as Florida, most strawberry production farms (~53%) are less than 15 acres and over half of those are less than one acre in size. As implementation of risk management practices can be affected by scale, small-scale growers may face unique barriers.

Purpose & Objectives

To characterize the farm, business, and risk management practices among strawberry growers in the Southeastern U.S.

Objectives

- Describe use and trends of practices
- Determine gaps in risk management practices
- Determine differences, if any, in use of risk management factors among growers of different scale

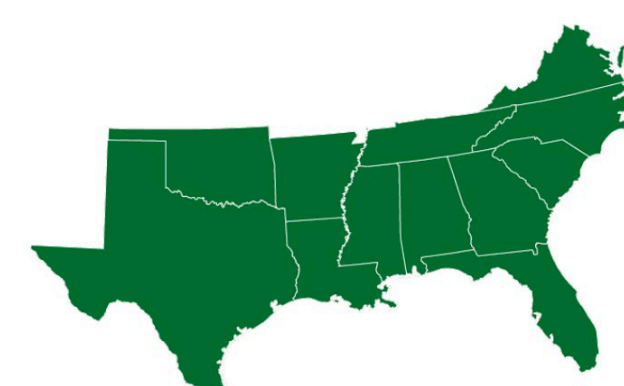
Methods

Survey Development

- Characterize business operation, crop production, and risk management practices
- Focus on GAPs and the Produce Safety Rule
- Input on content from local growers and extension agents

Distribution

- Distributed via mail and web campaign
- Thirteen Southeastern United States
- Identify through local, state, and university organizations
- Exhaustive web search for individual growers



Results

- Farm size ranged from 1-10,00 acres with 0.06-600 acres dedicated to strawberry production.
- The majority of growers did not report their income; however, those who did report most often fell within \$25,001 to 250,000
- The majority of growers had written food safety plan but NOT third-party audits

What is the total acreage of your farm?

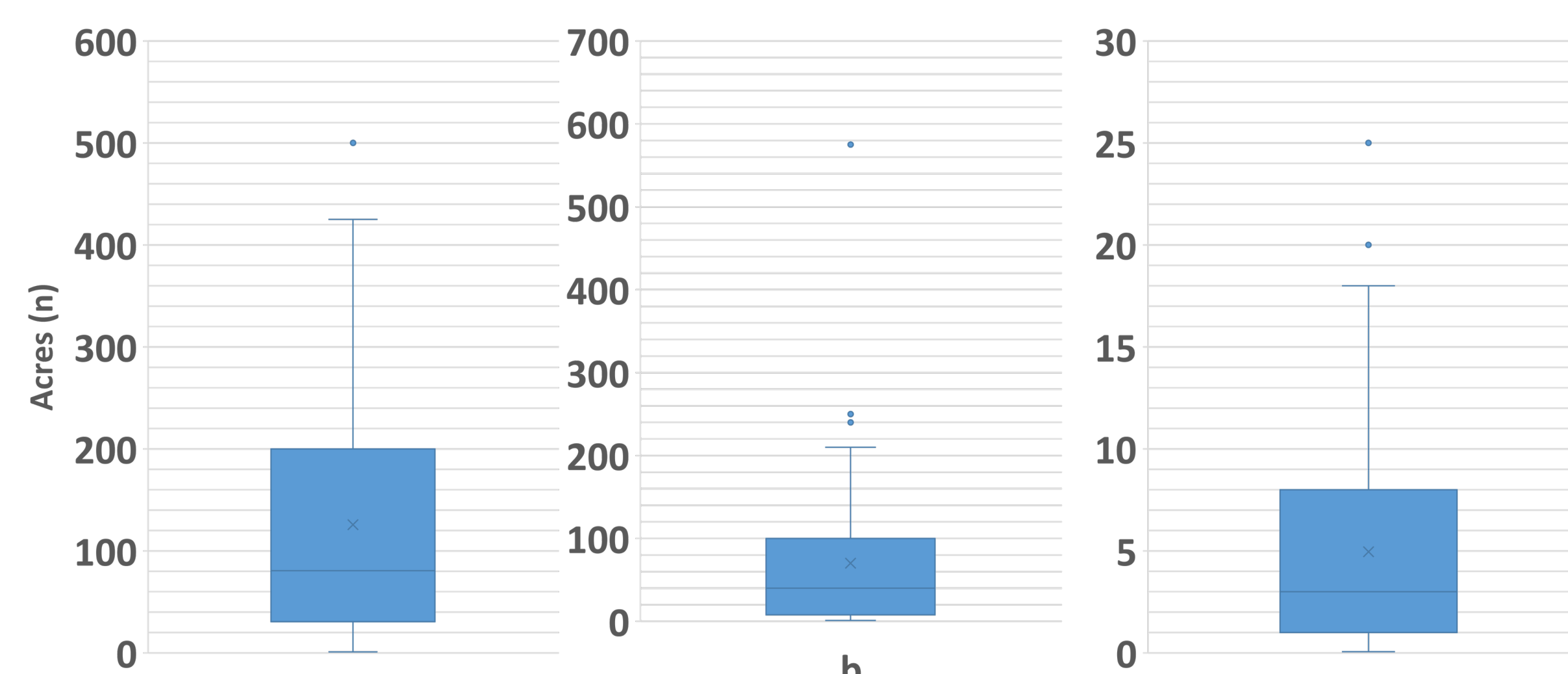


Figure 1 Farm Acreage. Responses broken down by total acreage (a), acreage for crop production (b), and acreage for strawberry production (c) with outliers removed.

What is your total farm revenue from strawberry production?

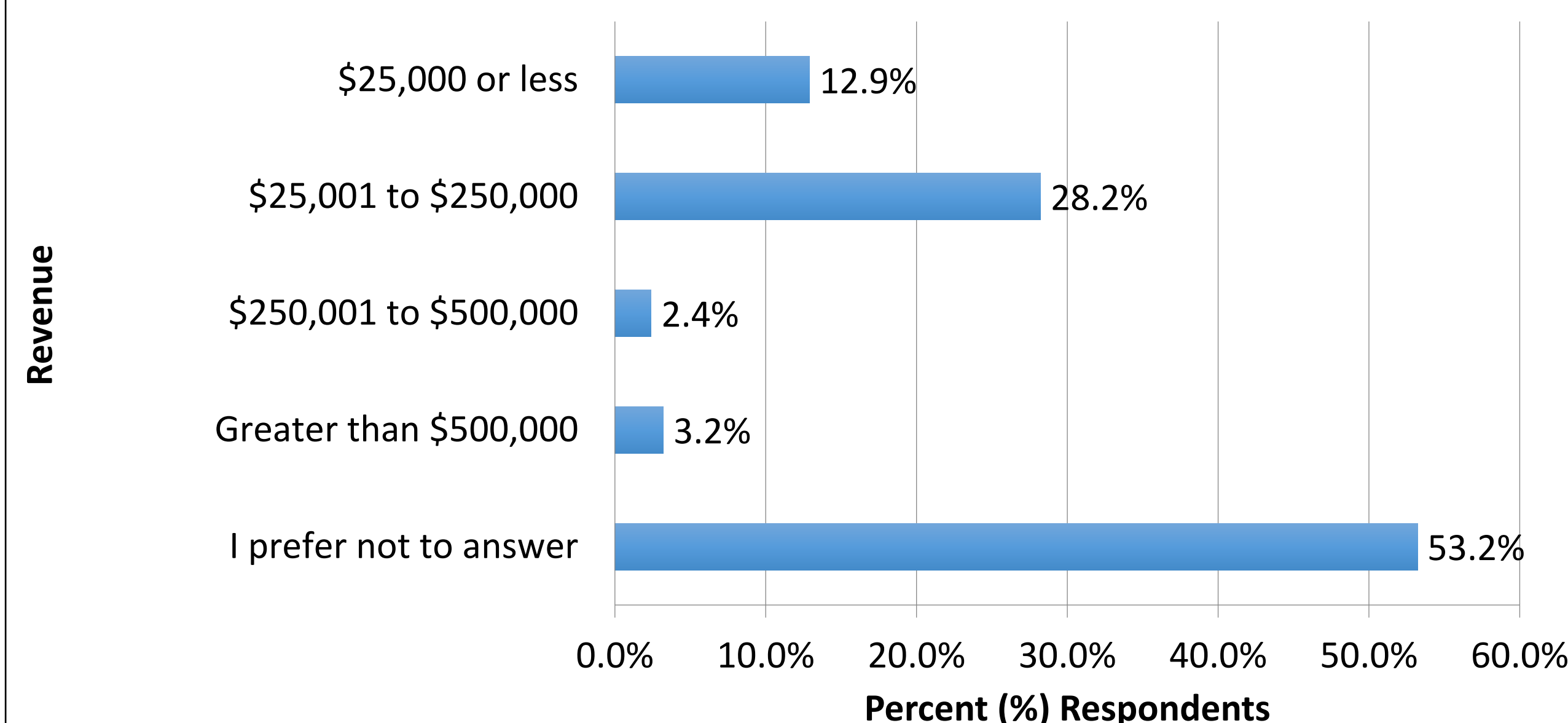
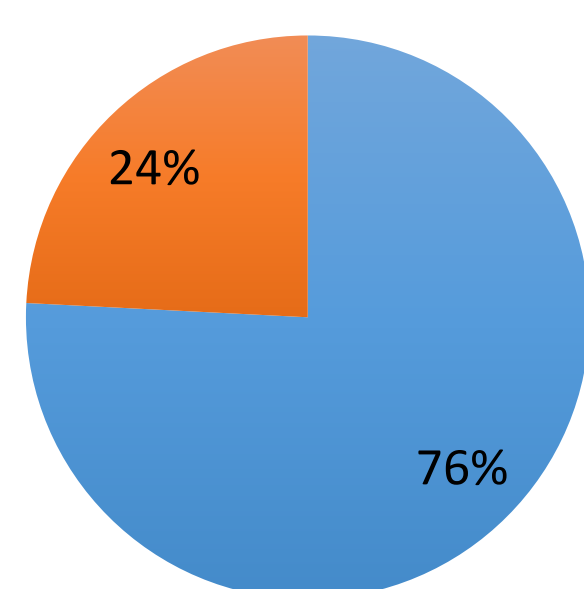
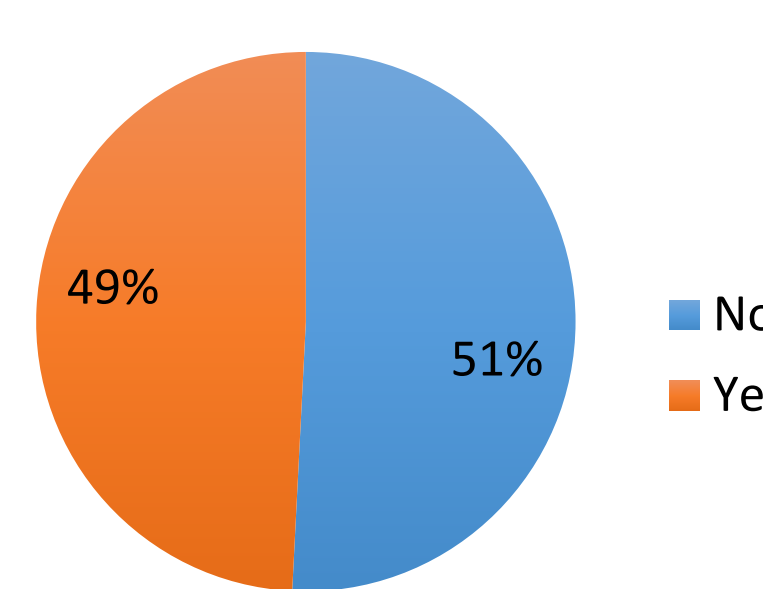


Figure 4 Total Revenue. Total Revenue for strawberry production. The majority of growers chose not to answer

Has your farm received third-party audit?



Do you have a written food safety plan?



Results

- There was a general linear increase in the use and documentation of risk management practices based on acreage and revenue
- Growers with a third-party audit or written food safety plan were more likely to use and document risk management practices

Chi-Square Test of Association Between Farm Characteristic and Risk Management Practices.

Query	Farm Characteristic (p-value)			
	Acreage	Revenue	Third-Party Audit	Written Safety Plan
Have you or any of your employees attended food safety training?	3.13 (0.372)	3.33 (0.343)	6.76 (0.009)	24.1 (<0.001)
Do you use application guidelines for soil amendment?	5.22 (0.156)	6.12 (0.047)	0.74 (0.39)	5.99 (0.014)
Do you collect samples for pre-harvest water testing?	5.28 (0.152)	8.22 (0.042)	23.5 (<0.001)	16.1 (<0.001)
How often do you collect sample?	7.2 (0.303)	10.7 (0.097)	3.1 (0.212)	4.77 (0.092)
Do you monitor for animal intrusion?	3.91 (0.272)	2.91 (0.406)	3.27 (0.071)	6.43 (0.011)
Do you take measures to prevent animal intrusion?	4.82 (0.186)	1.47 (0.69)	3.38 (0.066)	6.48 (0.011)
Do you conduct a pre-harvest assessment?	1.52 (0.677)	3.36 (0.339)	0.29 (0.589)	9.68 (0.002)
Do you label you produce containers with your farm information?	5.77 (0.123)	5.29 (0.152)	8.47 (0.004)	16.3 (<0.001)

Note: values are Chi-Square test statistic and p-value

Conclusions & Future Work

- Our results indicate that Southeastern U.S. strawberry growers have significant differences in risk-management practices based on farm characteristics
- As such strawberry growers may benefit from context-specific education focused both scale-related capacity constraints and technical training to increase their familiarity with food safety risk-management practices
- Based on the results of the survey as well as qualitative interviews and environmental assessments a commodity-specific education will be developed for exempt and very-small strawberry growers in the Southeastern U.S. ideally harvesting strawberries on <2 acres

Acknowledgments

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On-Farm Environmental Assessments of Very Small to Small-Sized Strawberry Farms in the Southeastern United States



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INTRODUCTION

Enhancing the safety of fresh produce through implementation of on-farm risk management practices (RMP) is a priority within the FSMA Produce Safety Rule. More specifically, fresh strawberries are vulnerable to on-farm contamination and have been associated with foodborne disease outbreaks. Between 1997 and 2017, 32 strawberry-associated outbreaks were reported, sickening 933 Americans. A variety of factors can impact implementation of RMP, particularly on very small to small-sized strawberry farms. On-farm environmental assessments can identify these key factors for implementing the RMP; a successful implementation of an intervention needs to consider the environmental context.

OBJECTIVE & RESEARCH QUESTION

- **Objective:** Determine the physical attributes of very small strawberry farms (two acres or less) in the southeastern U.S. (SEUS) for implementation of RMP.
- **Research question:** What physical attributes are available to implement RMP on very small strawberry farms in the SEUS?

METHODS

- A checklist was created to collect data about farm characteristics and physical attributes associated with implementing 7 RMP -- worker health hygiene, agricultural water, animal control, biological soil amendments (BSA), harvesting and packing, storage and transportation, and post-harvest handling.
- Data collectors were recruited from 9 southeastern states -- Alabama, Arkansas, Georgia, Kentucky, Mississippi, North Carolina, Oklahoma, Texas, and Virginia and were trained.
- On-farm visits were conducted on 17 farms (two acres or less); a map of each farm was sketched during on-farm visits.
- Descriptive statistics on all variables were performed to determine the frequencies of the physical attributes of the farms.

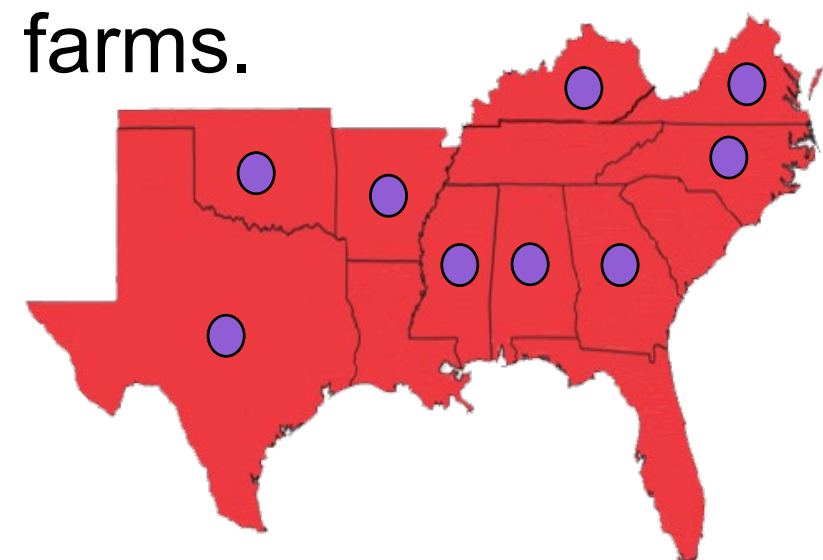


Figure 1. Recruited farms in the SEUS

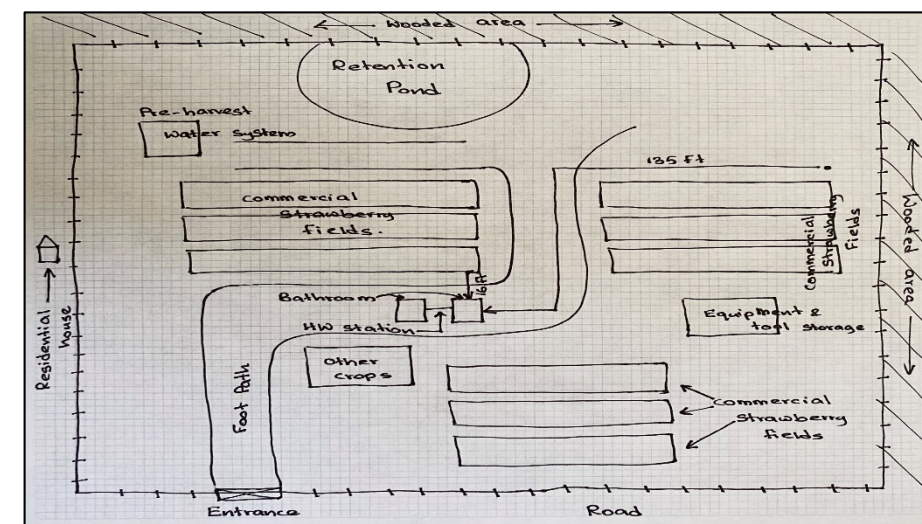


Figure 2. Example of the farm layout

RESULTS

Farm Characteristics:

- All 17 farms (100%) used plasticulture to grow strawberries.
- Sixteen farms (94%) grew other crops; 12 (71%) farms raised animals in addition to strawberries.
- Eleven out of 17 farms (65%) operated U-pick.

Worker Health and Hygiene

- Of the 17 farms, protective clothing during harvesting, packing, and BSA handling were provided by 11 (53%), 7 (50%), and 2 (14%) farms, respectively.
- The most commonly provided protective clothing were gloves and face mask, provided by 11 (65%) and 10 (59%) of the farms, respectively.
- Fifteen farms (88%) did not have a spill kit to clean up bodily fluids, such as vomit/diarrhea.
- Sixteen out of 17 farms (94%) had adequate toilets that were conveniently located (within ¼ mile) (94%). Of those 16 farms, more than 80% had toiletry resources (Figure 3).
- The number of available handwashing stations (HWS) on three farms has not been reported and 13 of the remaining 14 farms (93%) had adequate HWS that were conveniently located. Of those (n=13), more than 90% of farms had basic resources in HWS (Figure 3).

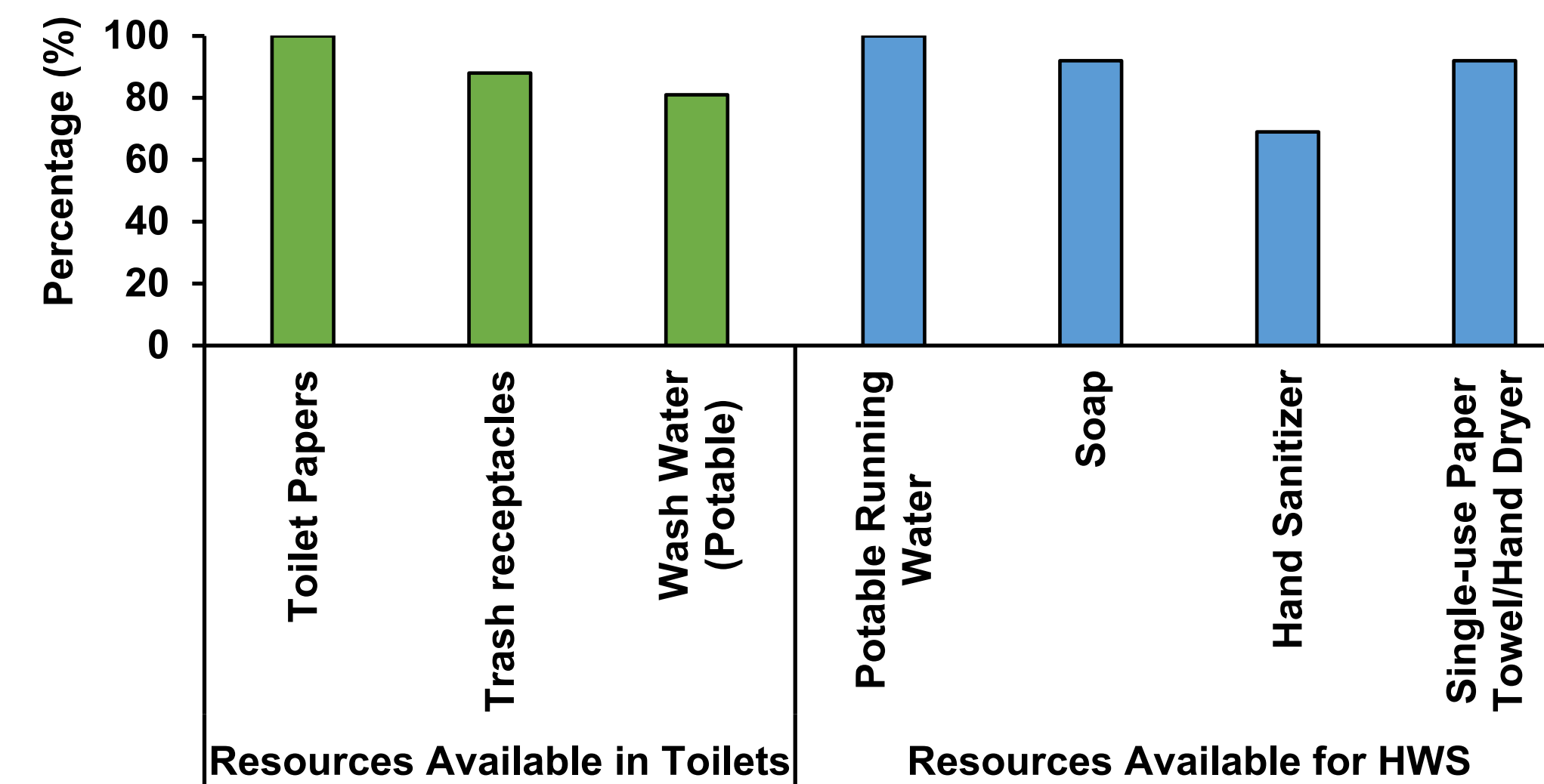


Figure 3. Resources available in toilets and HWS

Agricultural Water

- Fourteen farms (82%) used ground or surface water for irrigation (Figure 4). Of these, 71% (n=14) had no subsequent water treatment, and 50% lacked water testing to determine concentrations of *Escherichia coli*.
- All 17 farms (100%) used drip systems for irrigation, and nearly all (88%) farms installed backflow devices in the water distribution system.

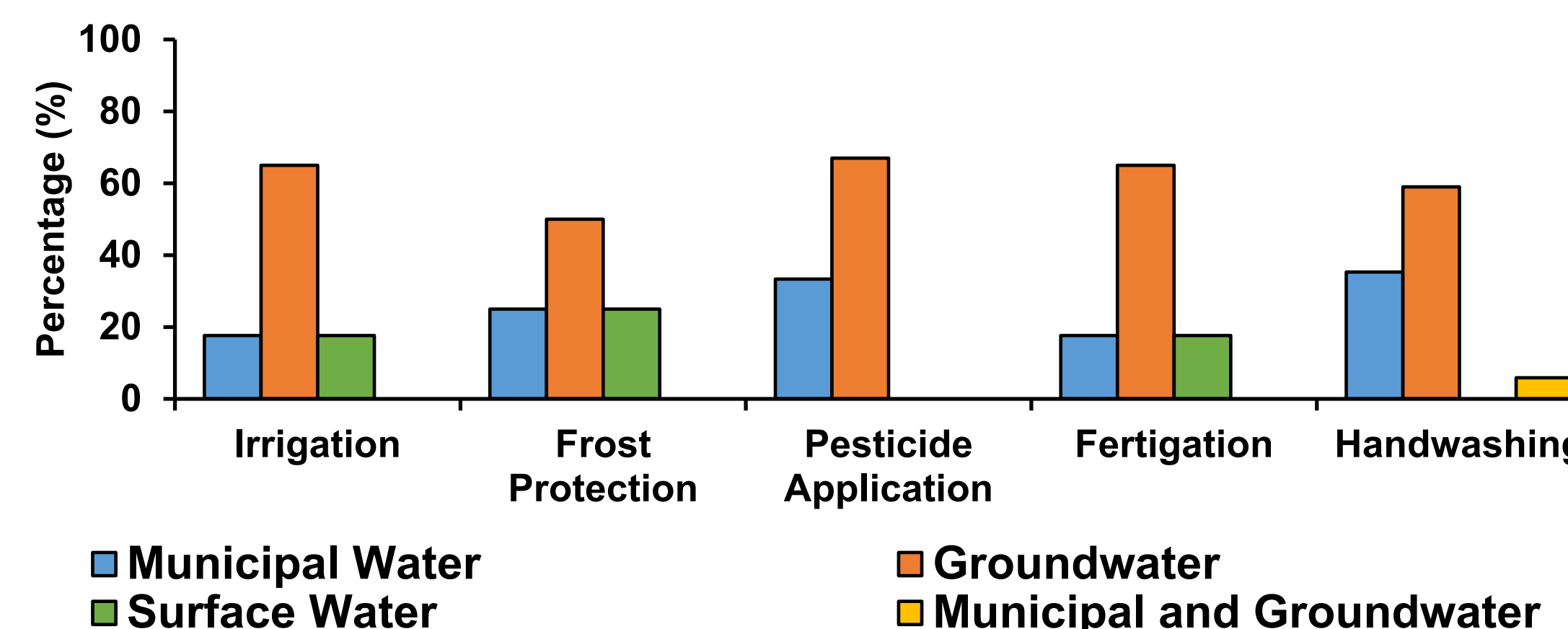


Figure 4. Source of water use for pre-harvest activities

Animal Control

- Nearly all farms (94%) used fences as the animal control measure (Figure 5).

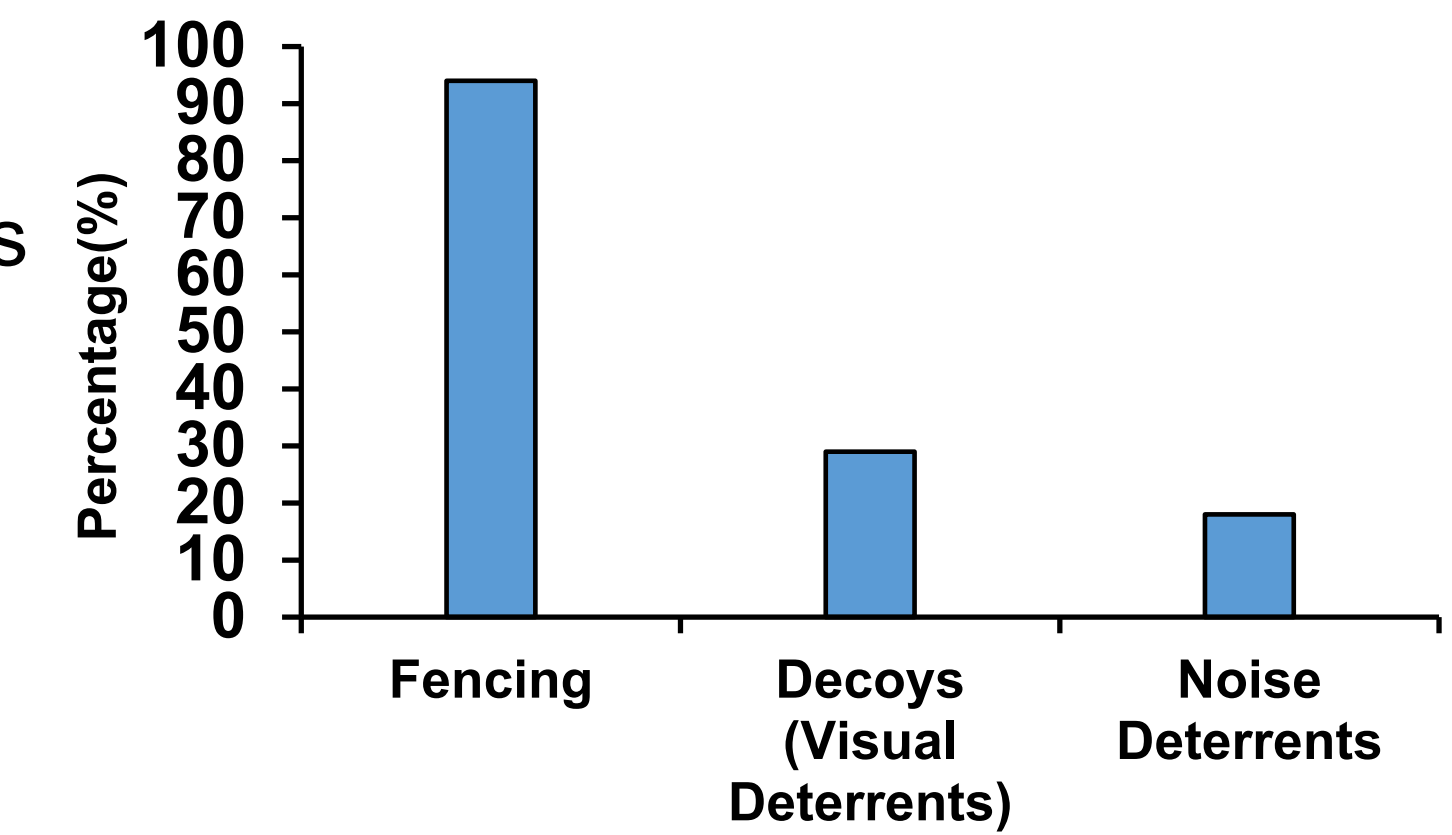


Figure 5. Animal prevention measures

BSA Handling

- Three farms (18%) used BSA and two of them stored BSA on the farm. The contamination prevention measures established for BSA storage were established away from high foot traffic area (2 farms) and established in a covered place (1 farm).

Harvesting and Packing

- Sixteen farms (94%) used harvest tools, and the most used harvest tool was the harvest carts (44%).
- Bucket/pail, clamshell, box, and bin were used as harvest containers by 16 (94%), 5 (29%), 5 (29%), and 1 (6%) farms, respectively.

Storage and Transportation

- Eight of 17 farms (47%) transported packed strawberries, but only 4 of them had separate vehicles to transport strawberries.

Post-Harvest Handling

- Of the 17 farms, 4 farms (24%) conducted strawberry processing activities. Of those (n=4), three farms conducted slicing, washing, and cooling, and two farms conducted freezing, coring, and manufacturing food items.

CONCLUSIONS

- The physical attributes available to implement RMP on many of these farms include drip irrigation systems (100%), fences (94%), toilets (94%), HWS (93%), and backflow devices (88%).
- Several physical attributes identified which can impede RMP implementation include lack of bodily fluid spill kit (88%) and use ground and surface water (82%) with lack of water testing for microbial quality (50%).
- The findings can be used to inform the development of training and education interventions aimed at increasing RMP adoption for very small to small-sized strawberry farms.

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FSMA PSR Subpart D: Worker Training, Health and Hygiene Training Curriculum

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Background and Project Importance

The Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR) establishes science-based minimum standards for the safe growing, harvesting, packing, and holding of produce on farms. Operations covered under the FSMA PSR must meet standards for worker training, health, and hygiene (subpart D). Produce operators (e.g., growers, packers) subject to the PSR will need to comply with the new worker training, health, and hygiene requirements.

Objective

To create a comprehensive training curriculum that satisfies the requirements of the PSR as it relates to subpart D.

Methods

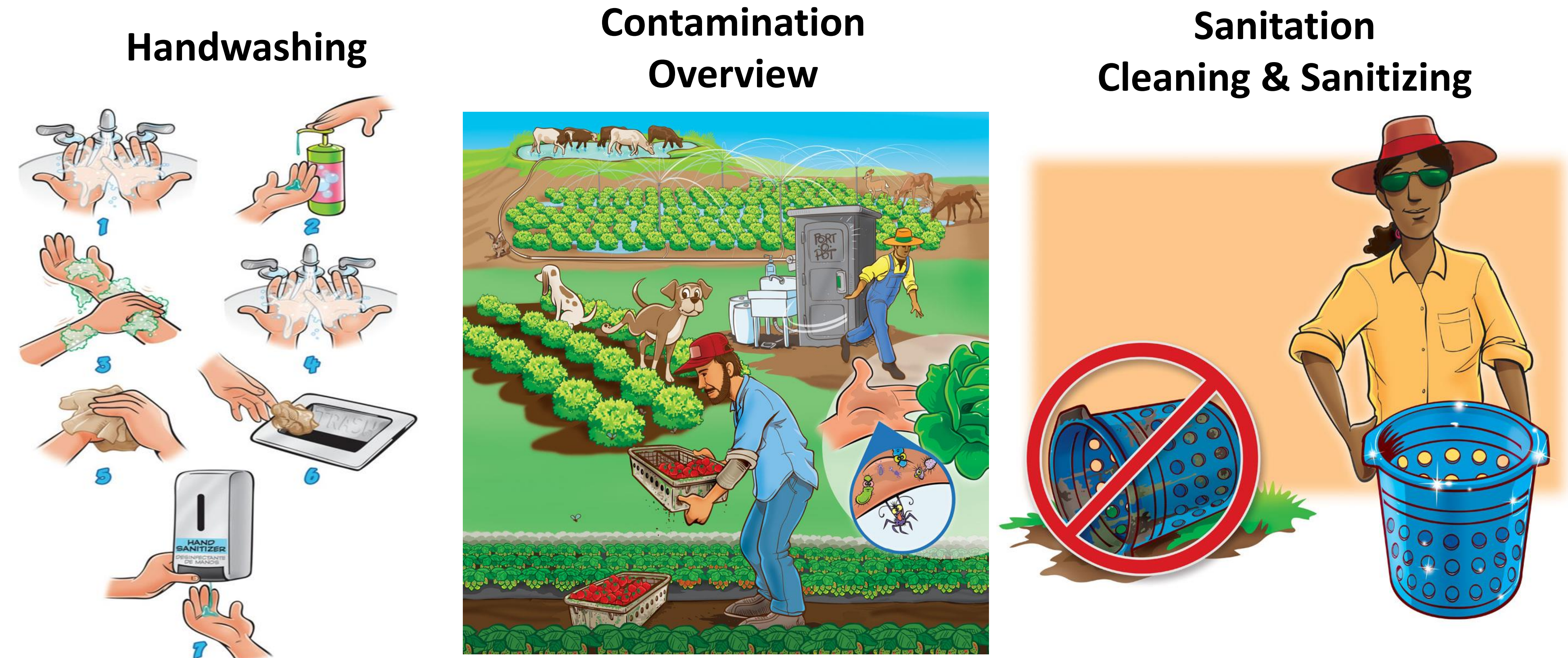
In partnership with several produce safety specialists and the Virginia Department of Agriculture (VDACS), this curriculum was created using the framework of the PSR in the code of federal regulations and other PSR guidance and educational documents.

Results

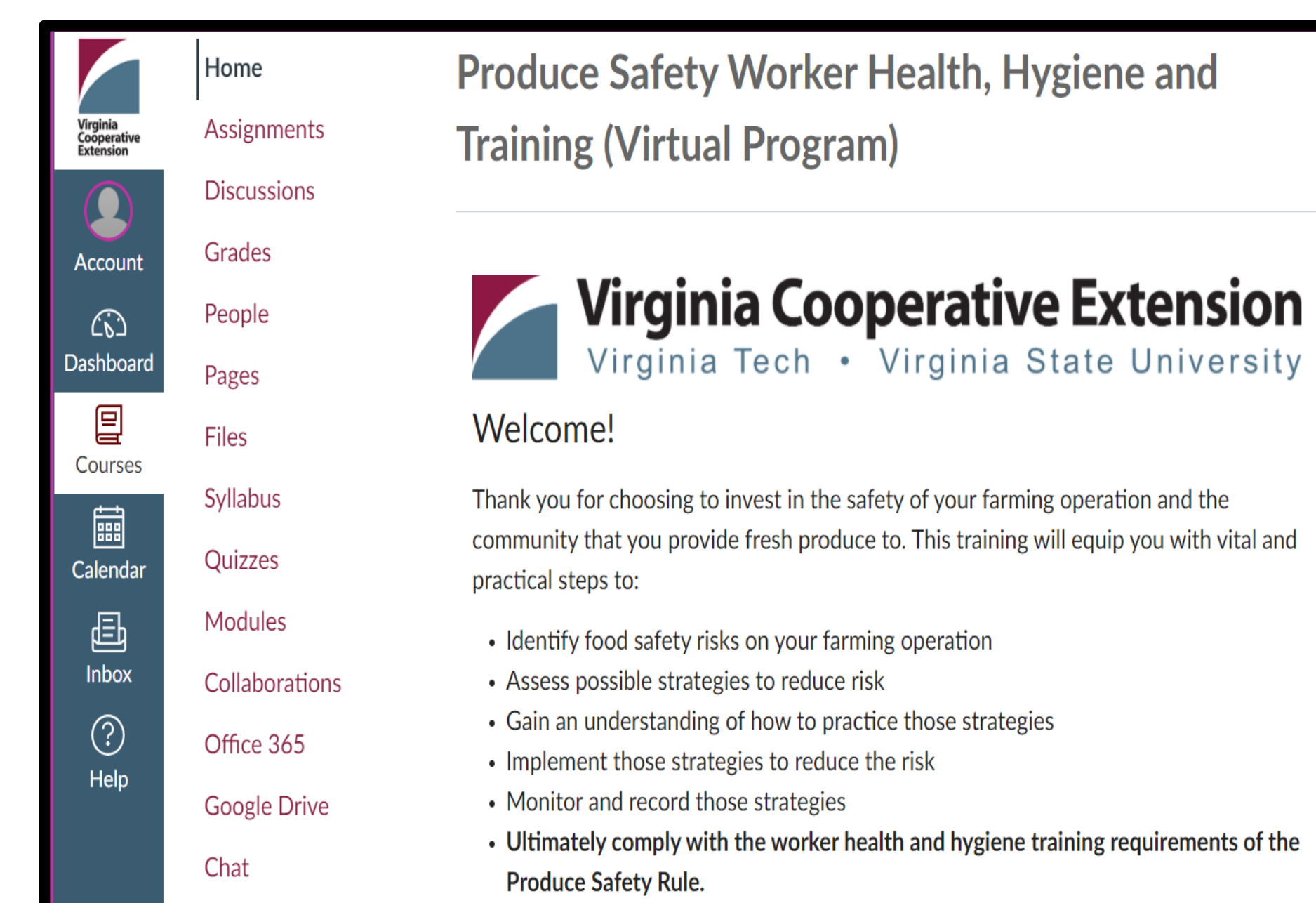
The training curriculum incorporates visual representations, and in-depth explanations of personal health and hygiene standards established by the PSR; as well as content and resources which will support a farm or packinghouse to confidently train their workers. The training will take approximately one hour to complete and covers the following sections: worker health and hygiene; wild and domesticated animals; soil amendment use; post-harvest handling and sanitation; and worker training, health and hygiene record keeping. The training is available virtually through Virginia Tech's online learning portal (VT Canvas). In addition, VCE agents have been trained to present this curriculum around the Commonwealth.

Significance

To our knowledge, no known training curriculum existed that was specific to only the worker training requirements of the PSR. This curriculum provides produce operators with the necessary resource to comprehensively meet the requirements of the PSR as it relates to subpart D. Registration for the curriculum can be accessed at <https://tinyurl.com/y35jdppm>



Online Curriculum



Grower perspective video

