

North Central Region Center for FSMA Training, Extension and
Technical Assistance

Produce Safety Alliance Grower Training Knowledge Assessment Results

Regional Results, 2021

This report was prepared by
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Introduction

The Food Safety Modernization Act (FSMA) was passed by Congress, and then in January 2011, signed into law by President Obama. The law consists of seven Rules, including the Produce Safety Rule, which applies to those who grow, harvest, handle or pack fresh fruits and vegetables. One requirement of the Produce Safety Rule is that fruit and vegetable growers take an approved food safety course. The Produce Safety Alliance (PSA) Grower Training is the first approved course and is offered in the North Central Region by several partners of the North Central Region Center for FSMA Training, Extension and Technical Assistance (NCR FSMA).

Between July 1, 2020, and June 30, 2021, NCR FSMA partners offered and evaluated 52 PSA Grower Trainings. Of these trainings, 30 were offered using remote delivery, because of the COVID-19 pandemic. In collaboration with partners, the NCR FSMA evaluated these trainings using a knowledge assessment. This report shares the results from trainings held in year 4 (2020-21).

Methods

The knowledge assessment was developed by Dr. Catherine Shoulders at the University of Arkansas. The knowledge assessment is a quiz with 25 questions related to the seven modules of the PSA Grower Training. The NCR FSMA has been utilizing the knowledge assessment since 2017.

Training participants were asked to complete the quiz before beginning the training and again after the training. Remote delivery participants completed the assessment online and face-to-face participants completed it on paper. The online survey was conducted using a Qualtrics survey, which the NCR FSMA evaluation team set up. Pre-test and post-test responses were matched using a unique identification number or word, along with the date of the training, and the state.

Only responses which included both a pre-test and a post-test from the same person were included in the analysis. (In a few cases, a person completed only the pre-test or only the post-test.) The evaluation team received 511 complete responses in year 4. In total, 3,703 complete responses have been received from the region since year 1 (2017-18), from 235 trainings.

The NCR FSMA evaluation team analyzed the data using SPSS™.

In addition, training organizers completed a cover sheet for each training. The cover sheets provided information including the date of the training, the location, names of trainers, the number of participants, types of supplemental educational activities conducted during the training, and whether the training was targeted towards any special population. Special populations tracked included Plain clothes growers (which includes Amish and Mennonite growers), minorities, local food growers, military veterans, non-English/limited English language, and other. In year 4, trainings were held for Plain clothes growers, local food growers, and regulatory professionals from the FDA and Michigan Department of Agriculture and Rural Development.

Year 4 saw a proliferation of multi-state trainings, when NCR FSMA partners jointly taught remote trainings. Kansas and Missouri held five joint trainings, with 54 participants responding to the knowledge assessment. Iowa and Nebraska held two joint trainings, with 43 respondents. Finally, Nebraska, North Dakota, and South Dakota held one joint training, with seven respondents.

While the Wisconsin Department of Agriculture, Trade, and Consumer Protection held two trainings in year 4, they did not conduct the knowledge assessment, because of a change in staff responsibilities at DATCP.

While data from more trainings was submitted in year 4 for the knowledge assessment (52) than in year 3 (50), the number of respondents was lower in year 4 (511 versus 893, Table 1). This is because the average number of participants in the trainings in year 4 (13) was lower than in year 3 (18).

Table 1: The number of responses to the knowledge assessment has declined steadily since year 2.

	# of responses					# of trainings				
	Year 1 2017-2018	Year 2 2018-2019	Year 3 2019-2020	Year 4 2020-2021	Total	Year 1 2017-2018	Year 2 2018-2019	Year 3 2019-2020	Year 4 2020-2021	Total
SINGLE STATE TRAININGS										
Illinois	-	86	179	-	265	-	5	7	-	12
Indiana	91	161	57	166	475	9	14	5	22	50
Iowa	184	164	131	13*	492	11	14	9	2*	36
Kansas	57	59	64*	*	180	3	6	4*	*	18
Michigan	-	277	178	185	640	-	13	8	16	37
Minnesota	131	276	71	43	521	5	15	5	4	29
Missouri	62	155	109*	*	326	3	10	5*	*	18
Nebraska	54	12	15	*	81	2	2	1	*	5
North Dakota	-	-	-	*	-	-	-	-	*	-
Ohio	-	-	-	-	-	-	-	-	-	-
South Dakota	9	16	-	*	25	1	1	-	*	2
Wisconsin	179	326	82	-	587	6	13	5	-	24
MULTI-STATE TRAININGS*										
Kansas and Missouri	-	-	7	54	61	-	-	1	5	6
Iowa and Nebraska	-	-	-	43	43	-	-	-	2	2
Nebraska, North Dakota, and South Dakota	-	-	-	7	7	-	-	-	1	1
Total	767	1,532	893	511	3,703	40	93	50	52	235

*See multi-state trainings.

Results

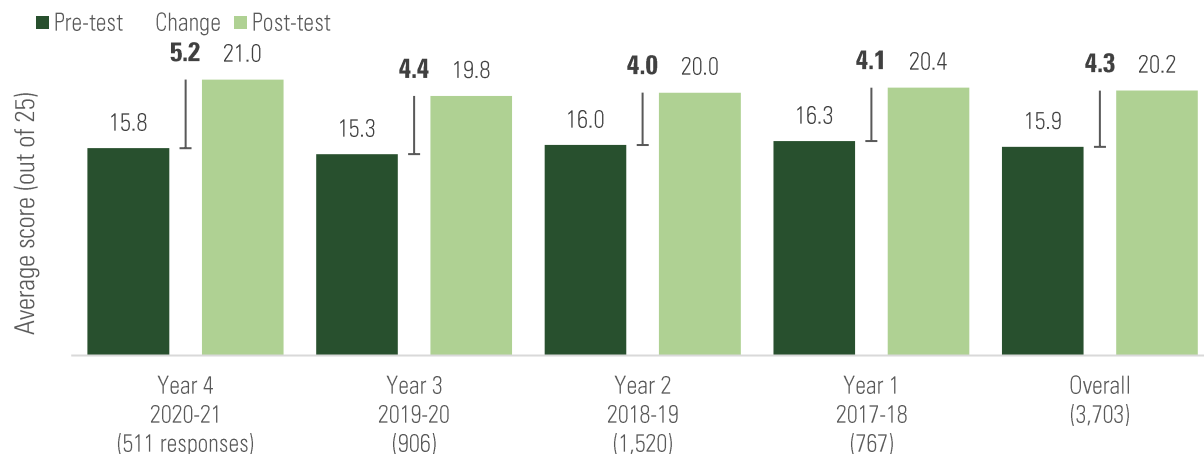
How much did respondents' food safety knowledge improve during the training?

Participants learned more from trainings held in year 4 than previous years.

In year 4, the average pre-test score of respondents (15.8 points of 25) was higher than previous years (Figure 1). An independent sample t-test showed that pre-test scores in year 4 were no different from previous years ($p=0.273$), concluding that participants came to the training with a similar baseline knowledge in year 4 as in previous years.

The average post-test score in year 4 (21.0) was also higher than in previous years. The difference in scores between year 4 and previous years was statistically significant ($p=0.001$), meaning the participants left the training in year 4 with higher knowledge than participants in previous years. Finally, scores improved on the test by 5.2 points, on average, in year 4, which is higher than previous years ($p=0.001$). The difference in average score change between year 4 (5.2 points) and previous years aggregated (4.1 points) is statistically significant ($p=0.001$), so one can conclude that participants learned more in year 4 than in previous years.

Figure 1: On average, post-test and change scores were higher on the knowledge assessment in year 4.
(3,703 respondents)

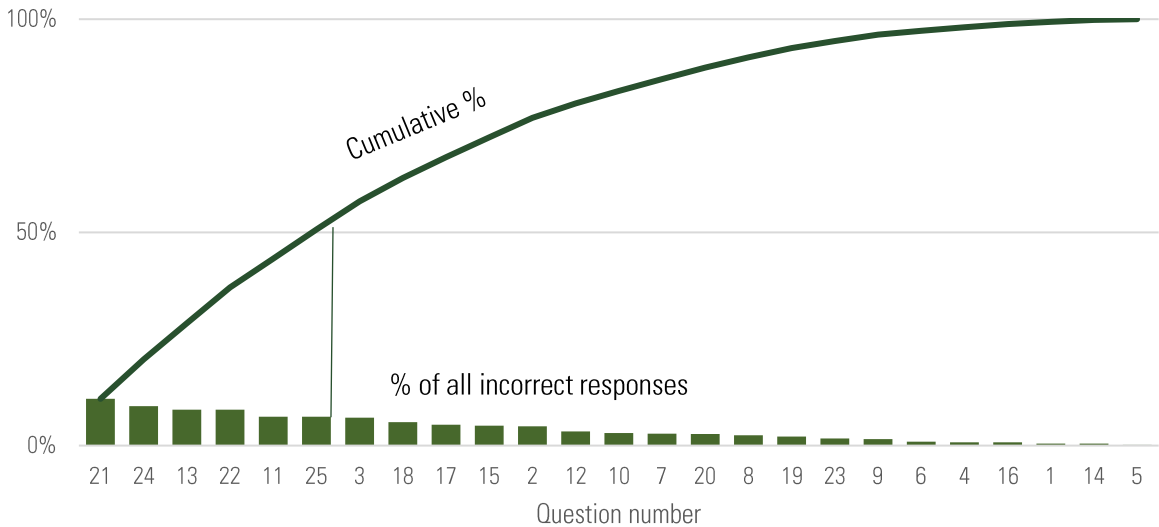


Which questions were still unclear even after the training?

The same “tricky questions” continue to be difficult for respondents to correctly answer year after year.

A few questions on the knowledge assessment were particularly difficult for respondents to answer correctly, even after participating in the course. The questions that were most often answered incorrectly on the post-test in year 4 were questions 11, 13, 21, 22, 24, and 25 (Figure 2). These questions have been identified as difficult in previous years, and year 4 was no different.

Figure 2: Over half of all incorrect responses on the post-test were from 6 questions.



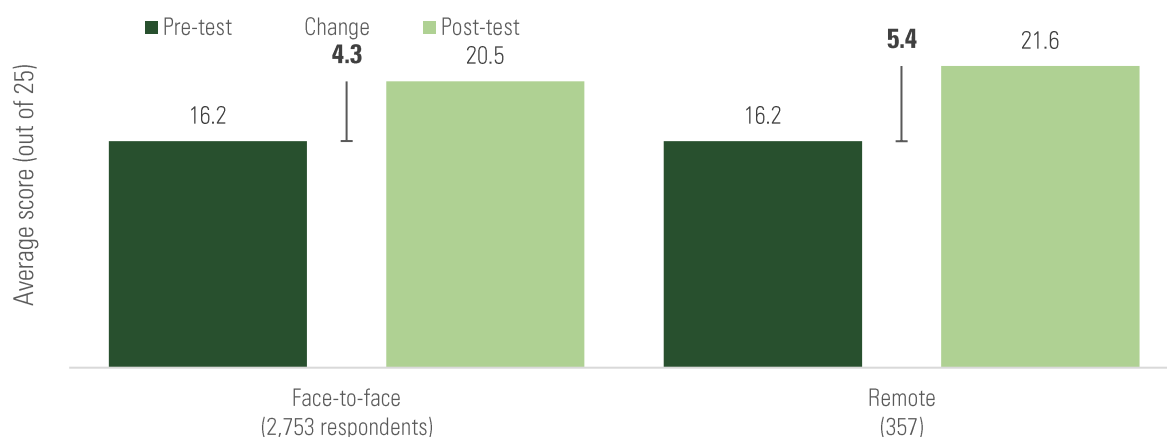
Did knowledge change at remote delivery trainings differ from face-to-face trainings?

Participants in remote delivery trainings learned more than participants in face-to-face trainings.

To determine if learning at remote delivery trainings was any different than face-to-face trainings, the NCR evaluation team compared knowledge change scores between the two types of trainings using data from all years. Trainings for Plain clothes growers and growers who do not speak English were removed from the analysis, because they did not participate in remote delivery trainings. Removing these two populations allows the analysis to compare similar populations, thus removing any confounding effects these special populations could have on the results.

Figure 3 shows that on average remote delivery participants had the same knowledge assessment scores on the pre-test as participants in face-to-face trainings (16.2 points). Therefore, remote delivery participants came to the training with the same level of baseline knowledge as face-to-face participants. The average post-test score was higher for remote delivery participants (21.6) than face-to-face (20.5), and the difference is statistically significant ($p=0.001$). Finally, on average scores increased by 5.4 points at remote trainings, significantly higher than at face-to-face trainings (4.3, $p=0.001$). Hence, one can conclude that participants in remote delivery trainings learned more on average than participants in face-to-face trainings, and they left with a higher knowledge of on-farm produce safety and FSMA.

Figure 3: Participants in remote delivery training learned more than participants in face-to-face trainings.



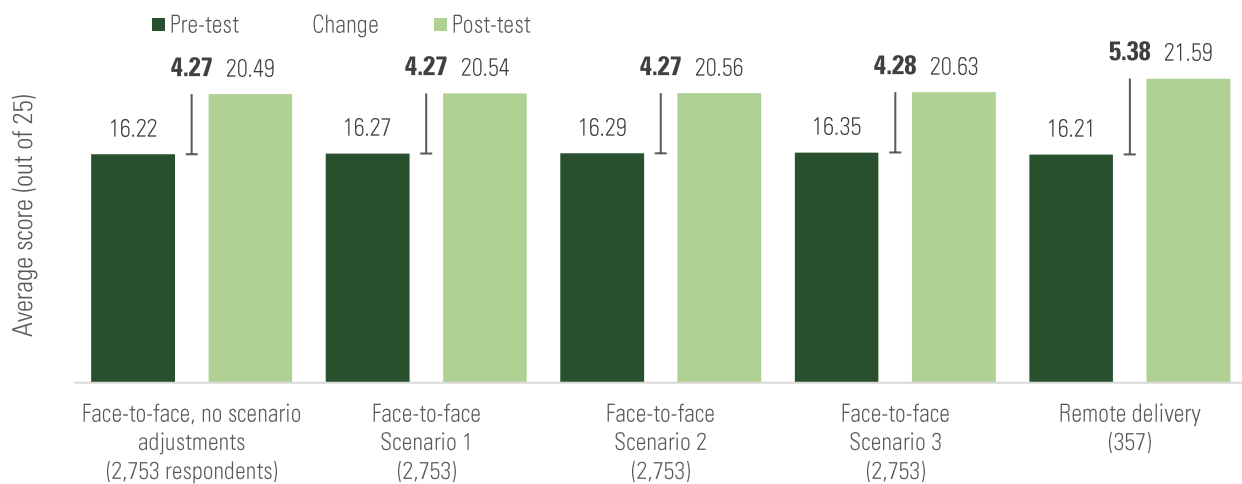
When taking the knowledge assessment on paper, some respondents chose multiple answers to a question, as opposed to one answer, and therefore received zero points for that question. In contrast, participants in remote delivery trainings took the assessment electronically and were forced to choose one answer. Had participants in face-to-face trainings been forced to select one answer they may have gotten the question right. To test whether forcing participants in face-to-face trainings to choose one answer would have increased their average scores and account for the differences between face-to-face and remote delivery trainings, the evaluators created several scenarios:

1. In scenario 1, respondents who chose multiple answers were awarded 0.25 points, which is the probability they would select the correct answer if they randomly chose one of the four answer choices.
2. In scenario 2, respondents who chose multiple answers were awarded 0.33 points, which is the probability they would select the correct answer assuming they could eliminate one answer choice as incorrect and then randomly select an answer from the three remaining choices.
3. In scenario 3, respondents who chose multiple answers were awarded one point, which is an extreme case assuming all respondents would select the correct answer if forced to choose one.

In each of these scenarios, the average pre-test and post-test score for face-to-face trainings were slightly higher than in the original analysis, hence lessening the difference between face-to-face and remote delivery trainings (Figure 4). However, in all scenarios, remote delivery trainings continue to have higher scores than face-to-face trainings, and the differences between remote delivery and face-to-face trainings remained statistically significant on the post-test and change scores ($p=0.001$ for all scenarios for post-test and change scores).

In conclusion, participants in remote delivery trainings scored higher on the post-test and increased their scores by more points on average than participants in face-to-face trainings. One question that cannot be answered using the knowledge assessment data is whether the better performance of remote delivery trainings was due to the delivery mode or to differences between populations who might choose or have access to remote delivery trainings and populations who might not.

Figure 4: When differences between paper and electronic assessments are accounted for, remote delivery average post-test and change scores were still higher than face-to-face.



How did one-day trainings compare with multi-day trainings?

Although one-day trainings resulted in slightly higher scores than multi-day trainings, the differences were minimal.

Trainers have debated the merits of offering remote delivery trainings over the course of one day or two days, discussing which would be more effective. Some believe one-day courses are better, because they are easier to schedule. Others prefer multi-day courses, believing they might help prevent fatigue.

Of the 30 remote delivery trainings held in year 4, 17 were in one day and 13 were held over the course of two days. In year 3, three remote delivery trainings were held, all of which were held in one day.

Figure 5 shows that participants in one-day courses scored slightly higher on average on the pre-test (16.4) than participants in multi-day trainings (15.9). The difference is not statistically significant. Therefore, participants in the two types of trainings came with similar levels of knowledge of food safety and FSMA. Participants in one-day courses also scored higher on the post-test (22.0 points) than participants in multi-day trainings (21.0). This difference is statistically significant ($p=0.003$), so one can conclude that participants in one-day trainings left with a higher knowledge of food safety and FSMA than participants in multi-day trainings. Finally, participants in one-day trainings improved their scores by more points (5.6) than participants in multi-day trainings (5.1), but the difference is not statistically significant.

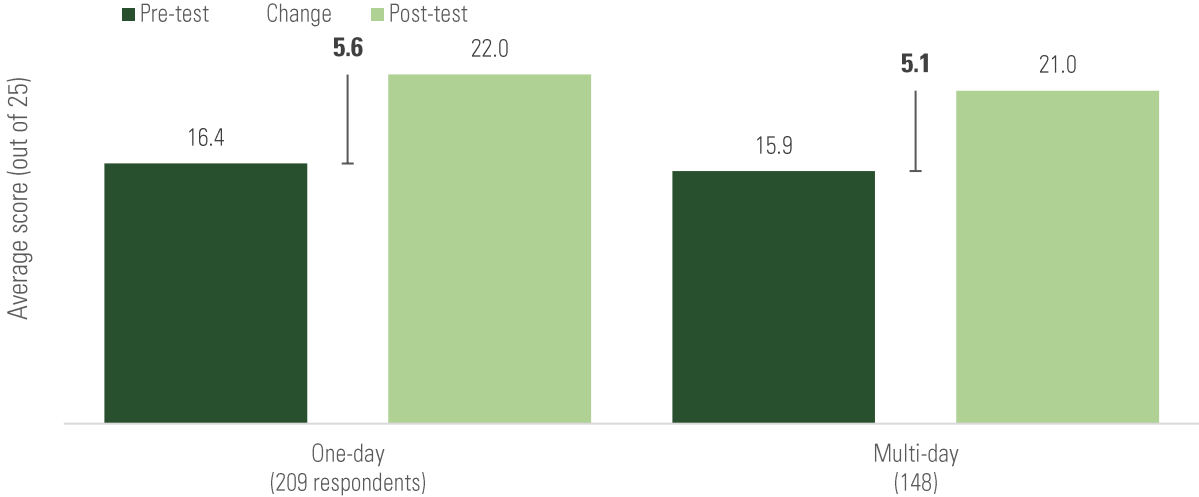
The analysis was also conducted removing special populations, to see if special populations participating in remote delivery trainings were confounding the results. When special populations are removed, the patterns remain the same, with participants in one-day trainings scoring higher on the pre-test and post-test and improving their score by more points than participants in multi-day trainings. Since the only difference that is statistically significant is in the post-test, *the length of training does not have a strong influence on participant learning.*

Results of a follow-up survey conducted in January 2021 showed the majority of growers prefer a one-day training over a multi-day training. However, the number of survey respondents who answered this question was very low, because the survey was directed toward people who took the course during the 2019-20 training season, which included very few remote delivery participants. One respondent noted in the comments that a multi-day training would be preferable during the growing season, whereas a one-day training would be best in the winter.

Therefore, the choice to offer trainings in one day or over the course of two days should probably be based on the preferences of the participants and availability of trainers, rather than on the belief that the time period of the course affects knowledge gain.

Figure 5: Knowledge assessment scores from remote one-day trainings were similar to those from remote multi-day trainings.

(data from 33 remote delivery trainings, 3 in year 3 and 30 in year 4)



How did trainings for special populations perform?

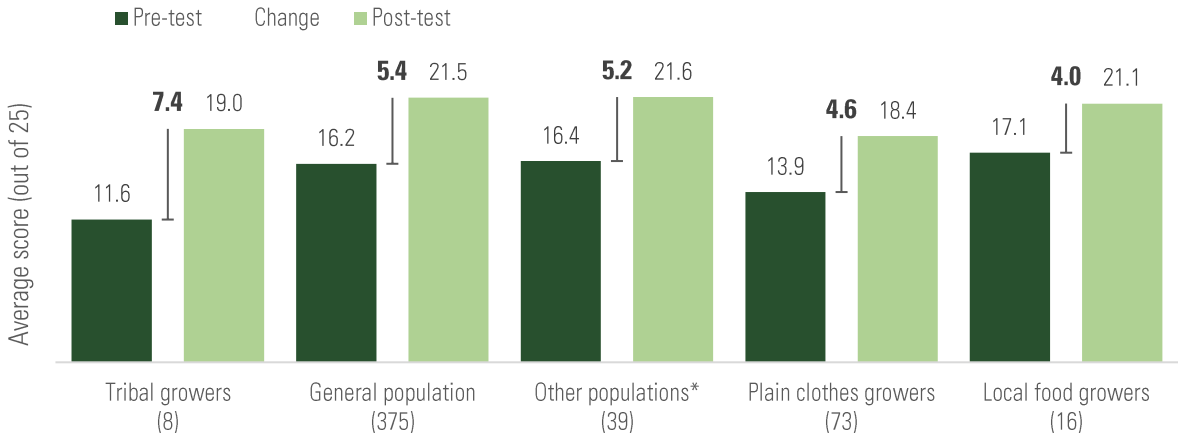
Tribal growers especially benefited from the training.

Figure 6 shows the average pre-test, post-test, and change scores from trainings for special populations as well as trainings for general populations. On average, scores increased by 7.4 points at a training for tribal growers in Michigan, which was higher than any other population. Participants in this training came with the lowest pre-test score, on average, which may indicate they were unfamiliar with FSMA or food safety prior to the training. Their average post-test score was 19.0. This is lower than the average post-test score for trainings that did not target any special population, but is higher than the average post-test score for Plain clothes growers. This is the first time that a training for tribal growers has been included in the knowledge assessment data, so it is impossible to conclude whether these results would be similar to other trainings for tribal growers.

Local food growers learned the least, on average, with an average increase of 4.0 points. Participants in these trainings had the highest average pre-test score, which may indicate they came with a high knowledge of FSMA and food safety prior to the training, explaining why they learned less, on average.

Finally, Plain clothes growers continued to have relatively low pre-test and post-test scores, as in past years. This supports the need for continued outreach to this population.

Figure 4: Tribal growers learned the most from the training.



*regulators, private orchard training, food bank and college/convent

Conclusion and recommendations

The biggest change in year 4 was switching from face-to-face PSA Grower Trainings to remote delivery due to the COVID-19 pandemic. Knowledge assessment results showed that knowledge gained from remote delivery trainings was higher than face-to-face trainings. Follow-up surveys conducted with training participants in January 2021 confirmed that for some participants remote delivery made it easier for them to access the PSA grower training, because they did not have to travel. That, combined with these results, provides reason to continue offering remote delivery trainings even when the COVID-19 pandemic wanes, if allowed by the Produce Safety Alliance.

Remote delivery trainings held in one day perform similarly to trainings held over the course of two days. The follow-up survey conducted in January 2021 showed that most remote delivery participants preferred courses offered in one day, with a very small sample size. Trainers may want to take these findings as well as situational factors into consideration when planning future remote delivery courses.

The same “tricky” questions that have been identified in previous years continued to be difficult for respondents to answer correctly in year 4. This may warrant revisiting the knowledge assessment instrument to consider rewording or replacing problematic questions.

Therefore, these recommendations result from the year 4 knowledge assessments:

- If allowed, continue to offer PSA Grower Trainings using remote delivery even after the COVID-19 pandemic wanes, to accommodate growers who are unable to travel to face-to-face trainings.
- Base the decision whether to offer future remote delivery trainings in one day or over the course of two days on the preferences of growers and availability of trainers, rather than on the perception that the time period of trainings leads to higher knowledge gain, which the data does not support.
- Continue to offer additional educational resources and events to Plain clothes growers, because they continue to score lower on the knowledge assessment than other populations.
- Consider modifying the knowledge assessment in future years to reword or replace some of the “tricky questions.” These questions include numbers 11, 13, 21, 22, 24, and 25.