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PEER-REVIEWED ARTICLE

Food Protection Trends, Vol 39, No. 2, p. 237–244

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Floridian Producers' Concerns About the Food Safety Modernization Act

ABSTRACT

This study explored the challenges producers encountered in complying with the Produce Safety Rule of the Food Safety Modernization Act (FSMA). The Southern Center provides FSMA education to stakeholders in the Southern Region. Survey data were collected from all Floridian participants of the Southern Center trainings. Results showed that stakeholders believed cost of compliance and knowledge of the FSMA were the most important barriers to FSMA compliance. GAP-compliant producers perceived greater challenges to FSMA compliance than non-GAP producers did. Extension agents and producers had similarly higher perceptions of the magnitude of challenges to FSMA compliance than specialists and consultants had, which indicated some discrepancies between stakeholders on perceptions of FSMA requirements. Results indicated that stakeholders' perceptions toward the major barriers of FSMA compliance had remained unchanged over the previous three years; cost of compliance and knowledge of the FSMA were persistent barriers to FSMA compliance. This paper recommended shared program planning between producers, Extension agents, specialists, and consultants to create impactful FSMA educational programs. Also, it recommended that educators seek input from stakeholders to design supplemental training for producers on managing costs of compliance. Program planners should account for farm-specific characteristics when designing educational programs to ensure that producers understand the steps needed to maintain FSMA compliance.

INTRODUCTION

According to the U.S. Department of Health and Human Services *(21)*, foodborne illnesses are "infections or irritations of the gastrointestinal tract caused by food or beverages that contain harmful bacteria, parasites, viruses, or chemicals" (*21*, p. 1). The Centers for Disease Control and Prevention (CDC) *(7)* maintains an updated database of multistate foodborne outbreaks by pathogen. The CDC recorded approximately 230,000 hospitalizations and 2,600 deaths from foodborne infections in 2016. In addition,

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the annual cost of foodborne illnesses has been estimated at $77.7 billion *(20)*. Food safety programs targeted to producers, such as Good Agricultural Practices (GAP), were driven by a need to improve food safety and quality. However, compliance to GAP is voluntary rather than mandated by law *(6)*. As a result, new mandatory agricultural policies target a reduction in foodborne illnesses. However, the challenges growers face in complying with these policies remain unclear.

The Food Safety Modernization Act (FSMA), the most significant reform to national agriculture and food safety in more than 70 years, aims to prevent food contamination and foodborne illnesses by regulating on-farm practices *(9)*. The Produce Safety Rule (PSR) of FSMA sets regulatory standards for safe growing, harvesting, packing, and holding of raw fruits and vegetables grown for human consumption *(22)*. Therefore, producers affected by the PSR are required, by law, to comply with a list of on-farm measures. *Table 1* provides an overview of the major practices regulated by the PSR.

According to the FDA *(22)*, compliance dates vary depending on businesses' average annual sales over the previous three-year period. Very small businesses ($25,000 to $250,000) are allowed four years, small businesses ($250,000 to $500,000) are given three years, and all others (>$500,000) are required to comply with the PSR in two years. FDA has proposed allowing producers an additional four years for standards relating to water quality testing and recordkeeping. All producers must comply with the PSR, except in the case of water, by the year 2020 *(22)*. However, the Produce Safety Alliance [PSA] *(19)* has stated that the PSR standards are based on GAP, and as a result, GAP-compliant producers should be better prepared to comply with the PSR.

Educational programs for stakeholders

Compliance with the PSR depends on stakeholders' access to information, training programs, and tailored technical assistance *(16)*. Effective training and educational programs can be essential to overcoming barriers to compliance *(13)*. The FDA partnered with the PSA and Sprout Safety Alliance (SSA) to coordinate training for stakeholders. The PSA and SSA were responsible for developing a standardized educational curriculum, Train-the-Trainer (TTT) courses, and for creating a network of trainers to support the produce industry. The FDA, in conjunction with the National Institute of Food and Agriculture (NIFA), established the National Food Safety Training, Education, Extension, Outreach, and Technical Assistance Program to fund and oversee the implementation of a National Coordination Center (NCC) and four Regional Center (RCs) throughout the U.S. *(22)*. The RCs are delivery points of educational and outreach programs for Extension agents and stakeholders. The Southern Center (SC), housed at the University of Florida, is responsible for providing PSR training to stakeholders of the Southern region and Puerto Rico.

Barriers to compliance

Producers should understand the resources of their farms (i.e., land, labor, and capital) and how certain regulatory practices affect their operation *(17)*. However, producers may be unwilling to adopt new farm practices if they lack the management skills needed to implement and maintain practices

TABLE 1. Components of the PSR

Component	Brief Description
Agricultural water	Establishes criteria for microbial water quality based on the presence of generic *E. coli.*
Biological soil amendments	Sets microbial standards that limit detectable amounts of bacteria for processes used to treat biological soil amendments.
*Sprouts	Prevents introduction of dangerous microbes into or onto seeds, tests for the presence of *Listeria* species.
Domesticated and wild animals	Requires practices to identify and not harvest produce contaminated by certain animals.
Worker training, health and hygiene	Requires hygienic practices that prevent contamination of produce by infected persons and visitors.
Equipment, tools and buildings	Prevents structural sources, for example, toilet facilities, from contaminating produce.

**Note.* The SC does not provide training related to sprouts.

that meet regulatory requirements. Fazio, Rodriguez, and Molnar *(11)* indicated that a lack of technical assistance and information may be a significant barrier to adoption. Therefore, access to information and educational training programs are important to the adopting of new food safety practices.

A study by the Southern Sustainable Agriculture Research and Extension Program (SARE) indicated that economic barriers affected adoption of sustainable agricultural practices *(11)*. Economic barriers include transitional costs incurred from adopting new practices, financial uncertainty regarding the ability to recover costs, and the burden of additional investment costs. Nowak *(17)* indicated that farmers may be unwilling to adopt practices incompatible with their current production systems, since such incompatibility can lead to increased labor and capital investments. Consequently, Knowler and Bradshaw *(14)* noted that income and long-run profitability affect adoption of new farm practices.

McCann and Claassen *(15)* assessed farmers' barriers to participation in water conservation programs such as the Environmental Quality Incentive Program (EQIP) and the Conservation Stewardship Program (CSP). They noted that the cost of policy compliance were likely to be positively correlated with the magnitude of operational change required and stated that transaction costs are especially high for major programs of the USDA. Transaction costs may be a likely barrier to PSR compliance, since FSMA regulates a wide range of on-farm practices.

According to Bartel and Barclay *(5)*, implementation of an Environmental Law in Australian agriculture was unsuccessful because it excluded input from affected stakeholders. An agricultural conservation compliance policy in Iowa showed that farmers with generally positive attitudes toward the policy were more likely to be compliant than farmers with opposing views *(3)*. Several studies have indicated that attitudes and perception are significant barriers to change *(1, 2)*.

Research problem and purpose

Compliance with the regulatory procedures outlined in the PSR is likely to help reduce foodborne illnesses. According to Paggi et al. *(18)*, although efforts to promote GAP, Good Handling Practices (GHP), and Good Management Practices (GMP) have increased, producers have faced many barriers to adoption of these practices. However, producers are legally required to comply with the PSR and must overcome all barriers to adoption. Therefore, the purpose of this study is to describe the barriers to FSMA compliance based on the perceptions of producers, Extension agents, specialists, and consultants in Florida.

The objectives were to: (a) rank barriers based on stakeholders' perceptions; (b) compare barriers between GAP and non-GAP compliant producers; (c) describe the differences in perceived barriers between Extension agents, producers, specialists, and consultants; and (d) identify any changes in perceived barriers over the past three years. Results will have implications for Extension programming, as they provide information on the most critical and persistent barriers to compliance. This information will allow Extension to create supplemental educational materials to meet the specific needs of Floridian agricultural producers to facilitate compliance with the PSR. Further, this study adds depth to the existing literature on producers' responses to agricultural policy reform.

MATERIALS AND METHODS

This study used a correlational research design *(4)*. The target population consisted of participants of the Southern Center for FSMA Training, Extension, and Outreach to Enhance Produce Safety (SC) who resided in Florida. The SC participant database was chosen as the sampling frame because it includes most of the participants of the SC since implementation of the SC in January 2016. Based on the SC database, a total of 686 participants from Florida completed PSA training at the SC, and this study used a census. Most of the participants were producers (78%), 9% were specialists, 9% were consultants, and 4% were Extension agents. In addition, most participants (66%) completed the SC PSA training in 2017, 20% participated in 2016, and 14% participated in 2018.

This study utilized a survey technique to gather cross-sectional data from participants. Trainers were asked to distribute the structured questionnaire to participants during the training sessions. To ensure face validity, the basics of crafting good questions and constructing closed-ended questions were used to design the questionnaire *(10)*; the questionnaire was short, contained no double-barreled questions, and provided an exhaustive list of response alternatives for each question. The questionnaire was reviewed by an expert panel of food safety specialists and Extension educators. Based on comments from the panel, the questions were revised for clarity, instructions for participants were added, and questions were grouped into sections to improve the overall readability and flow of the questionnaire. The study was determined exempt from the need for approval by the Institutional Review Board at the University of Florida.

The survey included a pre-defined list of seven barriers to adopting the PSR. This list reflected major barriers to adoption of food safety practices as identified in the literature. The barriers examined were: (a) costs of compliance, (b) current knowledge of FSMA, (c) participation in FSMA training, (d) amount of training needed, (e) perception and attitudes of FSMA, (f) Extensions' ability to provide FSMA training, and (g) availability of information on FSMA. Participants were asked to indicate if each barrier affected their ability to comply with the PSR via a series of Yes/No questions. Additional information collected were type of business (small to large) and current compliance to GAP requirements. Participants

TABLE 2. Perceived challenges to FSMA compliance (*n* = 686)

Rank	Barrier	Yes (%)	No (%)
1	Costs of compliance for producers	56	44
2	Producers' current knowledge of the FSMA	52	48
3	Producers' perception of and attitudes toward the FSMA	40	60
4	Producers' participation in FSMA training	34	66
5	The amount of training that will be needed by producers	33	67
6	Availability of information on the FSMA	23	77
7	Extension's ability to provide training on the FSMA	17	83
	Frequency of barriers: Mean (SD)	2.55 (1.97)	

TABLE 3. Differences in barriers identified by GAP and Non-GAP producers

#Overall Rank	Barrier identified as a challenge	*n*	Current Compliance (%)		X^2
			GAP	Non-GAP	
1	Costs of compliance for producers	318	58	43	7.18*
2	Producers' current knowledge of the FSMA	285	52	37	7.30*
3	Producers' participation in training on the FSMA	189	33	30	0.31
4	Producers' perception of and attitudes toward the FSMA	211	39	24	9.08*
5	The amount of training that will be needed by producers	199	37	25	5.46*
6	Availability of information on the FSMA	138	24	26	0.17
7	Extension's ability to provide training on the FSMA	101	19	13	1.94
	Frequency of barriers: Mean (SD)		2.61 (2.00)	1.97 (1.97)	
	Welch's *t*-test	$t = 8.83^*$			

Note. *$P < 0.05$. #Overall Ranking = [(%) GAP + (%) Non-GAP]/2

were also asked to indicate if they were producers, Extension agents, specialists, or consultants.

A construct was created for the total number of barriers to PSA compliance (Cronbach's alpha = .72). With an acceptable internal consistency *(8, 12)*, differences in the mean number of barriers were examined based on current compliance to GAP, type of participant, and year of participation in training at the SC. In addition, differences in each barrier were identified via a series of Chi-square tests. Objective (a) was presented as descriptive frequencies, an independent *t*-test and Chi-square tests were used for objective (b), and an ANOVA and Chi-square test were used to address objectives (c) and (d). The Welch test adjustment was used instead of the traditional *F*-ratio for the independent *t*-test and ANOVA to account for differences between unequal groups. In addition, the Games-Howell post-hoc test was examined for pairwise differences between unequal groups. Statistical significance was assumed at $P < 0.05$.

RESULTS

Table 2 provides a descriptive summary of participants' perceptions toward the barriers to PSR compliance. More than half of the participants surveyed identified cost of compliance and current knowledge of FSMA as major barriers to PSR compliance. In contrast, more than half of the participants indicated that producers' perceptions of and

TABLE 4. Differences in barriers across participant type

#Overall Rank	Barrier identified as a challenge	Participant Type (%)				
		Extension Agent (n = 27)	Specialist (n = 61)	Consultant (n = 62)	Producer (n = 536)	X^2
1	Costs of compliance for producers	50	55	64	53	2.35
2	Producers' current knowledge of the FSMA	70	68	71	47	21.40*
3	Producers' perception of and attitude toward the FSMA	55	64	56	33	30.23*
4	Producers participation in training on the FSMA	25	46	40	31	7.49
5	The amount of training that will be needed by producers	5	29	37	35	8.34*
6	Availability of information on the FSMA	10	25	31	21	4.66
7	Extension's ability to provide training on the FSMA	5	16	23	16	3.57
Frequency of barriers: Mean (SD)		2.20[a] (1.24)	3.04[b] (1.58)	3.21[b] (1.94)	2.35[a] (1.98)	
ANOVA (Welch test)		*Adjusted F* = 5.65*				

Note. *P < 0.05. Games-Howell post-hoc test used for unequal groups: a ≠ b. #Overall Rank = [(%) Extension Agent + (%) Specialist + (%) Consultant + (%) Producer]/4

attitudes toward the FSMA, their participation in FSMA training, the amount of training needed, the availability of information about the FSMA, and Extension's ability to provide training on the FSMA were not major barriers to PSR compliance. Overall, cost of compliance was ranked highest as a barrier to PSR compliance among all participants of the SC training in Florida. On average, participants thought there were two to three major barriers to PSR compliance (M = 2.55, SD = 1.97)

Table 3 shows the difference in perceived barriers to PSR compliance based on producers' current GAP compliance. For both groups, the highest ranked barrier was cost of compliance, followed by producers' knowledge of the FSMA. Results of an independent samples t-test indicated a statistically significant difference in total number of perceived barriers between GAP-compliant and non-GAP compliant producers (t = 8.83, P < 0.01). On the basis of the mean number of barriers between the two groups, GAP-compliant producers perceived that there were more barriers to PSR compliance (M = 2.61, SD = 2.00) than non-GAP compliant producers did (M = 1.97, SD = 1.97).

Chi-square tests for differences related to individual barriers based on producers' current GAP compliance showed a statistically significant difference in producers' perceptions toward cost of compliance, knowledge of the FSMA, amount of training required, and perceptions and attitudes toward the FSMA. While 58% of GAP-compliant producers indicated cost of compliance was a major barrier, only 43% of non-GAP compliant producers agreed. Similarly, 52% of GAP producers stated their current knowledge of FSMA was a major barrier, while only 37% of non-GAP compliant producers stated this was a barrier to compliance. Also, only 24% of non-GAP producers indicated producers' perceptions and attitudes toward the FSMA was a barrier, compared with 37% of GAP-compliant producers.

Table 4 shows the differences in perceived barriers to PSR compliance among Extension agents, specialists, consultants, and producers. Overall, most participants thought cost of compliance and producers' current knowledge of the FSMA were major barriers to PSR compliance. However, the ANOVA test results indicated a statistically significant difference in the total number of perceived barriers by type of participant (F = 5.56, P < 0.05). The Games-Howell

TABLE 5. Changes in perceived barriers over a three-year period for all participants

#Overall Rank	Barrier identified as a challenge	Year of Participation (%)			
		2016 (n = 137)	2017 (n = 453)	2018 (n = 96)	X^2
1	Costs of compliance for producers	61	53	60	3.54
2	Producers' current knowledge of the FSMA	47	49	44	0.98
3	Producers' perception of and attitudes toward the FSMA	44	39	41	0.89
4	The amount of training that will be needed by producers	43	31	30	7.03*
5	Producers' participation in training on the FSMA	37	33	33	0.49
6	Availability of information on the FSMA	29	23	17	4.5
7	Extension's ability to provide training on the FSMA	18	17	16	0.29
Frequency of barriers: Mean *(SD)*		2.83[a] (2.17)	2.47[a] (1.94)	2.53[a] (1.75)	
ANOVA (Welch)		Adjusted F = 1.51			

Note. *P < 0.05. Games-Howell Post-Hoc test used for unequal groups. #Overall Rank = [(%) Year 1 + (%) Year 2 + (%) Year 3]/3

post-hoc test indicated that, compared with specialists and consultants, Extension agents and producers believed there were significantly fewer barriers to PSR compliance.

The Chi-square test for each barrier indicated significant differences in participants' perceptions toward cost of compliance, knowledge of the FSMA, and perceptions of and attitudes toward the FSMA. Although most Extension agents, specialists, and consultants identified producers' current knowledge of FSMA as a major barrier to compliance, only 47% of producers agreed. Additionally, 29% of specialists, 37% of consultants, and 35% of producers indicated that the amount of training needed by producers was a major barrier to compliance; in contrast, only 5% of Extension agents thought this was a major barrier. More than half the Extension agents, specialists, and consultants, but only 33% of producers, thought producers' perceptions of and attitudes toward the FSMA constituted a barrier.

Table 5 provides a summary of differences in perceptions of barriers over a three-year period. Results of the ANOVA test indicated there were no changes in participants' perceptions of the barriers to PSR compliance during 2016–2018 (F = 1.51, P = 0.22). However, individual Chi-square tests indicated there was a statistically significant change in perceptions of the amount of training needed by producers over the three-year period. In 2016, 43% of participants indicated the amount of training needed by producers was a major barrier to PSR compliance, a figure that decreased to 31% in 2017 and 30% in 2018. Overall, particpants' perceptions of the major barriers to PSR compliance remained mostly unchanged over the three years.

DISCUSSION AND CONCLUSIONS

The Southern Center (SC) was created to provide education to all stakeholders affected by the FSMA PSR. Floridian participants of the SC saw cost of compliance and producers' current knowledge of FSMA as major barriers to PSR compliance. This finding is consistent with findings of previous studies on the adoption of food safety practices *(11, 15, 17)*. However, opinions differed between stakeholders on the magnitude of the barriers examined. Overall, GAP-compliant producers perceived more barriers to PSR compliance, compared with non-GAP compliant producers. In contrast, the PSA *(19)* noted that GAP-compliant producers are already well prepared to comply with the PSR. This indicates some confusion among participants on the regulations put forth by the FSMA. On the other hand, GAP-compliant producers may have a better understanding of the barriers to complying with FSMA because of their familiarity with similar regulations, compared with non-GAP compliant producers and may therefore be less inclined to downplay the possible operational implications associated with compliance.

Some differences were seen between stakeholders' perceptions of barriers, based on their professions. Extension agents and producers had similar perceptions toward the major barriers to PSR compliance, while specialists and consultants estimated the magnitude of these barriers as

higher. Extension agents work closely with producers and may therefore better understand producers' challenges. However, consultants and specialists may have had different perceptions of the barriers because of their understanding of the long-term implications of PSR compliance from a business standpoint. This suggests the need for specialists and consultants to collaborate with county Extension agents and producers in the design of specialized educational material on the FSMA; shared program planning that includes input from Extension agents, producers, specialists, and consultants is probably essential to creating impactful FSMA programs.

Overall, stakeholders' perceptions toward the number of barriers to PSR compliance were mostly unchanged over the three years. However, the number of participants who believed the amount of training required was a major barrier to compliance was lower in 2018 than in 2016. This is expected, since the SC had provided regular training and information to stakeholders in Florida over the three years studied. However, since major barriers such as cost of compliance and knowledge of FSMA persists, results suggest that a continuation of educational training and tailored technical assistance is necessary to ensure full compliance. While results point to a need to address the persistent cost barrier, findings indicate producers' willingness to engage in educational training to ease the adoption of the PSR, since attendance to training was not a major barrier.

In view of differences observed in the perceptions of barriers to PSR compliance among stakeholders, this study recommends closer cooperation between Extension agents, consultants, specialists, and producers in addressing barriers to PSR compliance. Specialists and consultants should work closely with Extension agents and producers to assess strategies designed to reduce the major barriers, especially with respect to managing the cost of compliance. Since producers do not view the amount of training required as a barrier to PSR compliance, this study recommends that Extension educators collaborate with producers to develop, plan, and deliver supplemental training on cost management during their transition toward FSMA compliance. For example, FDA is currently revisiting the agricultural water standards in the produce rule *(22)*; the necessity, frequency, and cost associated with different methods of water testing could be explored through additional training. Different perceptions of the magnitude of barriers between GAP and non-GAP producers also indicate misconceptions related to PSR regulatory standards, and supplemental training should aim to bridge any gaps in knowledge among producers based on their current practices. As a result, there is a need for specialized FSMA training based on farm-specific factors. Extension educators must work with stakeholders to reduce barriers to PSR compliance, and these efforts should go beyond the standardized PSA curricula for FSMA training. Future educational programs are necessary to ease the challenges faced by Floridian producers in complying with the FSMA.

ACKNOWLEDGMENTS

This research acknowledges Travis Chapin, Matthew Krug, Jessica Lepper, Rachel McEgan, and Keith Schneider for their efforts in coordinating data collection.

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