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Impacts of the Food Safety Modernization Act's Produce Safety Rules, exemptions, and behavioral insights among small-scale produce growers

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Abstract

While the Produce Safety Rule (PSR) of the Food Safety Modernization Act (FSMA) sets a regulatory framework to promote the production of safe produce, the exemption criteria it provides exclude many very small and small-scale farms from full compliance. Regardless of exemptions, food safety remains a shared priority across the food system. For qualifying farms, exemption status provides some benefits but can also introduce limitations which farms might need to navigate. To examine the cognitive components that shape the food safety decision-making processes of FSMA-exempt produce growers, the theory of planned behavior (TPB) was adapted as a framework in this study. Growers' beliefs and perceptions that influenced their intent to implement safe practices were investigated. Growers' responses to the benefits and limitations of the exemptions from the FSMA Produce Safety Rule were also explored as part of

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the cognitive analysis. Through a series of focus group discussions, information was collected from thirty Indiana FSMA-exempt produce growers. Study participants expressed deep commitment to providing safe food to their consumers. It was determined that the importance of their own personal values and relationships within the food system contributed to decisions that affect their customers. A recurring theme was the trade-off between the reduced regulatory burden of the PSR and the increased liability risks in the absence of regulatory safeguards. Findings also highlighted the intersection of perceived benefits and limitations, regulatory expectations, and how availability of resources collectively shapes approaches to food safety. The findings underscore the unique situation of FSMA-exempt produce growers and the importance of tailoring food safety outreach programs that offer support based on practical, trust-based approaches.

Keywords
small-scale growers, decision-making, on-farm food safety, Produce Safety Rule, food safety focus groups, theory of planned behavior

Introduction

Food safety has become widely recognized as a public health concern in the U. S. due to increasing reported cases of foodborne illnesses and recalls (U.S. Food and Drug Administration, 2024). Foodborne illnesses represent an annual burden to society of approximately US$36 billion (Minor et al., 2015). Numerous outbreak cases have been associated with harvested produce, such as cantaloupes, lettuce, and peaches (Centers for Disease Control and Prevention, 2012; 2020; 2024a; 2024b; 2025). To reduce microbial contamination of farm produce, the Food Safety Modernization Act (FSMA) bill released the Produce Safety Rule (PSR), aimed at providing science-based evidence on safe on-farm practices to address the occurrence of outbreaks (U.S. Food and Drug Administration, 2015).

Prior to the final passage of the PSR, however, some small farm operators raised concerns about implementation of the rule. To meet the PSR requirements, small farms would be more heavily impacted than large farms due to the reported expense of adapting the requirements (Astill et al., 2019; Chen, Kinchla et al., 2021). In response to those objections, the PSR listed requirements that, if met, could exempt small-scale farms. One of the criteria was that farms with an average annual sale of $25,000 or less would be exempt. This would allow 62% of small-scale produce growers to be eligible for exemption from PSR requirements (Astill et al., 2019).

Although some farms qualify for exemption from the PSR standards, they still face food safety expectations from marketing channels, such as retail and wholesale units (Low et al., 2015; Martinez, 2016; Minor et al., 2019), as well as from consumers (Global Agricultural Productivity Report, 2018). These channels continue to subject these farms to the same safety standards, irrespective of their standing as exempted farms (Bovay, 2023). A study by Tobin et al. (2012) reported that consumers perceived locally grown produce as compliant with prevailing on-farm food safety standards. It appears that consumers usually perceive exempt farms as being compliant. While these reported cases demonstrated the potential impact of the market and consumers on exempted farms, little documented information is available on the factors that drive them to perform on-farm food safety activities or the impact of the PSR exemption on qualifying farms.

Determining the cognitive and behavioral perspectives that influence produce growers' decisions in implementing on-farm food safety practices can be a complex process, but the perspectives are important considerations in the design of implementation strategies (Morelli et al., 2022; Rose et al., 2018). The theory of planned behavior (TPB) is one model that has been used extensively as a framework to analyze individuals' intent in adapting a behavior or practice (Archila-Godínez et al., 2022; Barrett & Feng, 2021; Bosnjak et al., 2020; Ledo et al., 2021). This model postulates that three constructs—attitude, subjective norm, and perceived behavioral control— can predict an individual's behavioral intent (Ajzen, 1985; Ajzen & Fishbein, 2005). Attitude in TPB is influenced by the behavioral beliefs of the individual. This belief reflects the possible consequences of adopting the behavior. Subjective norms are as a result of the

perceived social or peer influence in adapting a behavior. This construct explores the influence of the expectations of other individuals to the decision maker. The last construct, perceived behavioral control reflects the individual's belief to correctly perform the behavior (Bosnjak et al., 2020).

The objective of this case study was to generate insights, through the lens of TPB, into what shapes the on-farm food safety practices of qualified PSR-exempt produce growers in Indiana. Our team also analyzed the produce growers' perceptions of the PSR to better understand the impact of the exemptions on them. The overall study included different methods; however, this paper will report and discuss only the insights that emerged drawing on TPB. By taking a closer look at the impact and decision-making of produce growers exempted from PSR, policymakers, extension professionals, and other stakeholders will be better enabled to assist in tailoring strategies to enable growers to expand their business.

Applied Research Methods

The research team used focus groups to collect information from small-scale produce growers about what influences their produce safety decision-making process and their response to exemptions from the FSMA Produce Safety Rule. The Institutional Review Board (IRB) at Purdue University approved the study protocol (IRB-1810021180). Prior to sessions, the research team provided participants with consent forms as well as copies of the forms to keep for their records (Chen, Ellett et al., 2021; Thomas et al., 2025).

Focus Group Script

The authors developed a focus group script, with open-ended questions in two sections. The first included questions on (1) their perspective on food safety regulations, (2) challenges with food safety regulations, and (3) the impact of being exempted from the FSMA PSR. The second focused on participants' responses to consumer expectations on produce quality and safety. In section two questions were further grouped into two parts. The first part focused on participants' thoughts on consumer expectations of produce farmers in relation to produce safety and regulations. Participants were provided with a list of actors in the food value chain and were asked, "Who was most responsible for a produce outbreak?" They were required to rate each actor on a scale of 1–9 regarding their perceived responsibility (1 = *strongly disagree*, 9 = *strongly agree*). The second group of questions sought to determine participants' expectations of farmers in relation to produce safety and regulations.

Recruitment of Participants

The research team recruited study participants from three Indiana farmer conferences from January to March 2023 and in January 2024. We sent out a recruitment survey through the conference registration platforms to identify prospects interested in and eligible for participation. To be eligible for a focus group, farmers had to meet the following criteria: (1) grow produce (fruit and/or vegetables), (2) sell produce that is grown on the farm, and (3) have annual produce sales averaging less than US$500,000 in the past three years. We selected the qualifying participants and provided them with the date and time for the focus group session. In addition, we sent a short online survey to the qualified participants to collect demographic information via Qualtrics XM. Participants unable to complete the online survey filled out a printed version prior to the session. Participation in the sessions was voluntary. (This study procedure has been used by Chen, Ellett et al. (2021) and Stoll et al. (2025b).)

Focus Group Sessions

Five focus groups were conducted to reach data saturation (Guest et al., 2017; Hennink et al., 2019), that is, when no new information was elicited and data collection was complete. Three of the focus group sessions were organized at the Indiana Horticultural Conference and Expo, one took place at the Indiana Small Farmers Conference, and one took place at the Veterans IN Farming Conference. The research team held the sessions at the conference sites for convenience, each session in a quiet and private room that was reserved at each conference location. This was to ensure that participants in the sessions were not distracted by other activities at the conference. Sessions were scheduled so they would not interfere with the reg-

ular conference activities. The sessions were audio recorded and lasted about 90 minutes, with a moderator facilitating and a co-moderator taking field notes. At the end of the sessions, the moderator and co-moderator held debriefings to discuss notable quotes, key points, and concepts that emerged during the discussions (Barrett et al., 2020; Thomas et al., 2022; Thomas et al., 2025).

Focus Group Data Analysis

The first author used the qualitative method of "coding" to analyze the focus group data. A researcher first transcribed the audio verbatim, while another researcher checked the transcriptions to ensure that all details captured were accurate. The transcribed data were transferred to NVivo version 12 to be coded and analyzed using thematic analysis (Hatch, 2002). The first author analyzed the data using primarily an inductive approach—reading the transcripts line by line and assigning codes to quotes or paragraphs that addressed the objectives to obtain as much valuable information as possible (Azungah, 2018). In developing the codebook, mixed coding methods were used (Saldaña, 2016), to adequately capture the outcomes from the data, and included in vivo, process, value, descriptive, holistic, sub-coding, and emotion.

The data was analyzed by two researchers, to minimize biases in codebook development. The first author generated an initial codebook from three of the transcribed sessions by using NVivo software (version 12) (Thomas & Feng, 2021; Thomas et al., 2025). The initial codebook had the codes, definition of codes, coding method used, and participant quotes. Another researcher independently coded two transcripts using the initial codebook. The first author and the researcher then discussed any discrepancies and made changes to the codebook. Overlapping codes were refined and properly defined or clustered into another code. Both researchers came to a consensus on all the codes developed and agreed that the codes were clear and responded to the research question. The first author then used this codebook to code the remaining focus group session. The other researcher checked the final codebook to confirm that all codes generated were exhaustive (Stoll et al., 2025a; Thomas & Feng, 2021; Thomas et al., 2025). The final codebook is in Appendix A.

The first author categorized the codes into conceptual clusters based on the central ideas described (Stoll et al., 2025a; Thomas & Feng, 2021; Thomas et al., 2025). The conceptual clusters were further grouped based on the TPB construct that they measured. The codes that addressed the impact of the PSR exemption were classified into themes and subthemes. Codes generated were clustered into conceptual subthemes, which were further categorized into two main themes. The two researchers discussed the developed themes and subthemes and came to a consensus on what clearly answered the objectives of the study (Appendix B).

Survey Data Analysis

Survey data collected via Qualtrics was imported as a comma-separated values (CSV) document and analyzed using SPSS version 24. A trained researcher added the data that had been filled out by some participants on printouts to the dataset on Qualtrics. A second researcher checked the datasets to ensure data entry accuracy. We performed descriptive data analysis using SPSS version 24. This paper will report and discuss only the data regarding the first section of questions, which were developed to explore farm food safety practices and perspectives that influence small-scale produce farmers currently exempted from the FSMA PSR.

Results

Participant characteristics are shown in Table 1. A total of 30 qualifying Indiana produce growers participated in five focus groups for this study. A majority (87%) of the participants were white non-Hispanic. The annual production sales for more than half the participants (53%) were below US$25,000. Approximately 63% of growers cultivated crops on 1–9 acres of land, with the majority producing berries, vegetables, melons, squash, or pumpkins (Figure 1).

Sales Point and On-Farm Food Safety Concerns

Farmers markets and farm stands were the pre dominant produce sales locations for most of the participants. In addition to making sales from their

farms, some participants also sold their produce at roadside stands close to their farms. Very few participants reported that they sold their produce to restaurants and grocery stores. Apart from these locations, a few participants mentioned selling to close friends and family, and others also cited donating produce to food banks, food pantries, or soup kitchens.

Table 1. Characteristics of Study Participants (*N* = 30)

Characteristics	% (*n*)
Gender	
Male	43 (13)
Female	53 (16)
Prefer not to answer	4 (1)
Age range	
25–34 years	13 (4)
35–44 years	27 (8)
45–54 years	20 (6)
55–64 years	27 (8)
65 years and above	13 (4)
Race	
White non-Hispanic	87 (26)
Hispanic	3 (1)
Black or African American	3 (1)
Prefer not to answer	7 (2)
Highest level of education	
High school diploma/GED	10 (3)
Associate degree	10 (3)
Bachelor's degree	30 (9)
Graduate degree	27 (8)
Prefer not to answer	7 (2)
Some college (no degree)	16 (5)
Annual sale of produce (US$)	
Less than $10,000	43 (13)
$10,000–$24,999	10 (3)
$25,000–$49,999	10 (3)
$50,000–$74,999	7 (2)
$75,000–$99,999	10 (3)
$100,000–$149,999	13 (4)
$150,000–$199,999	7 (2)
Acres of produce-growing land	
1–9 acres	63 (19)
10–49 acres	30 (9)
50–99 acres	7 (2)

Participants cited biological and chemical hazards as the two major areas of concern with respect to on-farm produce safety. The most concerning biological hazards were animals—domestic and wildlife—invading their farms. Participants indicated that they had put in place protective measures such as fencing to control this problem, but those measures were not enough to eliminate the pests completely. Regarding chemical hazards, pesticide application was the predominant chemical food safety concern raised by participants. Some participants mentioned concern about chemical spray drift and exposure because of their proximity to farms that apply pesticides.

Factors That Influence Food Safety Decision-Making

Themes were generated using the TPB model to determine what motivated or impeded the decisions of small-scale produce growers to perform food safety activities. Figure 2 depicts a schematic representation of the factors that influence the food safety behavior. Appendix B gives further details of the themes generated.

Attitude and Personal Values

Behavioral beliefs were identified as motivating participants to adopt on-farm food safety activities. Participants discussed their own values of growing safe food for all. They reported that despite their potential exemption from strict inspections, they intended to maintain safe, responsible methods in the way they grow produce. Other than selling to consumers, the participants frequently stated that because they and their families consumed the food they grew, they were agreeable to raising and selling safe and healthy foods. One participant asserted that food safety was non-negotiable:

> At first blush, it makes me giggle. Because if it's about food safety, then we should all be practicing food safety. Just because I'm small, doesn't mean I should not be safe. (Female, 45–54 years)

Subjective Norms

Some participants also discussed their personal connection with their customers and cited the need to provide safe produce for them. Some participants who provide farm tours reported that growers must ensure that customers who tour their grounds trust their small business and what they sell. Growers indicated they make every effort to protect their customers, which necessitates the need to ensure that what they produce is safe. They

Figure 1. Description of Produce Grown by Participants (Types of Produce are Not Mutually Exclusive)

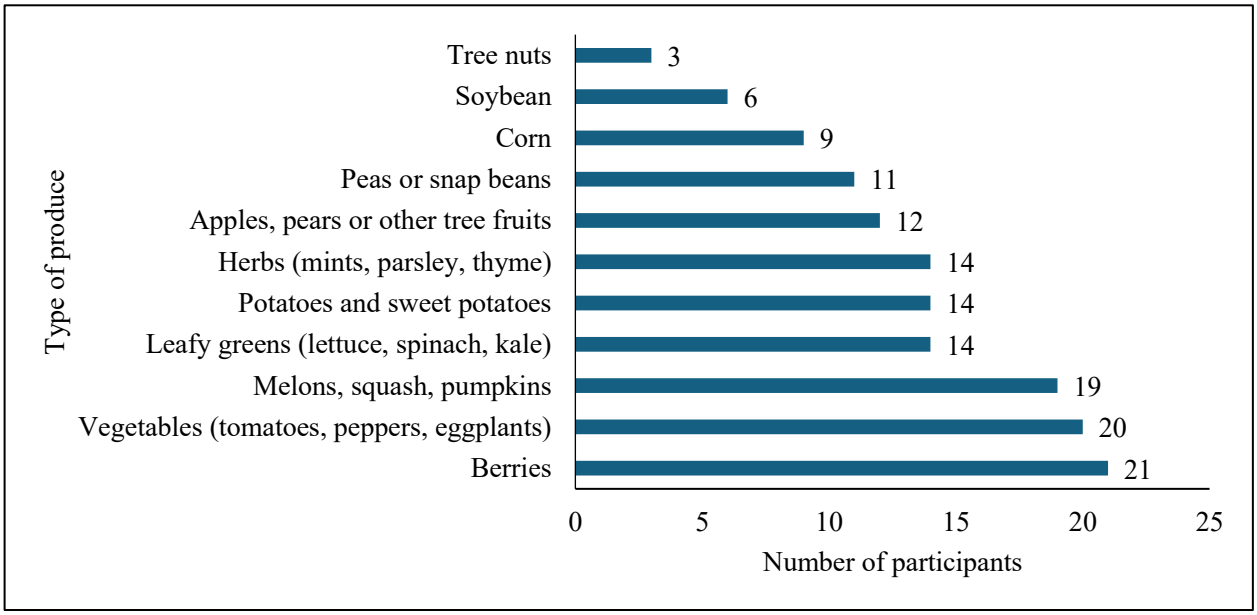
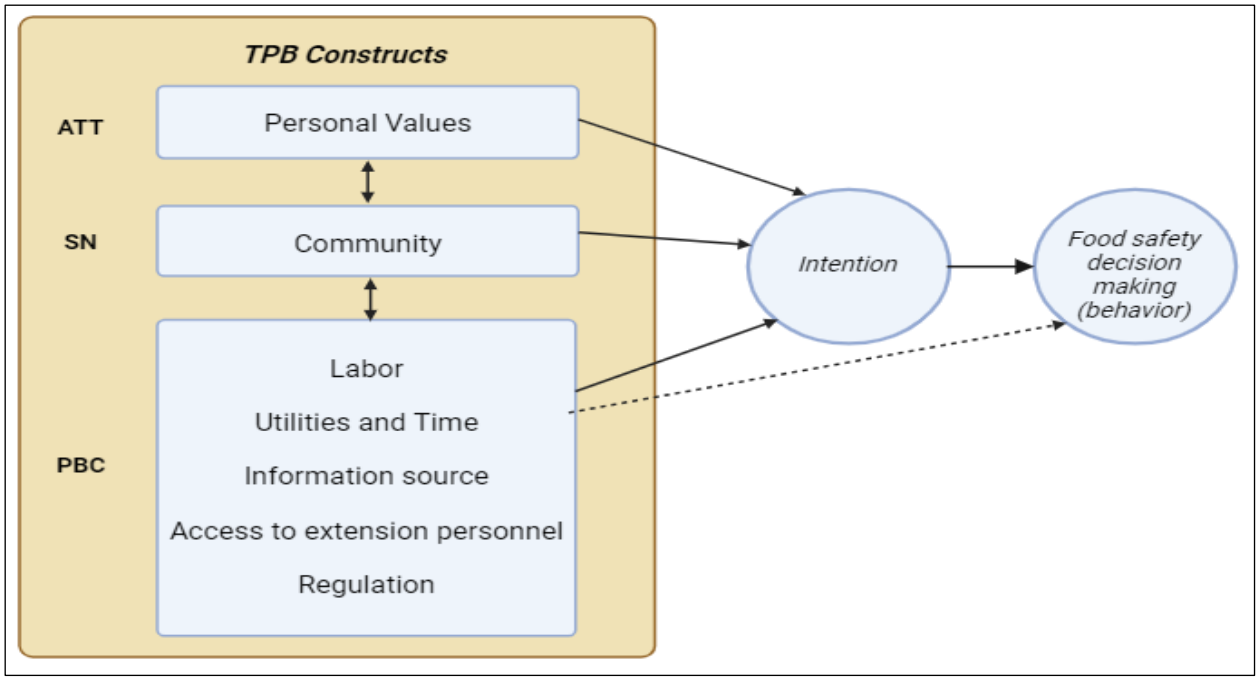


Figure 2. Factors that Influence Participants' Decisions to Perform Food Safety Activities, Adapted from the Theory of Planned Behavior (Ajzen, 1985)

ATT represents attitude; SN represents subjective norms; PBC represents perceived behavioral control.



further stated that some customers are neighbors and family members, and because theirs is a close-knit community, the welfare of these people is a priority to them: "My primary risk concerns actually I don't want people getting hurt, because [it affects] many children, families" (Male, 65+ years).

Some of the participants also reported that their concerns about certain practices, such as pesticide application, were partly because their customers had concerns about them. Participants indicated that this was an area about which their customers were very concerned, so it was a major concern to them as well. One identified a key focus: "Well, always pesticides, because the customers they always want to know what we sprayed on our crops" (Female, 45–54 years).

Perceived Behavioral Control—Labor

Perceived behavioral control (PBC) was a significant theme that emerged, reflecting how participants evaluated the ease or difficulty of performing food safety activities. Participants predominantly emphasized resource-related factors, such as labor, time, utilities, and access to information, as influential in their intent to adopt food safety practices. The following sections explore these dimensions of perceived behavioral control, shedding light on the challenges that growers face, and identifying potential strategies to respond to them.

Labor was identified as a PBC issue. Limitations in labor resources impeded many participants' ability to perform some food safety activities, with most growers reporting that they did not have enough farmhands to help with running regular on-farm activities. Participants said that their farms were family run, some reporting managing the farm with their partners. Because of wide-ranging responsibilities and demands on the time of small farm operators, ensuring consistency in performing produce-safe activities was a challenge for many growers:

> Well, it's really difficult. I mean it's just me and my husband. Trying to find help is impossible. So, it's just me and my husband, and we have two acres of orchard and two acres of vegetables, five acres of alfalfa, and, you know, other acreage with other trees and fruit, and it's just us and we're not young. (Female, 45–54 years)

Participants also identified communication challenges with on-farm workers and the difficulty of ensuring that proper produce-safe practices were being done. Growers reported inability to consistently ensure that their employees were performing produce-safe activities in their absence. One participant emphasized a language barrier as a concern because the workforce on his farm was predominantly non-English speaking.

Perceived Behavioral Control—Utilities and Recordkeeping

Some participants identified water and infrastructure as barriers that affected performing food-safe activities. These observations were closely tied to the financial cost involved. Participants explained that as they strive in carrying out produce-safe activities, they could not afford certain resources such as the infrastructure for marking off designated areas, especially in their post-harvest activities. Lack of financial resources can make it difficult to install improvements and adopt certain on-farm food safety practices, even if they wanted to.

Participants also reported that they did not have enough time to ensure that comprehensive good agricultural activities were incorporated in their daily farming duties. This coincided with the fact that they also did not have enough labor on hand, complicating their ability to fulfill day-to-day farming responsibilities while ensuring good agricultural practices.

Farm recordkeeping was the most common barrier mentioned. One small-scale grower regarded recordkeeping as overwhelming, explaining the main limiting factor:

> The time involved in keeping records. The thing that seems to be the hardest for me, and the time involved in that. I mean, it's like about 50 different sets of records. When you sit there and look at it maybe. I was in the meeting this morning down here. They were talking about digital recordkeeping. And it just overwhelms me to think about having the briefing written down, and I'm the only person doing it, and I'm the one keeping the records, and I am working around the clock almost. And I don't make any money. (Male, 65+ years)

Participants said they were aware of the importance of keeping records on the farm and want to continue, but as small-scale growers, record keeping adds an additional burden because of the limited number of workers they have available.

Perceived Behavioral Control—Information Type and Sources

Lack of relevant and updated information was a frequent theme in all focus group sessions. Participants reported a lack of up-to-date information on produce-safe practices, especially what is expected of small-scale growers. They were interested in learning what they could do to ensure safe produce but stated that acquiring the information was challenging and difficult:

> And then knowing when something changes, knowing that we will know about it, if something changes, right, just the updates themselves. And we can do that; we have somebody to come out and train our group. We learned about it then. But if something changes other than that, I don't know about it. (Male, 55–64 years)

Participants further reported that the channels to communicate updated information or resources to small-scale growers are not well established, making it difficult to include them in on-farm activities. A broad consensus among participants was that resource tools such as a centralized resource platform with all information and updates would be a good communication source for small-scale farmers. Participants emphasized a need for a "one-stop" platform to get a snapshot of all information needed, as they had to search on different platforms to find information. Some participants were quick to add they do not get timely updates on new information, and they would like to have a source where they can access it. Participants indicated they were willing to adopt some good agricultural practices provided they had the details of what was needed to achieve them.

Perceived Behavioral Control—Access to Extension Personnel

The theme of access to extension personnel, which emerged from the sessions, was closely related to participant desire for an improved channel for sharing information. Some participants reported insufficient numbers of state extension personnel to accommodate the needs of all farmers, and that they would prefer to have experts coming to their farms to see their daily practices and give advice on what was feasible for their farms. Some of the regulations were not clear to them and were difficult to apply even if they wanted to do so, particularly requirements related to record keeping and post-harvest sanitation. Participants reported that the requirements were not easy to understand, and emphasized that extension representatives could help clarify them with practical and hands-on demonstrations to adapt to their farms. However, due to the low extension representative-to-farmer ratio, they encountered difficulty in scheduling extension personnel to visit their farms, underscoring the importance of farm level guidance. They believe that having more personnel available to interact with them in the fields more often would be helpful.

Perceived Behavioral Control—Regulations

Participants reported that the inconsistencies and lack of clarity in the interpretation of regulations affected their ability to adopt better food safety practices on the farm. They indicated that they are confused about which food safety practices they are mandated to perform, and have encountered obstacles to obtaining technical assistance from extension professionals or other experts. Growers have said they are interested in engaging in certain food safety activities such as upgrading infrastructure like handwashing stations, water testing, and detailed recordkeeping. However, they found the regulations to be difficult to understand and impractical for small-scale growers to adapt.

Perceptions of Exemption from FSMA Produce Safety Rule

Further discussions assessed the implications of the FSMA PSR for the participants, most of whom were qualified for exemption (Table 2). Participants were asked if they knew about the FSMA PSR, and most of them had heard about it, with only one participant indicating otherwise. Interestingly, a few were not familiar with the requirements for exemp-

tion, and those who knew of the exemption said they were unclear about the criteria to qualify for it. Participants were then all briefed on the criteria for exemption, and made observations on how the exemption could influence their decision to perform produce-safe activities.

Benefits of Exemption

Numerous participants expressed a sense of relief at being exempted from the FSMA PSR. Those who had a clear knowledge of the FSMA PSR and what it entails expressed that they were glad that they were not required to comply, since the requirements would have been burdensome for their small farm. One of the cited benefits of exemption was access to direct sales. Some small growers indicated that their sales point is predominantly to their community, so they were able to continue selling directly to their customer base without having to worry about implications:

Table 2. Benefits and Limitations of FSMA PSR Exemptions for Small-Scale Produce Growers

Theme	Subtheme	Description	Quote
Benefits	Direct market sales	Ability to sell directly to consumers	We don't have to have it because we just sell directly to the consumer. So, we don't have to do any of that jumping through hoops. We don't even get visited by anybody. (Female, 45–54 years)
	Reduced time commitment	Less time involved in running activities	The time and effort required to know the law and to follow are all probably not feasible for someone who's more of a hobby farmer, right? (Male, 45–54 years)
	Fewer inspections	Fewer state or federal inspections/ audits on farms	They'll still do the on-site safety review of our farm, but they will do it every season, or every so many months, like they do on larger farms that are under that, you know, like I said, we're exempt. So, we don't have all that every so many months that they have to come out. (Female, 35–44 years)
	Reduced market struggles	Markets will struggle if there are no exemptions	I'm afraid that markets would really struggle. I know in [location] we, we struggle to have enough vegetable producers. If there were stricter requirements, people wouldn't do it. (Female, 45–54 years)
	Reduced financial burden	The reduced financial obligation of being exempted	Benefits, you do not have to pay. (Male, 35–44 years)
Limitations	Liability issues	The farmer is more liable, being exempted	Liability is really interesting too, when you think about it, because we aren't required, small farms aren't required to go through the training. We're not required to adhere to the rules of the training and so if one grower, I don't want to use me as an example, but I will because I don't want to use anyone else… But if maybe, I've gone through the training, I have the knowledge, but I'm still not legally required to do it. Is that on me? I would argue, yes, but legally I feel like that's a really gray area. (Male, 55-64 years)
	Reduced profits	Less generated income from sales	We used the wholesale as produce buyer and since GAP came into place, even though I'm technically exempt because we're small, we don't have the sales, they won't buy, so we lost a huge customer. My income went 50 [% less], like cut in half. (Female, 45–54 years)
	Reduced growth	Farmer mentions inability to expand as a business	It limits your growth, your size. (Male, 25–34 years)
	Discourages market reach	Inability to sell to a broader clientele, especially to larger retailers, due to FSMA restrictions	Yeah, you're limited, as a family farm; you're limited to direct sales because it's just not [not feasible to sell to other, large or wholesale retailers]. Yeah, and that's what we do [sell only to direct markets]. (Female, 45–54 years)

> We don't have to have it because we just sell directly to the consumer. So, we don't have to do any of that jumping through hoops. We don't even get visited by anybody. (Female, 45–54 years)

Another benefit of exemption was fewer inspections. Some participants noted discomfort with state inspections, and were relieved to have to undergo fewer comprehensive inspections:

> Your inspection process is not nearly as detailed order, comprehensive, or whatever word you want to use. I think that would be a relief to somebody who's a small farmer like, okay, we don't have to, you know, have you know this huge, expensive… (Female, 45–54 years)

Study participants further claimed that the exemption allowed them to stay in business, some stating that if they had to follow some of the FSMA PSR criteria, they would not be able to meet the standards due to the financial burden of complying. Because they are exempted, reduced financial obligations means for some of them more longevity to operate their farms. A few acknowledged that they farm as a hobby or to serve their immediate community, so the exemption allows them to continue their path.

The last benefit that participants reported was the reduced time commitment consequent to exemptions. A few claimed that some of the produce-safe practices required a large time commitment, including investing time in educating themselves as well as applying the practices. The exemption affords them the time to focus on other responsibilities.

Limitations and Future Opportunities with the Exemption

Participants acknowledged that exemption from the produce-safe practices requirement removes some protections by leaving them subject to certain types of liability. A few discussed the elevated risk of liability to which they are subject:

> I'm assuming that the people who made the exemptions talk to the insurance companies. I'm sure they didn't talk to the attorneys because nobody does. But that could be a huge liability issue and could be a major disadvantage. Whereas if you did qualify for those things and did those things (required food safety practices), then most of them (liability) would fall back on the customer as opposed to the producer or seller. (Male, 55–64 years)

Participating farmers further stated that liability protection could be a form of incentive to comply with food safety regulations whether they were mandated or not. Some inferred that having liability protection in place would make compliance more reassuring from legal consequences and encourage good agricultural practices following produce safety regulations. They stated that farmers are still liable for any possible production or distribution issue, even when following good agricultural practices:

> I mean if you were pulling all the FSMA requirements of that contamination, but you still had contamination outside the requirements, you are still responsible, and you will still be held accountable whether you're following FSMA or not, right? So, if there was some, there'd be more incentive on doing FSMA in the regulations if there was some sort of protection rather than just your limiting potential, limiting the damage. (Male, 35–44 years)

Other limitations include reduced market reach and diminished profit. A few participants said that because they are exempted, they are limited as to whom they can sell their produce, and therefore they are unable to make as much profit as they could have if they had more sales channels:

> I mean, I believe in food safety. And like I said, I want to follow the rules. It's just some of them, I don't know how to translate what they're saying for the larger places into something that is financially viable. (Male, 55–64 years)

The further commented that most retail stores and wholesale outlets require them to observe food

safety regulations, accommodate any audits, and to have regulatory certifications. However, because they are qualified for exemption, they usually are not subject to these requirements. Without these measures in place, growers are unable to sell their produce to these stores, and they have reduced access to market channels that are usually more lucrative than other retail outlets.

Some produce growers expressed that operating under the exemption restricted their capacity to expand as a business, confining them to operate as small businesses: "That's the only one there, because it keeps us really small, I mean a very small business" (Female, 45–54 years).

Some confided that due to reduced market reach and reduced profits, they were unlikely to expand as a business, although it was noted that expansion could also have its own challenges. Increase in sales or market access might shift them out of the exemption threshold, thereby necessitating full compliance with PSR, with which they often felt unfamiliar. The transition would necessitate a significant learning curve; thus, some hesitated to expand because they would be required to adopt complex standards they had never been required to understand. This perceived knowledge gap discouraged expansion for some growers, ultimately limiting profitability.

Discussion

This study investigated the perspectives of small-scale produce growers on carrying out food safety activities with respect to their exemptions from the FSMA PSR. Understanding the complexities of decision making among small-scale produce growers offers valuable insights into how various factors influence their on-farm food safety practices. This discussion explores the interplay of consumer influence, intrinsic and extrinsic perceived behavioral controls, and strategies to engage growers exempt from FSMA PSR. The findings, interpreted through the lens of TPB, suggest that attitudes, subjective norms, and perceived behavioral control influences growers' intent on food safety practices. From subjective norms shaped by consumer expectations to resource availability and regulatory barriers, these themes depict the multifaceted motivations and challenges faced by growers. Moreover, these findings emphasize the importance of community ties, personal values, and external support in shaping growers' behaviors. By fostering a deeper understanding of what motivates decision-making processes, this discussion seeks to identify actionable strategies that would enhance engagement and adoption of food safety practices among small-scale produce growers.

The Role of Consumers in the Decision-Making of Produce Growers

Subjective norms, particularly those shaped by consumers, play a pivotal role in the food safety decisions of PSR-exempt produce growers. The findings from this study show how consumer expectations, particularly regarding pesticide use, directly influence growers' implementation of food safety practices. Additionally, growers' emotional connections to their communities, and combined with their personal values, further demonstrate how both societal expectations and intrinsic motivations influence their commitment in ensuring safe produce. Subjective norms as a major predictor for behavioral decisions has been confirmed by previous studies (Khan & Pandey, 2023; Lin & Roberts, 2017; Martínez-Ruiz & Gómez-Cantó, 2016; Ong et al., 2022), one study finding that subjective norms were the major construct that influenced food safety behaviors among food service employees (Lin & Roberts, 2020).

Our findings showed subjective norms, specifically the food safety expectations of consumers, influencing on-farm food safety decisions. For example, produce growers reported pesticides to be a major food safety concern for their consumers. They explained that some of their customers asked about their production methods, particularly pesticide application because it concerned them. It was apparent that they wanted to meet their customers' expectations, to maintain trust, and protect them. This emphasized that customer expectations played a role in shaping their food safety practices. Some growers explained that they were more mindful of how they applied pesticides, ensuring the correct dosages and that trained personnel were applying them. They were transparent in communicating their practices to consumers, building continuous trust. A study found that lack of social pressure

from farmers played a major role in influencing farm advisors' intent to engage in farm and health safety discussions (Mohammadrezaei et al., 2023). Generally, consumers are known to contribute significantly to market decisions such as growth and prices (Dumitru et al., 2023); it is therefore likely that farm practices would also be influenced by consumer preferences and behaviors.

A study by Stojcheska et al. (2016) asserts the importance of involving the farming community in developing adaptable strategies for rural development policies. Similarly, in our study produce growers considered the safety and approval of their community when considering their safety practices. The majority of the growers in this study serve consumers within their community with whom they have an emotional connection. This further elicits a deep need to not only satisfy their demands as consumers but also to protect them. Produce growers described wanting to avoid harming their consumers in any way, a discussion that came from an emotional and moral perspective. The personal values of these growers motivate them and keep them accountable for maintaining safety. For small-scale farmers, this is an important norm that should be examined further to determine ways to involve their communities in their decisions to enact food safety (Chen, Ellett et al., 2021).

In a study of English farmers, Mills et al. (2018) asserted that their personal values served as an intrinsic motivation in performing some environmental management practices. Our study similarly showed that produce growers expressed a moral obligation in relation to on-farm safety. Though small-scale growers expressed the benefits of exemption from PSR, they contended that food safety was non-negotiable, that it was a basic requirement of farming, regardless of regulatory standards. Such personal beliefs contribute to their own food safety expectations and have the potential to be translated into practices. This resembles findings that farmers' positive attitude toward rural development support increased their intent to apply for it (Stojcheska et al., 2016). These findings show that personal belief systems and values play a role in individual decision making when performing a behavior (Rezaei et al., 2018).

Another interesting dynamic this study revealed was the intertwining between subjective norms and produce growers' personal values on performing food safety activities. PSR-exempt farmers were willing to grow safe produce for their consumers and for themselves. This interrelation also was reported by Mahasuweerachai (2022), who found that restaurant employees' moral norms were driven by social norms, and that their feelings of guilt for not following food safety standards were associated with social expectations. The interrelation of produce growers' values with societal expectations in this study might also be due to their consumer base being their community. Societal groups with ties among members have more impact on decision making than groups with no relationship to each other (Bell et al., 2016). The emotional ties of small-farm operators to their community might have enhanced their beliefs in implementing food safety practices.

Intrinsic and Extrinsic Perceived Behavioral Control in the Decision Making of Produce Growers

For produce growers in this study, perceived behavioral control was shaped by access to resources available to them that enabled implementing food safety practices (Sansom, 2024). These resources were intrinsic and extrinsic. Intrinsic resources involved growers' own operations, and included utilities, time, and labor. These were important to the grower in being consistent with on-farm food safety practices. Interrelations existed between the lack of or limited availability of these resources. For example, many of the participating farms were run by the grower and partner or spouse, or family, which was just enough hands to handle daily farming activities. Subsequently, growers did not have enough time to engage in as many safety-related practices as they would have liked. A study by Chen, Ellett et al. (2021) reported similar findings, indicating time and labor to be major barriers to small-scale produce growers in establishing or expanding value-added businesses. It was reported that growers had limited time and lacked the labor force to engage in a lot of activities other than regular farming production, which was also emphasized in this study. One of the reasons exemptions and modified requirements were pro-

vided for very small and small farms was to reduce the administrative burden of the PSR and to allow these farms to continue to operate. The importance of the PSR to address this issue was further highlighted in this study, as growers clearly expressed the implications of this burden when discussing their efforts to adopt food safety practices.

The extrinsic resources were the external factors that can facilitate or hinder grower intent to practice food safety. These included lack of information, limited access to extension personnel, and regulatory inconsistencies. Produce growers showed an interest in learning more to improve their practices; however, they had limited access to information. Similarly, Handschuch et al. (2013) reported the importance of access to information for small-scale raspberry producers in adopting food safety and quality standards. In our study, information on improved best practices was available, but it was difficult for growers to easily access. Some platforms were not user-friendly, deterring farmers from searching for information. Various tools and resources have been developed to improve information availability (Chen, Gibson et al., 2021; Laury-Shaw, 2015; Nayak et al., 2015); but there is a demonstrated need to continue developing tailored resources for this population.

Growers indicated the need for more extension personnel to provide guidance in the fields to oversee food safety practices. Extension and other assistance is an important tool in engaging growers in farming activities, including food safety practices. demonstrated the As an example of the importance of external assistance, growers in membership associations benefited through improved skills that helped to implement food safety standards (Handschuch et al., 2013). Growers suggested that the continuous presence of extension personnel on farms improves information access and assistance for engaging in food safety activities. The Indiana Department of Health has a Produce Safety Program that inspects farms that must comply with the PSR, but provides outreach and technical assistance to all produce growers irrespective of compliance status (Indiana Department of Health, 2026). The study participants, who are from Indiana, may have experienced the benefits of the outreach component of this program, which may be why they suggest maintaining continuous support presence. Based on this observation, we encourage further investigation to determine more ways to better engage extension personnel in communicating and making information available regularly to growers.

Growers discussed the role that regulations play in adopting certain food safety practices. Growers regard regulations as inconsistent and confusing, increasing difficulty in understanding expectations that they must satisfy. Several growers stated that the language used was difficult to understand and lacked clear definitions of what was expected. They also noted a lack of alignment in regulatory information from different stakeholders. Inconsistent messages received from extension agents, inspectors, retailers, and other growers made them unsure of what was actually expected of them. The regulatory standards were also impractical for small farms to adopt even if they wanted to implement more practices. This finding aligns with other studies on the roles that growers perceive regulations have in adopting food safety practices. Chen, Ellett et al. (2021) reported that growers had limited understanding and time to implement regulations which formed a barrier to improving food safety. Baron and Frattaroli (2016) noted that inadequate regulations and enforcement regimes cause some individuals to continue with practices that could compromise food safety.

Strategies to Engage Small-Scale Produce Growers Who Are Exempted from FSMA PSR

This section explores the growers' perspectives on regulatory barriers, their concerns about liability, and the potential for incentives, such as liability protection, to encourage adherence to advanced food safety standards. Regulatory guidelines play a critical role in shaping food safety adoption decisions among small-scale produce growers, yet inconsistencies and unclear expectations present significant barriers to implementation. Although the participants are qualified to be exempted from the FSMA PSR, food safety was still an expected standard that growers intend to achieve. However, they found it challenging due to inconsistencies with regulatory requirements. This outcome resembles the finding that niche market producers found

regulations to be undefined and with unclear measurable objectives, making implementation more challenging (Young et al., 2011). Additional findings support the claim that regulatory requirements may hinder small produce growers' ability to adopt food safety practices (Chen, Ellett et al., 2021, Stoll et al., 2025a; Swinehart et al., 2025), and provide stakeholders with evidence of the challenges growers face with standards and demonstrate the need for support systems to encourage the adoption of food safety practices. This study also supports the argument that regulatory standards could be designed to be scalable and easily adaptable for farms of any size. Chen et al. (2022) recommended developing tailored standards for small farms to enable them to attain their goals. Such an approach could include user-friendly documentation, or record-keeping requirements such as checklists and seasonal logs, as well as a tiered compliance program structure based on characteristics such as farm size and market channels. These could facilitate adopting and maintaining food safety standards.

Liability protection was a major subject raised by producer growers, who contended that while exemption from the PSR had the benefit of reduced financial obligation and time commitment, nevertheless liability was a major concern. Our findings suggest that produce growers are more likely to engage in advanced regulatory standards if they are offered an added advantage, specifically liability protection. For example, produce growers suggested providing a form of insurance as an incentive for obtaining food safety certification. They believe that in the case of a foodborne illness outbreak, for example, they would remain liable despite compliance with or exemption from food safety standards. Many different perspectives have been reported on the impact of incentives in promoting intent to adopt a behavior. A study of the impact of financial profits on farmers' intent to adapt to climate change policies determined that they are more likely to adapt if they know the resulting benefits (Zobeidi et al., 2022). Contrary to this finding, a study indicated that economic incentives such as financial profits have lesser impact on farmers' behavioral intent than other cognitive factors, such as personal values and community influences (Buelow & Cradock-Henry, 2018). Based on participants' responses, our study supports the advantage of incentives in motivating produce growers' intent to perform food safety practices.

Limitations

Although focus group scripts were developed to assess the insights of produce growers, due to time limitations at a few conferences certain topics might not have been thoroughly addressed. Additionally, since focus groups were conducted solely with produce growers who attended these specific conferences in Indiana, the findings may not be generalizable to a broader population of produce growers. While the TPB framework guided this study, the qualitative nature of the research limited the ability to test predictive relationships of specific TPB constructs with grower behaviors or with other variables. Future more quantitative studies could further explore such associations and reach a higher number of growers.

Conclusion

The current study utilized the Theory of Planned Behavior (TPB) model to explore how small-scale produce growers in Indiana approach their on-farm food safety practices despite being exempt from the FSMA Produce Safety Rule (PSR). Key findings revealed the significant role of growers' personal values, community influences, and resource availability in shaping their intent to implement safety measures. Importantly, these factors are often intersected, emphasizing the interconnected nature of personal and social motivations. This study also highlighted growers' perspectives on PSR exemptions, revealing both benefits, such as reduced financial burdens, and concerns, particularly regarding liability risks. The findings suggest that strategies such as provision of liability protection, tailoring educational tools to small farms, and strengthening the presence of extension personnel may support these growers in their pursuit to ensure safe produce. Future efforts could also consider developing a centralized resource platform for PSR-exempt produce growers, with specific practical food safety guidance that aligns with their farm systems. These insights can inform strategies to promote food safety while addressing the unique needs of PSR-exempt farms.

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Appendix A. Codebook Generated from Focus Group Discussions

Code	Coding Method	Definition	Quote
Inconsistencies in the interpretation of regulations	Descriptive	Farmer mentions a lack of consistency in the interpretation of regulations.	One of the issues that I'm dealing with is depending on who you talk to, people in Purdue, you get one answer, you talk to somebody at the state level, you get a different one in somebody else's state level, you get a different one. So, I think it's consistency.
Lack of clarity on regulations	Descriptive	Farmer does not understand the regulations and expectations	And everything has limitations and exceptions. If those are very clear, that I know what this is I do and this is, I don't, that can make a difference in the world. So yes, it all comes down to communication, clear communication.
Lack of education	In vivo	Farmer mentions there is little to no education from regulatory agencies.	Here's what's been more, but there has not been a lot of education or help out there from the state or whoever. Sorry, no offense, there have been limited educational opportunities like this, or even help.
Lack of information sharing channel	Descriptive	Farmer mentions there is no channel to know when new updates to regulations are made.	And then knowing when something changes, knowing that we will know about it, if something changes, right, just the updates themselves. And we can do that, we have somebody to come out and train our group. We learned about it then. But if something changes other than that, I don't know about.
Lack of resources	Descriptive	Farmer mentions a lack of a consistent, standard resource with the needed information.	Like, there's no resource other than talking with other wineries and other people that are doing the work. But again, it might be inconsistent. One person might say one thing, you know.
Lack of utilities	Descriptive	Farmer mentions the unavailability of amenities such as water	I mean, it's difficult for farmers on my farm. I don't have running water. I don't have a well, so any water I have, we buy, and it's stored in tanks. Water is super, super precious to me. So since I don't have a fresh water source like in my apple packing line, I don't run water in it because it's better not to use water, if you don't know you've got good water, right.
Limited personnel	Descriptive	Farmer mentions a limited number of personnel to work on farm.	Well, it's really difficult. I mean it's just me and my husband. Trying to find help is impossible. So, it's just me and my husband, and we have two acres of orchard and two acres of vegetables, five acres of alfalfa, and you know, other acreage with other trees and fruit, and it's just us and we're not young.
Overwhelming record-keeping requirements	Descriptive Process	Farmer indicates difficulty in keeping up with records	The time involved in keeping records. The thing that seems to be the hardest for me, and the time involved in that. I mean, it's like about 50 different sets of records. When you sit there and look at it maybe. I was in the meeting this morning down here. They were talking about digital record-keeping. And it's just overwhelming to me to think about having the briefing written down, and I'm the only person doing it, and I'm the one giving the records and I know that I worked around the clock, and I don't make any money.

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Impractical	Holistic	Farmer mentions the impracticality of regulations	I think it's impossible for a small farm to do it. That is just my take on it.
Lack of infrastructure	Descriptive	Farmer mentions a lack of infrastructure on farm.	Yeah, going straight from the field right to the washing pack because you have like 3 hours before it's too hot to do that. Like, I don't have time to go home and shower. I don't live on the farm, so there's that. I mean, we wash our hands, wash our arms, and that's what you get.
Limited time	Descriptive	Farmer mentions limited time in daily operation to adhere to some regulations.	Yeah, going straight from the field right to the washing pack because you have like 3 hours before it's too hot to do that. Like, I don't have time to go home and shower. I don't live on the farm, so there's that. I mean, we wash our hands, wash our arms, and that's what you get.
Animal or bug controls	Descriptive	Farmer mentions consumers ask questions concerning how animals or bugs are controlled from invading the produce	How are you treating your flea beetles? How are you treating your caterpillars on your kale?
Chemical application	Descriptive	Farmer mentions consumer is concerned about chemical application on produce	Our primary one is, what are you spraying? Or do you spray anything on there?
Sourcing and processing	Descriptive	Consumer wants to know where the produce is sourced and what processing is used	Mostly is where are you getting it from? Where is it at? They ask you how you process sometimes?
No concern	Value	Farmer mentions that consumers are not concerned about safety rules	If your product looks good and nice, and I think that there is not even a thought how it was packed.
More trained personnel	Descriptive	Farmer mentions there should be more personnel, both extension personnel and 'non-extension' personnel (locals who are not extension trained to teach others on regulations).	If money were not an issue, that Purdue could send somebody out to every single place, and say, this is what you must do, this is what you don't have to do. Or to have local trainers that are not necessarily government employees, as in Cooperative Extension staff being the only ones who can do it. If I could teach my neighbor, yeah, that kind of thing, if I could teach my church. That would be helpful.
Regular updates	Descriptive	Farmer mentions regular updates be given	Yeah. And the annually updated list to toggle the scale of production, and then how someone who does small, medium, large, wholesale, to come out, do training, and update that, like I said annually.
More resource tools needed	In Vivo	Farmer indicates a resource that has all information needed or have more resources or point personnel	Use the term flowchart for there's some way you could log into a website, and it would have a few introductory questions like what is the size of your operation, an acre for fruit or crop produced, and your typical annual gross sales. And then from there, which crops are you producing? This then takes you down a trail of things you need to be worried about giving your crop size, location, and other things being ignored because you're not a large operation or you're not growing a particular crop. So I think that would be a way to develop that kind of tool in cooperation with

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			the regulatory agencies in the state. So, we're consistent with current state of federal law.
Knowing sources of information	Descriptive	Farmer mentions knowing where to source information	For me, knowing where to go for the information like this, this GAP training you know.
Liability protection	Descriptive	Farmer suggests protection as a way to easily comply to regulations	I mean if you were pulling all the FSMA requirements of that contamination, but you still had contamination outside the requirements, you are still responsible and you will still be held accountable whether you're following FSMA or not right? So if there was some, there'd be more incentive to do FSMA in the regulations if there was some sort of protection rather than just limiting potential, limiting the damage.
Direct market sales	Descriptive	Farmer mentions ability to directly sell to consumers as a benefit of being exempted	We can sell directly to consumers, I mean even though you're limited, you still can do it.
Implement regulations	Descriptive	Farmer mentions being aware of the regulations and implementing some even though they are exempted	As a grower what I'd say, but on the same thing like you said like I think it sounds like most of us though not needing to be certified are aware of the broad strokes of these practices and try to implement as many as are feasible or makes sense. For context, that is not the case for some other growers who either willingly ignore and do things, it's just cheaper.
Learning curve	Descriptive	Farmer indicates the impact of having business grow to a non-exempted FSMA business	That's true because if we want to get any bigger, we have to find other avenues to sell, which means we will probably have to get into wholesale and schools and stuff like that, which means that we have to go back and learn all the certification, all the regulations, you know, if we have to build different buildings and have separate well, and you know, yeah, I mean it would be very cost prohibitive.
Liability issues	Descriptive	Farmer indicates that the farmer is more liable as being exempted	I'm assuming that the people who made the exemptions talk to the insurance companies. I'm sure they didn't talk to the attorneys because nobody does. But that could be a huge liability issue, it could be a major disadvantage. Whereas if you did qualify for those things, and did those things, then most of those would fall back on the customer as opposed to the producer or seller.
Market struggles	Descriptive	Farmer mentions the market will struggle if there were no exemptions	I'm afraid that markets would really struggle I know in Crawfordsville, we struggle to have enough vegetable producers if there were stricter requirements people wouldn't do it.
Less inspections	Descriptive	Farmer mentions fewer inspections on farms as an advantage	They'll still do the on-site safety review of our farm, but they will do it every season, or every so many months, like they do on larger farms that are under that, you know, like I said, we're exempt. So, we don't have all that every so many months that they have to come out.
Personal morals or values	Values Emotions	Farmer expresses their own values on the safety of people	I think, from my perspective, and just hearing, I think food safety is very important.

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			At first blush, it makes me giggle. Because if it's about food safety, then we should all be practicing food safety. Just because I'm small, doesn't mean I should not be safe.
Reduced financial burden	Descriptive	Farmer indicates the reduced financial obligation from being exempted from FSMA	Benefits, you don't have to pay.
Reduced growth	Descriptive	Farmer mentions inability to expand as a business	It limits your growth, your size.
Reduced market reach	Descriptive	Farmer mentions inability to sell to a broader clientele due to FSMA restrictions	Yeah, you're limited. As a family farm, you're limited to direct sales because it's just not. Yeah, and that's what we do. We're not going to try to venture into wholesaler or anything, because that's a whole different ball game.
Reduced profits	Descriptive	When a farmer indicates reduced sales due to food safety regulatory expectations	It's just that we used to before FSMA came into place; we used to wholesale. And since FSMA came into place, even though I'm technically exempt because we're small, we don't have the sales, they won't buy, so we lost a huge customer. My income went 50 like cut in half.
Reduced time commitment	Descriptive	When farmers mention saving time the benefits of being exempted.	The time commitment. You have to spend a huge amount of time going to training sessions, reading materials, taking exams, whatever it might be, then in my business, only 2 or US$3,000 a year, it's not worth it.
No harm	Value	Farmer does not want to harm consumers	My primary risk concern actually is I don't want people getting hurt, because many children, families [eat produce]. One of my biggest expenses is liability insurance. But in terms of the food safety side, we began during the pandemic several years ago, we're sanitizing, we provide buckets to begin with, we put a fresh new plastic bag and liner in every bucket for every customer, which they then take the fruit home in. So that provides a barrier of safety, and they're picking the fruit.
Pesticide application	Descriptive	Chemical food safety risks farmers are concerned about	Well, we do have bees also, so we have to be really careful what we spray, because it can harm them, but also the customers and our own personal consumption. I don't want to be eating chemicals.

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Appendix B. Compilation of Codes (Appendix A) into Themes and Subthemes Based on the Theory of Planned Behavior

Theme	Subtheme	Code
Attitude	Personal values	Personal morals or values
Subjective norms	Community	No harm Pesticide application Sourcing and processing
Perceived behavioral control	Labor	Limited personnel
	Utilities and time	Lack of utilities Overwhelming record-keeping requirements Limited time
	Information source	Lack of education Lack of information-sharing channel Knowing sources of information More resource tools needed. Regular updates
	Access to extension personnel	More trained personnel
	Regulation	Inconsistencies in the interpretation of regulations Lack of clarity on regulations Impractical