



## SMALL FARMS AND FOOD SAFETY PRACTICES IN TEXAS

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### Review Article

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**Keywords:** Small farms; Food Safety practice, Food safety knowledge; Small grower resources; Produce growers.

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## المزارع الصغيرة وممارسات سلامة الأغذية في تكساس

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### الخلاصة

تعني سلامة الغذاء معرفة كيفية شراء الطعام وإعداده وتخزينه لمنع انتشار البكتيريا الضارة التي تسبب الأمراض المنقولة بالغذاء، مثل السالمونيلا والإي كولاي. هدفت هذه المراجعة إلى تقييم الفجوات الحالية في سلامة الأغذية بين المزارع الصغيرة في تكساس لتحديد مجالات التركيز الرئيسية للمواد التعليمية والتدريبية المحتملة لأصحاب المصلحة هؤلاء. يكسب صغار المزارعين 25000 دولار من المبيعات السنوية على مدى 3 سنوات ويقل متوسط بيع المواد الغذائية عن 500000 دولار. ستساعد المعلومات الواردة في هذه المراجعة في تصميم مواد تدريبية هادفة ومحددة بشأن سلامة الأغذية للمزارع الصغيرة.

كلمات مفتاحية: المزارع الصغيرة، سلامة الأغذية، معرفة سلامة الأغذية، موارد المزارعين.

### Introduction

Produce consumption has increased in the United States (U.S.) due to its nutrient value and health benefits (1); however, fresh produce (fruits and vegetables) have been associated with multiple foodborne disease outbreaks (3, 4 and 11). In the U.S., out of the outbreaks recorded between 1998 to 2008, about 46% of outbreaks were caused by produce (17). Produce may become contaminated by a variety of sources such as agricultural water (during growing and post-harvest activities), farm workers, raw manure and contaminated soil amendments, wild and domesticated animals, farming tools, and equipment (1, 9 and 10). However, sources of produce contamination vary for different production areas and for each farm, as each farm has different environmental conditions and topography (1 and 9).

The Food Safety Modernization Act (FSMA) produce safety rule focuses on minimizing the risks of foodborne illnesses and sets standards for every stage of product production, including standards for growing, harvesting, packing, and holding produce for human consumption (24 and 10). The FSMA produce safety rule has set standards and compliant dates based on farm size (25). Most small and mid-size farms sell their products locally or at farmers' markets (12). Growers that have average sales of less than \$25,000 in annual sales over a 3-year period and have an average food sale of less than \$500,000 are not covered and are not mandated under the FSMA rule, and do not

need to comply with all rules required for farms that are covered or are eligible for a qualified exemption. Nonetheless, according to Subpart A of the Produce Safety Rule, specifically Sect. 112.4 (a), produce sold during the previous 3-year period of more than \$ 25,000 (on a rolling basis), adjusted for inflation using 2011 as the baseline year for adjustment (26). However, small and medium-sized farms are subject to the Federal Food, Drug, and Cosmetic Act (FD and C) (26) which encourages growers to perform good agriculture practices (GAP), generating and keeping auditing and/inspection documents, and disclosing their farm information (including business name and farm address) at the point of purchase to be able to trace the product in case of any food safety issues (25). Many small growers have no food safety plan in place (6). Usually, growers who are starting as small farmers do not have a background in agriculture (5). This lack of previous agricultural knowledge is accompanied by a small or limited income, and no previous food safety training or resources (5). To this end, studies have shown that there is a lack of food safety knowledge among small growers in many states in the U.S. (5, 14, 15, 22 and 23). Research has also shown that small farm growers lack the required resources to implement food safety practices (5) and are not following appropriate food safety practices (15 and 22). Some examples of high-risk practices that can increase risks of produce contamination include using raw manure or combination, allowing livestock to roam freely on the farm, not providing handwashing or toilet facilities near the farm or packing area, and using dirty tools and equipment (2, 5 and 25). Research has indicated a need for food safety training and educational programs for small and mid-size farms (5 and 13). According to the National Agricultural Statistical Service (NASS) 2017 agriculture data census, approximately 66 small farms produce sales up to \$ 500,000, and 619 very small farms produce sales up to \$ 250,000 covered by the rule in Texas (27). Most of these farms grow leafy greens in addition to other commodities, such as nightshade, cruciferous produce, and fruits. However, there is a need to identify specific needs and gaps in small growers' food safety perceptions. Understanding microbial risks that affect produce through food safety training can help growers of small farms to minimize foodborne illness and provide safe and healthy produce to consumers (9 and 23). In order to design the best food safety educational programs and resources for small farmers in Texas, it is important to identify the gaps and needs small farmers to have in food safety practices. This way, it will be possible to provide them with the appropriate resources and promote the safe production of produce.

### **Discussion**

The best way to identify the gaps is to design a survey to determine current food safety practices and assess food safety perceptions among small farmers in Texas.

Studies from other U.S.A. states have shown that small farmers did not provide handwashing and portable toilet facilities to their workers (5 and 22). Harrison et al. (5) conducted a survey of small and mid-sized farms in Georgia, South Carolina, and Virginia, and found that about 40% of the participants did not provide handwashing or toilet facilities to their workers. Similarly, Sinkel et al. (22) conducted a study on Kentucky fresh produce farmers and reported that only 60% of farmers provided these

resources to their workers, which means 40% did not provide these resources. However, even if the growers (farm owners) provide these resources, intensive training or guidelines need to be in place on how, when, and why workers are required to use handwashing and toilet facilities.

Additionally, a study has indicated that only 25% of these growers (farm owners) have access to food safety educational tools such as posters, booklets, and signs for their employees. Only 21% of growers (farm owners) have previous food safety training, and only 22% of them currently have food safety learning programs. The numbers obtained regarding food safety training indicated that the majority of the participant growers do not have previous and current food safety training, and do not have access to any food safety resources or educational tools. This situation implied that there are huge gaps in food safety knowledge and learning resources among small farm growers in Texas, and immediate action is needed. Harrison et al. (5), found gaps in food safety knowledge and resources among farmers of small and mid-sized farms and farmers' markets in Georgia, Virginia, and South Carolina, and suggested a need for food safety educational learning programs for this group of farmers (5).

In addition, outreach training or guidelines in form of posters, videos, information sheets, booklets, or other tools have been shown to be effective in enhancing growers' food safety knowledge (16). These materials can include topics such as proper use of soil amendments, water testing, use of animals in the farm and wild animals' mitigation, and any other related issues on how to manage farm environments that may pose food safety risks. Previous studies have demonstrated that educational materials in the form of videos and information sheets were effective tools for farmers' markets managers and vendors (16).

Currently, irrigation water is one of the most critical sources of product contamination. Irrigation water, especially surface water, is known to be one of the most important sources of produce contamination (9 and 18). Therefore, knowledge about water quality and water treatment are critical issues that growers need to know. The only way to know the microbial quality of irrigation water quality is through laboratory analysis (7). However, the data showed that growers lack the necessary information about water testing and the majority of them did not test irrigation water. The data also suggests that growers lack knowledge about the risk of product contamination through irrigation water. Educational programs are an effective approach to improving growers' knowledge about the risk of product contamination through irrigation water or postharvest water (19).

The nonavailability of important resources in some farms, such as handwashing and toilet facilities, could result in poor hygiene practices. Hence, using bare hands as a harvesting method for produce may lead to cross-contaminated produce with human pathogens. This information confirms that most small growers sell their produce locally and directly to consumers, which means that the product does not undergo any processing before it is sold.

The information from this review suggests that growers need to be provided with scientific and research-based food safety materials. While several studies have been conducted in this regard and educational resources were proven to be effective, the next

step is to develop food safety educational materials from the findings that reflect the actual problems and address specific gaps.

In terms of the efficacy of food safety educational materials, Jackson et al. (8), conducted a multi-state survey to determine the influence of Good Agricultural Practices (GAPs) awareness on performing food safety. These authors found that growers who have knowledge of Good Agricultural Practices (GAPs) are more likely to provide handwashing and toilet facilities, encourage hygiene practices on the farm, and provide hygiene-specific training to workers (8). Moreover, a study identified the cost of implementing food safety practices as a primary obstruct for farmers, especially small farms (20). However, the same study indicated growers are more likely to enhance their financial benefits through relatively higher market sales gains for the production of safe foods when GAPs are incorporated (20). Previous studies have demonstrated a need for low-cost, effective training programs for small growers (5). Penn State Extension conducted on-farm food safety workshops statewide to train produce growers on GAPs and then assessed the growers' knowledge through pre and post-tests. The results indicated an increase in growers' knowledge, attitudes, confidence levels, and intentions to perform GMPs (15). Iowa State University developed food safety educational materials through a multi-disciplinary three-level sequential program ("Know," "Show," "Go") to provide knowledge on GAPs (Know), documentation of food safety practices (Show), and aids in growers' readiness for third party auditing (Go), and results showed effectiveness in changing growers' long-term food safety knowledge, attitudes, and behaviors (21). To this end, an overall assessment of this review suggests that scientific-based food safety educational materials in form of outreach training, videos, guidelines, information sheets, and/or toolkits are needed for small farms in Texas.

### **Conclusion**

Small farms account for farms that sell less than \$50,000 gross annually, and those with an annual gross sale of \$25,000 are exempt from most FSMA requirements. Regardless of exemptions, small growers are still subject to some requirements and may undergo inspections if their product becomes contaminated and pose a risk to consumers. Small growers can substantially reduce the risk of foodborne illnesses if they are equipped with food safety training and resources that assist them in implementing food safety practices in their farms.

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