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Survey of Farmers Market Managers in California: Food Safety Perspectives

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Abstract

We conducted a survey to characterize certified California farmers markets (FMs) regarding location, seasonality, size, product, product labeling, advertising methods, postharvest practices, regulations governing vendors, training offered, and training interests. Data obtained from the survey highlight the need for improvement regarding food safety and can serve as a basis for development of collaborative education by Extension educators, regulatory agencies, and FMs. Extension professionals can play a proactive role in such training opportunities, focusing outreach efforts for training according to applicable findings and including online training venues to maximize reach to stakeholders.

Keywords: [food safety](#), [farmers markets](#), [outreach](#), [vegetables](#), [animal products](#)

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Introduction

During the past decade or so, there has been an increase in consumer demand for locally grown, sustainably produced, and organic meat and produce, especially in California (California Department of Food and Agriculture [CDFA], 2016; Hardesty, 2008; Martinez et al., 2010; Meadows, 2013). This demand has led to a rise in the number of small-scale farms and the subsequent direct marketing of agricultural products through farmers markets (FMs) (Animal and Plant Health Inspection Service, 2012; Hardesty, 2008; Meadows, 2013). Although this rise in direct-to-consumer sales may have a positive economic and social impact, concerns about

food safety risks associated with directly marketed food have been posed (Abel et al., 1999; Govindasamy et al., 2002; Scheinberg et al., 2013). On farms, differences in food safety practices as well as the potential for contamination and cross-contamination of products as a result of agricultural practice and handling factors (e.g., manure and compost application, irrigation type, water used to wash produce, sanitization of containers and surfaces) contribute to food safety risks (Alegbeleye et al., 2018; Harrison et al., 2013). Additionally, food safety practices during harvest and after harvest (e.g., storage, transportation, sampling) may affect the presence of foodborne pathogens in FM products (Brackett, 1999; Wisniewski et al., 2016).

California plays a substantial role in U.S. and international agricultural production and crop distribution (Agricultural Marketing Service [AMS], 2018; CDFA, 2016). A growing sector of this production is led by small-scale farms, reflected by the approximately 800 FMs in operation in California (AMS, 2018). Of those FMs, 687 are part of the CDFA Certified Farmers' Market (CFM) Program. This program, started in 1977, allows farmers to directly market their products and exempts them from packing, sizing, and labeling requirements (California Code of Regulations, 2019; CDFA, 2016). The program benefits the agricultural community by enabling farmers to cut out middlemen and take a price premium and allowing consumers to meet farmers and learn how their food is produced.

California farmers choosing to direct market their products have various opportunities to do so but also encounter a host of associated regulations. For example, farmers selling agricultural products (e.g., fruits, nuts, vegetables, shell eggs, honey, flowers, nursery stock, livestock, and poultry products) at a CFM must hold a CDFA certified producer certificate, as supervised by the County Agricultural Commissioner's Office. This certification is part of the CDFA CFM Program and ensures that farmers comply with certain rules intended to verify that all products are grown by the farmers selling them (CDFA, 2015b, 2019; Trotter & Lewis, 2016). Farmers selling animal products are also subject to U.S. Department of Agriculture (USDA) regulations (Food Safety and Inspection Service, 2018), CDFA regulations (CDFA Meat, Poultry, and Egg Safety Branch, 2019; CDFA Milk and Dairy Food Safety Branch, 2019), and county-level legislation. Additionally, within California, there are several FM associations, each of which has specific food safety and good agricultural practice (GAP) guidelines for vendor members, such as requiring an annual farm visit for each vendor (Farmers Market Coalition, 2018). California farmers also can sell cottage foods under the California Homemade Food Act and California Cottage Food Operation certification program (University of California Agriculture and Natural Resources [UCANR], 2019; University of California Cooperative Extension [UCCE], 2018). Because of such complexities, Extension educators and specialists in California have been playing an important role in extending knowledge and training in different areas for small-scale farmers, including agricultural diversification, business and marketing, processing (e.g., for cottage food production), and distribution of agricultural products sold at FMs (UCANR, 2019, 2020; UCCE, 2018; University of California, Davis, Agricultural Sustainability Institute, 2020).

Unfortunately, the combination of federal, state, county, and organizational regulations creates a complex set of rules for vendors and FM managers, making it difficult for them to standardize their practices across various FMs and to comply with different requirements (e.g., for hygiene, sanitation, storage, cooling, and packaging). The implication of this heterogeneity on FM practices, management, and regulations regarding food safety in FMs in California has not been fully studied to date.

In the study described in this article, we aimed to characterize the food safety practices and related practices (e.g., marketing and operations) used by FM vendors and assess the need for food safety training among FM

managers. The information gathered here will help Extension professionals and educators with the development and implementation of programs addressing food safety in FMs in California and may be of value to those in Extension elsewhere as well.

Materials and Methods

Survey Design, Structure, and Implementation

We compiled a list of CFM managers in California using available lists from FM associations and official websites (AMS, 2018; CDFA, 2016) and distributed an online survey (Qualtrics, Provo, UT) via email in July 2018 and via a follow-up email in September. An alternative hard-copy version of the survey was made available upon request. We pretested the survey with professionals affiliated with Cooperative Extension and the FM associations. The survey was accessible from July 2018 to October 2018. It consisted of 37 questions (23 single answer, five multiple answer, two text entry, and seven matrix table) and was divided by topic into five parts: introduction; knowledge about on-farm practices; food safety, storage, and cooling; FM information; and requirements to become a vendor. A copy of the survey is available upon request. The survey instrument was reviewed by the institutional review board administration (University of California, Davis; Davis, CA; No. 1183923-1).

Data Analysis

We analyzed quantitative data using descriptive statistics in R software, version 3.5.2 (R Core Development Team). We calculated relative frequencies and percentages on a per-question basis, using total respondents for each question as the denominator.

Results

After identifying and contacting 370 FM managers, we received 90 online responses. We excluded from the analysis 22 surveys with an overall question response rate below 5%. Of the 68 remaining responses, mean survey progress reached 80.4% ($SD = 30.3$), with 58.8% of respondents completing all survey questions. Forty-four of the 68 respondents finished the survey in less than 15 min, and the mean response time overall was 10 min.

Almost one third of the respondents came from California's North Coast area (29.4%, 20/68), followed by the Central Valley (22.1%, 15/68) and the South Coast and Deserts (19.1%, 13/68). Eleven other areas were represented with one to five participants each. Most respondents considered themselves FM managers, except two individuals who self-identified as a project manager and a board president. Almost half of the FMs (49.3%, 33/67) were open year-round. Seasonal markets tend to concentrate during the months of April to November, especially May to October (20.9%, 14/67). The majority of FM managers (60.3%, 41/68) managed a single FM ($M = 2.12$, $SD = 2$), and one managed 12 FMs.

FM Information

Responses to the survey question about FM size (i.e., "How many producers/vendors participated at your market in 2017?") indicated that the median number of vendors per market was 30 ($M = 59$, $SD = 64$). Five

respondents answered this question per market. In this subgroup, the median number of vendors per market was 23 ($M = 26.4$, $SD = 22$). The number of vendors per market during peak harvest season varied, with FM managers reporting that figure as being less than five (18.4%, 9/49), between six and 15 (36.7%, 18/49), and above 16 (44.9%, 22/49). Nearly three fourths of the FM managers (70.8%, 34/48) reported not being part of an FM association.

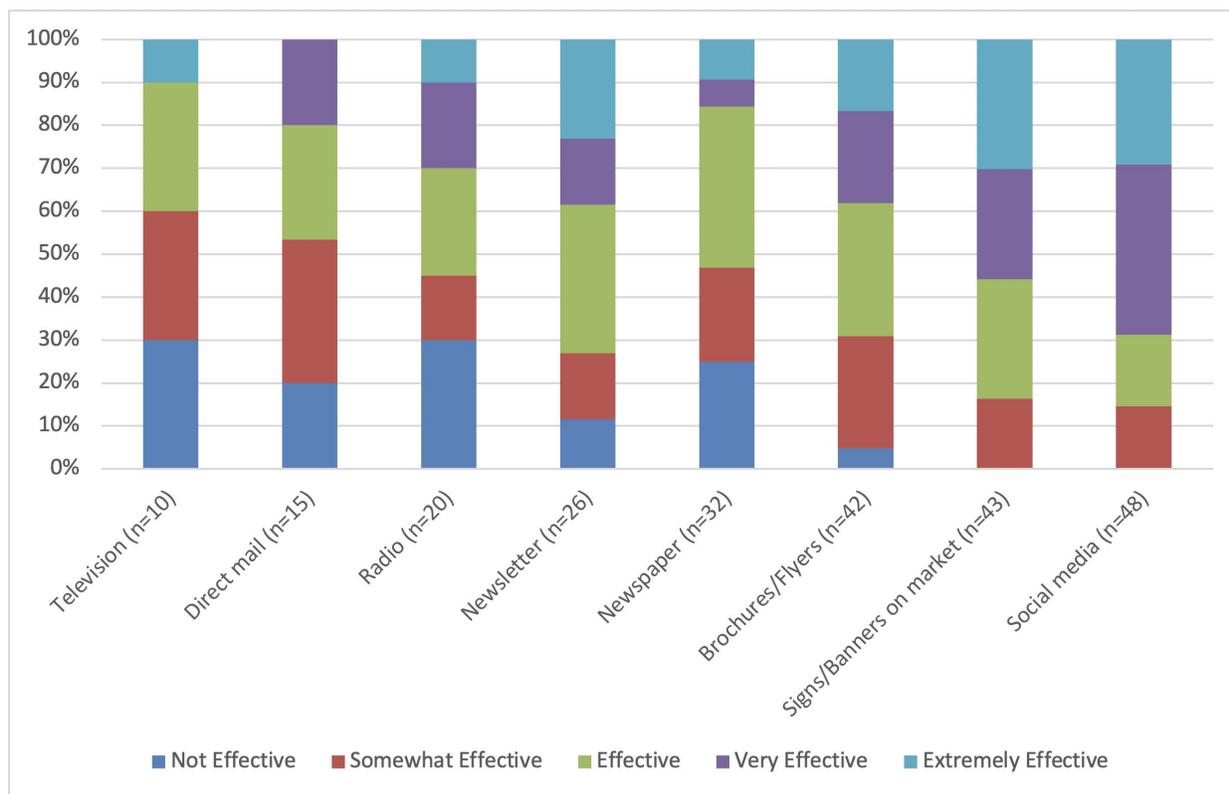
The most common items sold at FMs were fresh fruits and vegetables (100%, 49/49); herbs, flowers, and plants (100%, 49/49); honey, nuts, jams, jellies, and preserves (91.8%, 45/49); and baked goods (87.8%, 43/49). Also common were prepared foods (84.8%, 39/46) and other processed foods (70.5%, 31/44). Although animal products were less popular, they were still present in approximately two thirds of FMs (dairy products—59.1%, 26/44; meat and/or poultry products—63.6%, 28/44; fish and/or seafood—47.8%, 22/46).

The most commonly used label (i.e., product attributes) for produce at FMs was "certified organic" (77.6%, 38/49), but other labels were also used (81.6%; 40/49), specifically "locally grown" (77.5%, 31/40), "pasture raised/free range" (62.5%, 25/40), "chemical/pesticide free" (47.5%, 19/40), "hormone/antibiotic free" (25%, 10/40), "natural" (25%, 10/40), "humanely raised" (20%, 8/40), and "biodynamic" (15%, 6/40). Slightly more than two thirds of the FM managers reported that producers could sell other farms' products using a second certificate (77.1%, 37/48) and that producers could sell farm products from outside the local area (<100 mi; 66.7%, 32/48). A lesser number of FM managers (38.3%, 18/47) reported that the variety of items that could be sold at their FMs (e.g., meat, eggs, and fish/seafood) was limited. Almost one third of respondents (28.6%, 14/49) operated in a permanent facility whereas over two thirds (71.4%, 35/49) operated in temporary facilities.

The two most effective advertising methods used by FMs were social media and signs and banners on markets; the least popular was advertising on TV (Figure 1). Other methods reported by participants were word of mouth, bus and transit advertising, solicited free print exposure, promotion of local food and markets through partnering with other nonprofits and governmental agencies, and large decals on market vehicles (this method was classified as "very effective" or "extremely effective").

Figure 1.

Perceived Effectiveness of Advertising Methods Used by California Farmers Market Managers



Note. We calculated percentages by dividing the number of respondents who ranked the specified advertisement venue by the total number of responses for that option (n).

Most FM managers (70%, 28/40) reported that they were the ones who had developed the requirements for vendors for their FMs; others indicated that requirements for vendors were developed by the city, the county, or a municipal government agency (47.5%, 19/40); a community or nonprofit association (37.5%, 15/40); the FM board of directors (37.5%, 15/40); or a service organization (5%, 2/40). Almost two thirds of respondents to the relevant set of questions (62.5%, 25/40) selected more than one option (e.g., rules were developed by them and by a government agency).

Additionally, comments from the FM managers reflected concerns such as shrinking markets, differences between local government and privately operated/owned markets, excessive food safety regulations that are considered unnecessary, and a lack of monetary incentives to ensure that government regulations are followed.

Knowledge About On-Farm Practices

Most respondents did not ask vendors questions related to on-farm food safety practices. Specifically, large proportions of respondents did not ask vendors about (a) whether sanitation training is available to farm workers (88.6%, 54/61), (b) whether they use sanitizers on cleaning surfaces that touch fruits or vegetables

after harvest (80.3%, 49/61), (c) whether they post materials with information about sanitation procedures at their farms (88.6%, 54/61), (d) whether they test the agricultural water on their farms (86.7%, 52/60), (e) whether they use animal manure in their vegetable production (71.7% 43/60), (f) whether domestic animals (e.g., dogs, cats, chickens; 88.3%, 53/60) or wild animals (e.g., deer, feral pigs, waterfowl; 88.6, 54/61) have access to their vegetable production areas and what procedures are used to harvest vegetable crops (75.4%, 46/61), and (g) whether they provide handwashing facilities (85%, 51/60) and restroom facilities (85%, 51/60) within short walking distances of fields and packaging areas.

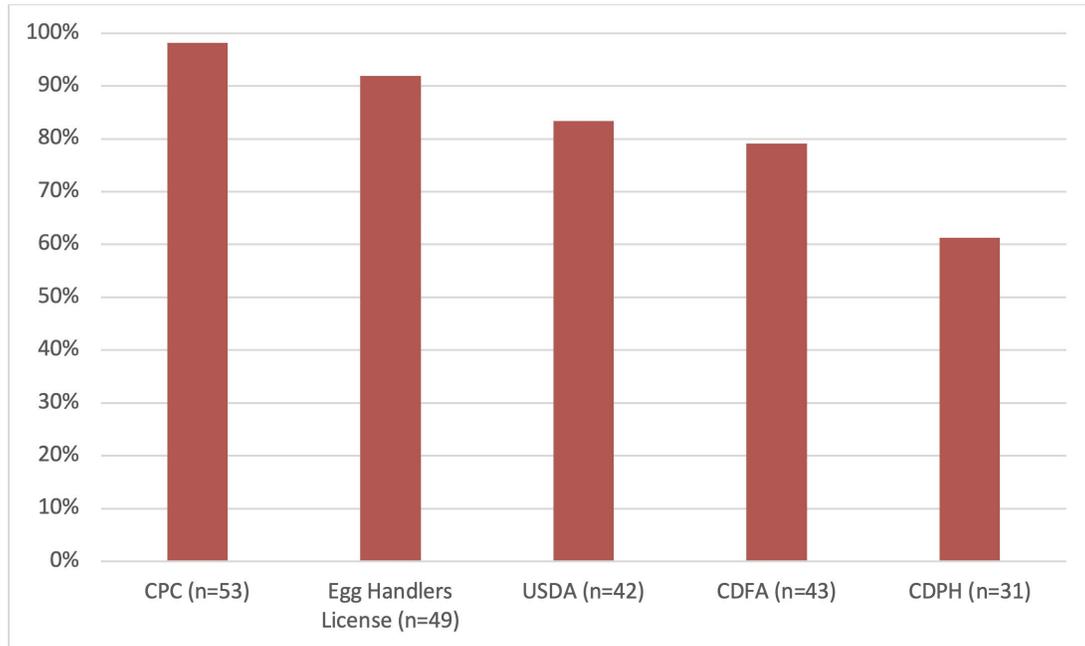
Food Safety, Storage, and Cooling at the Market

Most respondents (88.2%, 45/51) reported that their markets had on-site food safety standards in place. In answering an open-ended question, a majority of respondents (66.7%, 30/45) reported complying with local environmental health department regulations. A smaller proportion (20%, 9/45) reported that they provided a handwashing station but did not explicitly state that they followed local environmental health department regulations. Those who did not have standards in place (11.8%, 6/51) were FM managers who were not part of an FM association, most of whom (83.3%, 5/6) expressed interest in food safety training materials. Many respondents (43.4%, 23/53) reported that they did not train vendors or market workers on sanitation related to displaying or handling products at the market, and many (37.7%, 20/53) did not train vendors on sanitation specific to sampling.

FM managers required vendors to provide several certifications or licenses to sell fresh fruits, nuts, vegetables, shelled eggs, or meat products at their markets (Figure 2). However, between two and five FM managers reported that they did not ask for the required CDFA certificate, egg handlers license, or USDA certificate, even when the vendors sold the relevant products. An individual CFM may set its own rules (regarding, for example, producers' food safety plans, second certificates allowing farmers to sell products from another farm, safety signage, and product admission policy). Therefore, FM rules may be more restrictive, are normally stricter than state or county regulations, and are part of the agreement between the farmer and the FM manager (CDFA, 2015a). Given that most surveyed FM managers managed a single market, the varied requirements for becoming a vendor could pose a compliance challenge to vendors/farmers who intend to sell their products at multiple FMs.

Figure 2.

Percentages of California Farmers Market Managers Who Reported Requiring Specific Certifications or Licenses for Vendors Selling Fresh Fruits, Nuts, Vegetables, Shelled Eggs, or Meat Products

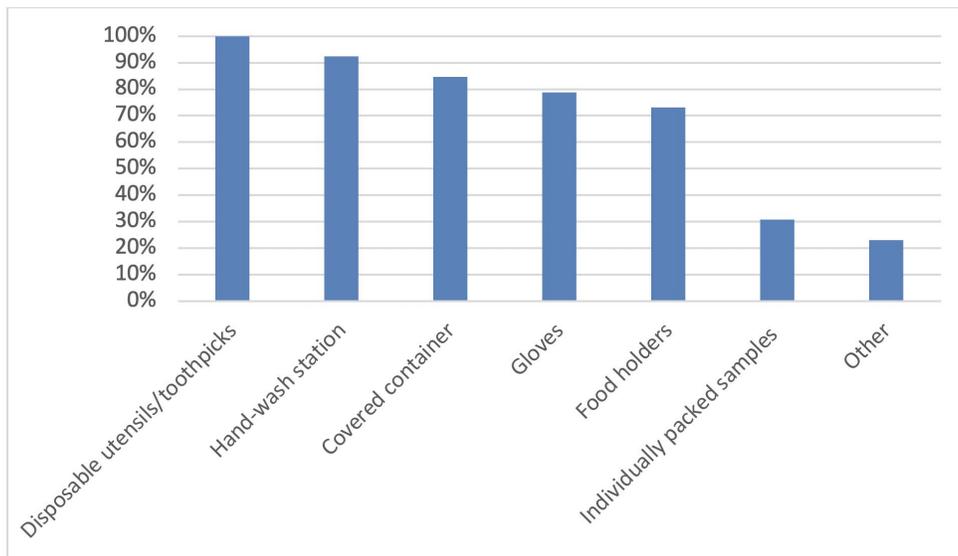


Note. Respondents could choose more than one option. We calculated percentages by dividing the number of respondents who confirmed requiring the specified license or certificate by the total number of responses for that option (n). CPC = Certified Producer's Certificate; USDA = U. S. Department of Agriculture–inspected documentation; CDFA = California Department of Food and Agriculture–inspected documentation; CDPH = California Department of Public Health Cannery License Number.

Most respondents (96.3%, 51/53) allowed sampling of products at their markets. Relative to sampling, these FM managers generally required the use of disposable utensils/toothpicks, handwashing stations, covered containers, gloves, and food holders (Figure 3).

Figure 3.

Percentages of California Farmers Market Managers Who Reported Requiring Specific Food Safety Measures for Product Sampling



Note. Percentages are based on the total number of survey participants responding to the question of whether sampling is permitted at the farmers market ($n = 51$). Respondents could choose more than one option. "Other" includes proper practices related to health and hygiene, food temperature, and sanitation (e.g., use of bleach, produce and utensil washing stations, and sneeze guards).

Forty-nine FM managers reported that vendors sold fruits and vegetables at their markets. According to the FM managers, most of these vendors did not use a cooling method during transport or during transport and storage, although some used portable coolers filled with ice during transport and storage (Table 1). With regard to temperature control methods for frozen meat and poultry, FM managers reported that vendors used ice cooling, electric coolers, and prechilled or frozen ice chests during transport or during transport and storage (Table 1).

Table 1.

Cooling Methods for Fresh Fruits and Vegetables or Meat Products Used by Vendors at California Farmers Markets as Reported by Farmers Market Managers

Type of cooling/refrigeration	Transport		Storage		Transport/ storage		No response	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Fruits and vegetables								
No cooling	15	51.7	2	6.9	12	41.4	20	—
Portable coolers with ice	9	47.4	2	10.5	8	42.1	30	—

Refrigeration	7	58.3	2	16.7	3	25.0	37	—
Cold water	1	20.0	1	20.0	3	60.0	37	—
Meat and poultry products								
Ice cooling	11	45.8	1	4.2	12	50.0	4	—
Electrically powered coolers	6	46.2	2	7.7	6	46.2	15	—
Prechilled	5	62.5	0	0.0	3	37.5	20	—
Frozen ice chest	6	54.4	0	0.0	5	45.5	17	—

Note. A total of 49 farmers market managers reported that vendors at their markets sold fruits and vegetables ($n = 49$), and 28 indicated that vendors at their markets sold meat and poultry products ($n = 28$). We calculated percentages by dividing the number of responses for a specified option (n) by the total number of respondents for that question.

When respondents were asked whether they were interested in obtaining food safety training materials for vendors, only 13.5% (7/52) answered no. Among the 45 who were interested, the most appealing training method was printed fact sheets (95.6%, 43/45), followed by in-person training (i.e., workshops; 42.2%, 19/45), online training modules (33.3%, 15/45), YouTube videos (24.4%, 11/45), and videos and DVDs (13.3%, 6/45).

Discussion and Implications

In an effort to support the food safety of products sold directly to consumers at FMs, we characterized and described CFMs in California by means of a survey. We identified a need for and interest in food safety training by FM managers. Our findings can serve as a basis for development of collaborative educational options by Extension educators, regulatory agencies, and FMs regarding food safety training and outreach targeting stakeholders involved with FMs. Extension professionals and educators can play a proactive role in these training opportunities. Although our study was conducted in California, our findings may apply to other states.

Our results suggest that most FM managers supervise only postharvest food safety practices of vendors at their markets and refrain from asking vendors about on-farm pre- and postharvest practices. Similarly, Harrison et al. (2013) reported that only small percentages of FM managers (2%–11%) asked vendors about on-farm practices at FMs in Georgia, Virginia, and South Carolina. The findings of our study could be an indication of managers' reliance on preharvest certification programs, such as the national organic program (USDA, 2011), the GAP program (Florida Department of Agriculture and Consumer Services, 2007), CDFAs small farm food safety guidelines (CDFA, 2012), and federal and state regulations (U.S. Food and Drug Administration, 2015). Extension professionals should encourage FM managers to include assessment of GAPs as part of their FM vendor agreements and to visit vendors at their farms to ensure that they are following GAPs (CDFA, 2015a).

Through our survey, we observed a wide range of practices and protocols regarding transportation, storage, sanitation, and sampling of products at FMs. These differences may compromise food safety of fresh products sold and sampled at FMs. Studies yielding similar results have been conducted in other states (Gwin & Lev, 2011; Harrison et al., 2013; Karumathil et al., 2016; Levy et al., 2015; Pan et al., 2015; Peng et al., 2016;

Scheinberg et al., 2013).

However, comparisons to FMs in California should be made with care, as FMs in the state are highly regulated (Assembly Bill 1871, 2014; CDFA, 2016, 2019; Trotter & Lewis, 2016). For example, in California, FMs are required to separate areas for agricultural products sold by CDFA-certified and organic-certified farmers from crafts and food stand areas, with FM managers generally in charge of implementation and enforcement of the certified and noncertified sections. On the other hand, California FM managers tend to rely on the farmer/vendor to be in compliance with various county, state, and federal regulations. This circumstance may be because of the complexity of the regulations or because they view each vendor as an independent business. Additionally, vendors offering sampling at FMs must follow local department of environmental health regulations and the California health and safety code to minimize microbial contamination and maximize consumer safety (CDFA, 2015a). Thus, compliance and interpretation vary from county to county, market manager to market manager, and farmer to farmer. There is an opportunity for Extension professionals to develop resources to proactively assist FM stakeholders in understanding and navigating the complex maze of regulations and food safety guidelines and to make those resources more readily available to FM managers and vendors.

Currently, most outreach and Extension resources on food safety are tailored to farmers and vendors selling agricultural products at FMs (Bucknavage, 2015; CDFA, 2012; Ellis et al., 2004; Leff, 1993; Shaw et al., 2015). Therefore, there is a need to extend these resources to FM managers, nonfarm vendors, and other stakeholders involved in direct marketing. Our study shows that there is an opportunity for Extension professionals to expand their outreach programs to other stakeholders, including FM managers, directors, and staff as well as other individuals involved in supporting the success of direct marketing. Those materials could be made easily available and could be integrated into the certification process for FM managers and farmers via collaboration by Extension specialists, Extension educators, FM association representatives, and government agency personnel. The training could be delivered through social media, printed fact sheets, and in-person or online sessions. Such training should aim to increase food safety for products sold at FMs, thereby reducing the possible occurrence of foodborne illnesses and upholding state standards for food safety and public health. For example, in Sonoma County, California, Extension professionals have developed fact sheets for vendors who are getting started selling at FMs and have held meetings annually with FM managers, county and state regulatory agencies, and other FM stakeholders to review regulatory changes, build relationships, and increase support for CFMs. This approach has helped increase FM managers' understanding of regulations; enhance agencies' awareness of how their own regulations intersect, interact, and contradict other regulations at FMs; and increase mutual understanding between enforcement agencies and FM managers.

One limitation of our study is that our survey did not reach FM managers without email addresses and FM managers who were not part of the CDFA CFM Program. Another limitation is that the participation rate could have been affected by survey mode (i.e., web-based instrument vs. in-person interview), a phenomenon defined as the mode effect (Lavrakas, 2008). In an attempt to increase the participation rate, we used a mixed-mode survey design and offered both web-based and hard-copy options (Dillman et al., 2014). For future studies, other efforts, such as engaging FM associations in the study design and survey enrollment, could improve participation rates.

Conclusions

As FMs and other direct-to-consumer marketing channels continue to increase in popularity, it is crucial to support assurance of the food safety of animal products and fresh produce sold at FMs. The information we gathered can inform how FM managers and FM associations can better implement organizational policies and practices that support food safety. Our study will provide the foundation for developing targeted training, communication, and outreach activities through Extension in California to help ensure the food safety of products sold at FMs, with the ultimate goal of minimizing the transmission of foodborne pathogens and preserving the success of small-scale farmers, FMs, and direct-to-consumer market channels.

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