

Private and Public Value of Extension Food Safety Education: Perspectives from
Minnesota

A Dissertation

SUBMITTED TO THE FACULTY OF THE
UNIVERSITY OF MINNESOTA

BY

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IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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August 3, 2020

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Acknowledgements

TO GOD BE THE GLORY!

Not a day goes by that I don't see the love and mercy of God in my life. This journey and everything it has taken to get to this point has been by His grace.

I thank my advisor, Dr. Joanne Slavin, my committee and my trusted mentors for supervising and nurturing my dissertation process. Their support has made all the difference.

Thank you to my colleagues at the University of Minnesota Extension – Center for Agricultural, Food and Natural Resources (AFNR) for providing an inclusive, energetic and explorative work environment. Much of what I have learned during my research experience has been due to their willingness to share and let me grow.

This work provided the opportunity for state-wide collaborations with colleagues at the MN Local Food Advisory Committee, MN Cottage Food Producers Association, MN Department of Agriculture, MN Department of Health, MN Farmers' Market Association and MN Food Safety and Defense Task Force. My experience was enriched through these interactions and I hope to continue conversations.

I am grateful to the College of Food, Agricultural and Natural Resource Sciences dean's office for financial, academic and personal support. Specifically, I am indebted to Dr. Greg Cuomo and Dr. Michael Schmitt for their patient mentorship during major changes in my graduate education.

Thank you to the Schlumberger Faculty for the Future Fellowship Program for funding the first three years of my doctoral experience, to the Dept. of Food Science and Nutrition and Extension – AFNR, for assistantships and fellowships during my graduate experience.

Last, but not least, my heart is filled with joy for my family and friends, whose prayers, encouragement and trust have carried me to the end of this season.

Dedication

For my husband.

We made it!

Abstract

Educational programs offered by University of Minnesota Extension play an important role in helping learners understand and implement regulatory guidelines regarding food safety. The goal of the present study is to evaluate three such education endeavors (Cottage Food Producer training, Serve It Up Safely™ for food managers and the Food Safety Modernization Act - Produce Safety Rule), as a foundation for future programming. I hypothesize that the continued success of these programs in meeting private and public values is based on ongoing collaboration between Extension educators, learners and relevant regulatory agencies. The results of this study are based on post-training evaluation of learners. These studies highlight areas in the delivery of the programs and in the experiences of learners that can be the focus for further research and development. Discussion around the public value of the programs and future research considerations are also presented.

Contents

List of Tables	vi
List of Figures.....	vii
1. General Introduction.....	1
2. Literature Review	3
2.1. Introduction	3
2.2. Cottage Foods	4
2.3. Away From Home Dining.....	9
2.4. Safety of Fresh Produce (Fruits and Vegetables).....	11
2.5. Extension in the 21st Century	14
2.6. Summary.....	16
3. Research Methodology	16
3.2. General objectives	16
3.2.1. Specific objectives	17
3.3. Data acquisition and analysis.....	17
4. Minnesota Cottage Food Law Tier 2 education program.....	18
4.1. Part 1: Post-training evaluations	18
4.1.1. Context.....	18
4.1.2. Methodology	20
4.1.3. Results and Discussion.....	21
4.1.4. Summary.....	29
4.2. Part 2: Follow up Evaluations.....	30
4.2.1. Context.....	30
4.2.2. Methodology	31
4.2.3. Results and Discussion.....	31
4.2.4. Summary.....	39
4.3. Beyond Cottage Foods: A Needs Assessment	40
4.3.1. Context.....	40
4.3.2. Needs Assessment Background.....	40
4.3.3. Methodology	43
4.3.4. Results and Discussion.....	43
4.3.5. Summary.....	52

4.4.	Chapter Conclusions	52
5.	Minnesota Certified Food Protection Manager	54
5.1.	Context	54
5.2.	Methodology	56
5.3.	Results and Discussion	57
5.4.	Chapter Conclusions	66
6.	The Produce Safety Rule in Minnesota	67
6.1.	Context	67
6.2.	Methodology	68
6.3.	Results and Discussion	69
6.3.1.	Current produce farm inventory in Minnesota	69
6.3.2.	Post-training evaluations.....	72
6.3.3.	One year follow up evaluation	80
6.4.	Considerations	90
6.5.	Farmers and COVID-19: A story of resilience and adaptation	92
6.6.	Chapter Summary	94
7.	Private and Public Values of UMN Food Safety Education Programs	95
7.1.	Private value	96
7.2.	Public value.....	96
7.2.1.	Value to consumers	96
7.2.2.	Value to the community.....	97
7.2.3.	Value to the state.....	98
7.2.4.	Considerations.....	99
7.3.	Conclusion.....	100
	References	100
	Appendix A. Online CFP evaluation questions.....	115
	Appendix B. CFP Follow up Evaluation Questions.....	117
	Appendix C. Minnesota Food Entrepreneurs Needs Assessment Questions	119
	Appendix D: Serve It Up Safely™ evaluation.....	121
	Appendix E: MDA PSR post-training evaluation.....	125
	Appendix F: MDA PSR 1 year follow up post-training evaluation	131

List of Tables

Table 1: Cumulative Annual Cottage Food Producer Registration in Minnesota 19

Table 2: Practice implementation goals listed by learners..... 26

Table 3: Something producers hoped to learn from the course but did not..... 28

Table 4: Number of producers engaged in three product related practices 34

Table 5: Challenges faced by small scale food entrepreneurs in Minnesota 50

Table 6: Navigation issues encountered by learners taking the UMN Serve It Up Safely™ certification renewal course 62

Table 7: Implementation goals reported in different modules..... 64

Table 8: On-farm food safety related changes undertaken by farmers 86

Table 9: Participant recommendations to MDA, farmer trainers and UMN Extension ... 89

List of Figures

Figure 1. Cottage Food Producers in Minnesota. Image used with permission from Minnesota Department of Agriculture.	23
Figure 2: Producer self-reported increase in knowledge in five key topic areas	25
Figure 3. Cottage foods produced in Minnesota.....	27
Figure 4: Point of sale for cottage food producers in Minnesota.....	32
Figure 5: Percentage of respondents to the 2018 evaluation who reported engaging in the respective practices more than 75% of the time, before and after training. Learners who were not registered cottage food producers before the course were only evaluated on behavior after the course.....	36
Figure 6: Percentage of respondents to the 2019 evaluation who reported engaging in the respective practices after the course. Red highlights indicate practices where greatest changes were observed.	37
Figure 7: Business types reported by entrepreneurs responding to the needs assessment.	44
Figure 8: Needs reported by cottage food producers interested in scaling up to commercial production	46
Figure 9: Sources of information for responding entrepreneurs. MDA – MN Department of Agriculture, MDH – MN Department of Health, UMN FScN - University of Minnesota Food Science and Nutrition, AURI - Agricultural Utilization Research Institute, MISA - Minnesota Institute for Sustainable Agriculture.....	48
Figure 10: Location of learners taking the UMN Serve It Up Safely™ certification renewal course. Only unique zip codes are shown for clarity. Map created in ArcGIS. ...	59
Figure 11: UMN Serve It Up Safely™ certification renewal course participant work environment. BnB* - bed and breakfast type accommodation.	60
Figure 12: UMN Serve It Up Safely™ certification renewal course module registrations	61
Figure 13: UMN Serve It Up Safely™ certification renewal course section ratings	63
Figure 14: Produce farm locations within Minnesota counties. Choropleth image used with permission from MDA.....	71
Figure 15: Types of fresh produce grown in Minnesota, categorized as either covered, or not covered by the Produce Safety Rule. Data adopted from the 2019 MDA Annual Produce Farm Inventory Report.....	72
Figure 16: Age profile of participants.....	75
Figure 17: A: Number of acres of fruit and vegetables grown by participants; B: Years of farmer work experience	76
Figure 18: A: Number of farms classified under PSR coverage based on farmer’s 3-year annual sale average. B: Number of farms that qualify for a PSR exemption based on farmer’s 3-year annual sale average	78
Figure 22: Beliefs among farmers that: A (on-farm produce safety practices are important, average = 87%); B (bacteria, viruses, and parasites are a potential risk on the	

farm, average = 69%); **C** (the grower training made them more confident in managing the potential risk of bacteria, viruses and parasites on the farm, average = 82%); **D** (there will be a return on investment from adopting produce safety practices on the farm, average = 74%). **X** = farmer’s arbitrary number. Rates were generated from a sliding scale, where 0% – strongly disagree, 50% - neutral and 100% – strongly agree. 83

Figure 23: Farmer practice implementation or adaption around on-farm risk areas after training (N = 43) 85

Figure 24: Extent to which learner expectations of the course were met 88

1. General Introduction

The process of making policy is generally long and messy. Ideally, key stakeholders get an opportunity to provide input that policy makers take into account before making final decisions. Regulatory agencies then formulate regulations around policies. Unfortunately, regardless of the number of discussions and participants, policies and respective regulations remain abstract and in some cases ambiguous to many end users. While regulations inform the end user what needs to be done, how these goals are achieved are left for the end user to decide.

One indirect way that the American society has navigated this serious challenge is through the land grant mission at institutions of higher education. By providing practical, timely and science-based information to communities, regulators have found a trusted ally with potential to reach a wide range of audiences. This reach is multifaceted. It is not enough for regulators to simply reach end users, but to also effectively provide useful information, answer questions, follow up where necessary and in some cases, re-consider certain aspects of a regulation. Given the limited reach of agencies, institutions of higher education indispensable.

For instance statewide communities have learned to trust the University of Minnesota as a source of reliable information, as a result of long standing interactions through programs and events. What is not immediately clear is that many programs administered by the University address different regulations in some shape or form. In this sense the University, through the Extension umbrella, helps the state in disseminating, explaining and reporting on many regulations. Of course the University works directly on policy research as well.

However, in recent years, Extension services across the country face mounting pressures to be accountable and deliver value to retain access to public funding. Needless to say, many programs are shrinking and in some institutions, entire program components have been eliminated. The role of Extension as a disseminator of information is changing due to the wide use of the internet. So, it behooves all Extension professionals to explore new avenues of public value in programming.

The broader issues of interest covered are the ongoing initiatives toward minimizing the occurrence of foodborne illness and the role of food handler education in this context. In this arena, the author hopes to achieve two primary goals. First, reports from evaluations of three UMN Extension food safety courses are presented. Here, the discussion focuses on the end user experiences and feedback on the course content and delivery that will inform future course improvements. Then, the broader impact of these three courses for Minnesotans are discussed. In essence, this thesis evaluates the private and (perceived) public values of these programs.

The project is organized into seven chapters. Chapter 1 (this section) covers a general introduction. Chapter 2 provides a review of relevant literature, with a focus on foodborne illnesses in three industries covered by the Extension courses of interest. A brief on the public value movement in Extension is also provided. Chapter 3 covers the research methodology. Chapters 4, 5 and 6 discuss results from course evaluations and answer specific questions described in the relevant context. The last subsection in Chapter 6 presents the results from a needs assessment and the role these results played in the development of a new course. Chapter 7 addresses the program private and public values and final thoughts.

2. Literature Review

2.1. Introduction

In the United States, several measures have been put in place to ensure that food entering commerce reaches the consumer safely. By refocusing attention away from end-product testing to preventive measures throughout the farm-to-table continuum, the federal government mandates that food safety is valued by those involved in the food industry. The primary regulatory agencies (US Food and Drug Administration – FDA, and US Department of Agriculture – USDA), work harmoniously with state and local agencies to provide the oversight necessary to achieve this ambitious goal (US Department of Agriculture, n.d.-a; US Food and Drug Administration, n.d.).

There are two main food safety laws in the US today. The 2011 Food Safety Modernization Act (FSMA), was signed into law by President Obama, replacing a more than 70-year old system (US Food and Drug Administration, 2011). This law provides safety standards for food producers at all stages of production. On the other hand, food service, retail food stores and food vending operations, are regulated under the 2017 FDA Food Code, which can be adopted as needed by any governmental jurisdictions (US Food and Drug Administration, 2019b).

Despite these overarching measures, the Centers for Disease Control and Prevention (CDC) reports that an estimated 48 million Americans suffer from foodborne illness annually. Of these, 128,000 are hospitalized and 3,000 die (Centers for Disease Control and Prevention, 2019a). According to the 2018 preliminary Morbidity and Mortality Weekly Report (MMWR), cases associated with the eight monitored foodborne pathogens are on the rise, compared to data from 2015-17. These pathogens include

Campylobacter, *Cyclospora*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* (STEC), *Shigella*, *Vibrio* and *Yersinia*. However, it is not clear whether this increase can be credited to the efficiency of culture independent diagnostic methods or an actual rise in reported cases. Although the highest number of cases are associated with *Campylobacter* infections (18%), *Listeria* has the highest rates of hospitalization (96%) and death (21%) (Tack et al., 2019).

Because the global burden of foodborne illness is well documented (Scallan, Griffin, Angulo, Tauxe, & Hoekstra, 2011; Scharff, 2012; Tack et al., 2019), no exhaustive presentation is undertaken in this work. Instead, the focus is on the interplay between food regulations, regulatory bodies, Extension education programs and end user experiences. Specifically, this work looks at food safety in three areas of Minnesota's food system: cottage foods, away from home eateries and fresh produce.

2.2. Cottage Foods

Cottage foods are shelf stable (non-potentially hazardous) products prepared in uninspected home kitchens for direct sale to consumers. Examples include baked foods, pickles, home canned salsa, jams and jellies (Association for Food and Drug Officials, 2012; Minnesota Department of Agriculture, 2019b; University of Minnesota Extension, 2019). The safety of these products hinges on pH or water activity (a_w). Other measures used in the general food industry are time and temperature controls (TCS) (University of Minnesota Extension, 2019). Cottage foods have increased in popularity over the last few years, purportedly in response to the rise in consumer demand for local foods (Harrison, Critzer, & Harrison, 2016; Low et al., 2015; Rice et al., 2018). A 2014 report in Food

Safety News (FSN) suggested that the increase in cottage food production may be a response to seasons of high unemployment as well (Flynn, 2015).

Despite this industry's popularity, it is still regulated at the state level, leading to variability in restrictions regarding the types of products allowed, sales caps, points of sale and producer freedoms between states. Whereas 31 states allow unlimited sales, some like California have a \$1,000 per month cap, and others range from \$15,000 per year in South Carolina, to \$50,000 per year in Florida and Missouri. New Jersey is the only state prohibiting the sale of cottage foods, as of July 2020 (Forrager Inc., 2020; Rice et al., 2018). However, some progress is underway, with three different initiatives happening in 2020, including a lawsuit (<https://ij.org/case/nj-baked-goods-ban/>), updates on administrative rules by the department of health (<http://www.njhomebakers.org/>) and a legislative bill (<https://www.njleg.state.nj.us/bills/BillView.asp?BillNumber=S73>), all of which are aimed at lifting the ban on sale of baked goods.

As expected, state regulators are responding to the increase in number of cottage food producers. Unfortunately, this is not always a welcomed change. For instance, the Institute for Justice (IJ) released a report making the argument that cottage food laws are unnecessarily restrictive to small business development (McDonald, 2017). A 2019 opinion piece in the Lincoln Journal Star stated that the restriction around cottage food sales is “a needless obstacle that has nothing to do with health or safety” (Smith, 2019). In Maryland, an activism manager retorted that, “cottage food is inherently safe and the government shouldn't arbitrarily restrict where inherently safe food is sold” (Sibilla, 2019b). An activist in North Dakota shared her sentiments, stating that “given the

unblemished track record of food freedom laws, there is no need to impose such severe regulations on homemade food businesses” (Beck, 2019a).

In recent years, several states have made efforts to relax or expand what is covered under cottage foods. A Nebraska report stipulates that farmers’ markets (one of the major outlets for small businesses) is a limiting factor due to seasonality, and the need to actually sell at the market when individuals have other responsibilities. Additionally the farmers’ markets do not allow custom orders such as wedding or birthday cakes (Smith, 2019). Amendments to relevant laws in West Virginia now allow for year-round sale of cottage foods from home, through online orders and retail sales. Like their counterparts in Nebraska, these business owners were concerned about the seasonality of farmers’ markets and the inability to take custom orders (Beck, 2019b).

In the same vein, Oklahoma business owners criticize the need to hand-deliver products or rent space at the farmers’ markets. Also, commercial kitchens are expensive (for those seeking to use this option, rather than producing food at home), have limited space and require some business owners to drive long distances for access. They rely on the report by IJ to make the point that the restrictions around cottage foods hurt women in rural areas the most and are unnecessary (McDonald, 2017; Webster & Webster, 2020).

While the majority of cottage food business owners across the country function under various restrictions, North Dakota, Utah and Wyoming have adopted laws known as Food Freedom Laws. These laws offer more “freedoms” on the types of foods and points of sale (Sibilla, 2019a). As of July 1st, 2020, Wyoming allows the sale of any shelf stable food product directly to consumers and indirectly to retail stores and restaurants. A

sales cap was imposed at \$250,000, which puts this state progressively ahead of all other states in terms of allowable products, points of sale and sales cap (Crabill, 2020).

In Utah, those covered under the Food Freedom Law are exempt from additional licensing, permitting, certification, inspection, packaging and labelling requirements by the state, county or city. This law even provides a USDA exemption for poultry producers slaughtering $\leq 1,000$ birds per year, as well as allowing sale of domesticated rabbit meat. However, sales to commercial establishments and restaurants is not allowed, except for raw or unprocessed fruit. The law does not restrict the Department of Health from investigating related foodborne illnesses and like in Wyoming, the products must be sold to an “informed end user” (Flynn, 2018). While the Food Freedom Law allows for an easier food business set up, Utah also has a more demanding Cottage Food Law, with requirements including food safety training, home inspections, kitchen requirements and product sampling (Forrager Inc., 2020).

The Food Freedom Law in North Dakota allows the direct sale of any homemade food products, with the exemption of raw dairy and certain meat products. Nonetheless, concerns over potential public health issues has led to ongoing considerations around the freedoms afforded by the law. Proponents for the law argue that cottage food businesses are a low investment path to financial independence, especially for women in rural areas (Beck, 2019a; McDonald, 2017).

Maine governs cottage foods under the Food Sovereignty Law, which allows municipalities to enforce individual food regulations. This was a compromise between having strict rules and having a law as broad as the one in Wyoming (Bayly, 2017). The

obvious concern here is that the law inherently provides a potential loophole to bypass state and federal licensing and inspections around items such as raw milk (Nargi, 2017). Eventually, Maine had to clarify requirements for meat inspections to be consistent with federal laws (Flynn, 2017).

Early this year, a report in Food Safety News highlighted a call in Washington State towards food safety exemptions for ‘microenterprise home kitchens’. Like other state legislatures across the country, those in Washington are attracted to the economic benefits and low risk nature of the proposed business model. While the state was not seeking to follow the Wyoming example, these microenterprises would be allowed to sell up to 30 meals per day, for a maximum of 150 meals per week. Raw milk, raw oysters and any food products requiring the use of Hazard Analysis Critical Control Point (HACCP) principles were prohibited (Flynn, 2020).

In Minnesota, cottage food production is regulated under the 2015 Cottage Food Law (CFL) (Minnesota Department of Agriculture, 2020b). The law provides two options to produce food in home kitchens for direct sale to consumers. Tier 1 requires basic online food safety training provided by the Minnesota Department of Agriculture (MDA). Cottage food producers (CFPs) registered under this category are restricted to a maximum annual sale of \$5,000. To obtain Tier 2 registration which allows a maximum annual sale of \$18,000, CFPs take a mandated, comprehensive food safety course offered through the University of Minnesota (UMN) Extension. The registration in both cases is obtained directly from MDA (Minnesota Department of Agriculture, 2019b; University of Minnesota Extension, 2019). Not all learners who take either the Tier 1 or 2 courses

become registered CFPs. For a detailed discussion on MN CFPs, the reader is referred to Chapter 4 in this volume.

2.3. Away From Home Dining

On average, Americans eat about 50% of their meals away from home, usually at food establishments. Unfortunately the majority of reported foodborne illnesses are associated with these eateries (Angulo & Jones, 2006; Hall et al., 2012; L. E. Lipcsei et al., 2019). In a 2017 CDC report, 841 foodborne disease outbreaks resulting in 14,481 illnesses, 827 hospitalizations, 20 deaths, and 14 food recalls were reported. Of these 64% occurred at restaurants (Centers for Disease Control and Prevention, 2019b). In instances where etiology is determined, norovirus accounts for the majority of the cases, followed by *Salmonella* (L. E. Lipcsei et al., 2019).

The global burden of foodborne illness, including the economic impact is well documented (Scallan, Griffin, et al., 2011; Scharff, 2012; Tack et al., 2019). State and local officials report epidemiologic and laboratory outbreak investigation data to the CDC through the National Environmental Assessment Reporting System – NEARS (Centers for Disease Control and Prevention, 2019c). NEARS complements the Foodborne Disease Outbreak Surveillance System – FDOSS (Centers for Disease Control and Prevention, 2018).

In 2018, FDA released the report from a 2013-14 study on risk factors associated with foodborne illness outbreaks in restaurants, namely inadequate cooking, improper holding/time and temperature and poor personal hygiene. The report stipulates that non-compliance issues were linked to failures in the Food Safety Management Systems

(FSMS), which are comprised of employee training, procedures and monitoring. While restaurants seem to have control over inadequate cooking, the report suggests that better control is needed around holding time and temperature, and poor personal hygiene (especially proper handwashing) (FDA National Retail Food Team, 2018).

The safety of food at food establishments is overseen by a Certified Food Protection Manager (CFPM). Current certification of CFPMs is based on the assumption that certification leads to greater food safety knowledge, resulting in safer restaurants. The aforementioned FDA study indicated that continued presence of a CFPM on the premises resulted in better compliance and better FSMS inspection scores (FDA National Retail Food Team, 2018).

Findings from other studies support this observation (Appling, Lee, & Hedberg, 2018, 2019; Brown et al., 2014; Cates et al., 2009; Hedberg et al., 2006; L. Lipcsei & Kambhampati, 2016; McFarland, Checinska Sielaff, Rasco, & Smith, 2019). According to Brown *et al.*, greater knowledge is associated with factors such as working in a chain restaurant, working in a larger restaurant, having more experience and having more duties (Brown et al., 2014). McFarland *et al.* recommend that behavior-based training should be included in addition to food safety knowledge-based education (McFarland et al., 2019).

Interestingly, the value of having certified personnel was only observed in independent restaurants and those with few branches (Kassa, Silverman, & Baroudi, 2010). When FSMS were considered, the CFPM did not predict out-of-compliance observations (Liggans, Boyer, Williams, Destromp, & Hoang, 2019). It is important to consider these varying observations because restaurant associated outbreaks are often

attributed to food handlers who are under the management of and often trained by CFPMs. Others suggest considering the complex and dynamic characteristics of FSMS, which in some cases include third party auditors (Appling et al., 2018).

In the US, most CFPMs are trained through the ServSafe™ program and certification (National Restaurant Association Educational Foundation, 2020). While this training was previously offered in person, it is now also offered online. An earlier study comprehensively looked at the program, and examined the influence of demographic characteristics and delivery methods on food safety knowledge of trainees. The results showed no impact of mode of delivery, gender or delivery location on knowledge gain (Makari, 2014). After taking the course and passing the exam, CFPMs can apply for certification from their respective states. In MN, CFPMs need continuing education and a certification renewal every three years. UMN Extension provides the Serve It Up Safely™ curriculum as a continuing education option (University of Minnesota Extension, 2020b). Chapter five in this volume discusses evaluation results from this course.

2.4. Safety of Fresh Produce (Fruits and Vegetables)

Consumption of fruits and vegetables is universally viewed as a trend towards healthier living (Callejón et al., 2015; Carstens, Salazar, & Darkoh, 2019; Wadamori, Gooneratne, & Hussain, 2016). However, the increase in consumption of fresh produce including in the United States, has been associated with a rise in the number of related foodborne outbreaks, several of which are multistate (Ackers et al., 1998; Angelo et al., 2015; Bennett, Littrell, Hill, Mahovic, & Barton Behravesh, 2015; Callejón et al., 2015; Carstens et al., 2019; Greene et al., 2008; Wadamori et al., 2016). In addition to public

health problems, these outbreaks also cause economic and agricultural losses (Callej6 et al., 2015; Warriner, Huber, Namvar, Fan, & Dunfield, 2009; Yeni, Yavař, Alpas, & Soyer, 2016).

Implicated pathogens include viruses, bacteria and parasites. However, most outbreaks are attributed to a few pathogens including *Listeria monocytogenes*, norovirus, *Salmonella enterica* and Shiga toxin producing *Escherichia coli*. Risks associated with these pathogens in fresh produce have been extensively reviewed. Associated produce include berries, cantaloupes, cucumbers, leafy greens, papayas, sprouts and tomatoes (Ackers et al., 1998; Angelo et al., 2015; Bennett et al., 2015; Berry et al., 2015; Callej6 et al., 2015; McDaniel & Jadeja, 2019; Wadamori et al., 2016; Warriner et al., 2009; Yeni et al., 2016). Mycotoxins have also been linked to produce related foodborne outbreaks (Yeni et al., 2016).

Contamination can occur at any point within the farm-to-fork continuum. Confirmed and suspected routes of contamination include poor on-farm agricultural practices especially in case of imported produce (Ackers et al., 1998; Bicudo & Goyal, 2003; Carstens et al., 2019; Warriner et al., 2009), cross-contamination during produce consolidation or at retail displays (Ackers et al., 1998) and in restaurants during meal preparations (Hall et al., 2012). Because bacterial contamination can be propagated along the distribution chain, tracing the course of foodborne outbreaks associated with produce can be very difficult. Incidences like the recent 2018 multi-state romaine lettuce outbreak led to voluntary labelling to indicate growing region and harvest date to mitigate some of the traceback complications (Carstens et al., 2019; Warriner et al., 2009).

Reservoirs of pathogen in the environment have been implicated and generally tie into poor agricultural practices or unfortunate weather events like floods and tornadoes (Angelo et al., 2015). Even the potential transmission of contaminated dust particles from very dry feedlots onto nearby produce farms has been investigated (Berry et al., 2015). Warriner *et al.* argue that growth in the bagged salad and fresh cut markets plays a significant role in the rising incidences of produce related outbreaks. They highlighted the persistence of human pathogens in the environment and on produce as an area for further research exploration (Warriner et al., 2009).

The 2011 Food Safety Modernization Act – Produce Safety Rule offers a holistic approach to addressing produce related foodborne outbreaks. By bringing together all the known and suspected risk factors, this Rule outlines mitigation strategies primarily around on-farm practices, thereby building on the previously used Good Agricultural and Handling Practices (GAPs and GHPs). The key areas covered by the Rule are worker health and hygiene, soil amendments, wildlife and domestic animals, agricultural water, post-harvesting handling and farm food safety plans (Astill, Minor, & Thornsbury, 2019; Brackett, 1999; Produce Safety Alliance, 2020; US Food and Drug Administration, 2020). On January 26, 2018, the PSR went into effect with the exemption of the water quality section. Based on ongoing feedback, FDA opted to put a hold on this section, while answering questions about implementation and ways to reduce the regulatory burden without risking public health (US Food and Drug Administration, 2019c).

Due to the importance of understanding the Rule and the complexities around water testing, education of farmers is vital (Shaw, Strohbehn, & Naeve, 2015; Soon & Baines, 2012; Yang & Swinburne, 2016). Before the implementation of FSMA, on-farm

food safety hinged on GAPs and GHPs (US Department of Agriculture, n.d.-b). Ideally, the PSR builds on many of these same practices and should, therefore, not be completely new. However, the Rule is very comprehensive and in many ways a first experience for farmers. As such, they rely on regulatory agencies and Extension programs to help navigate the nuances and determine what parts of the Rule apply to their farms (Strohbehn et al., 2018). UMN Extension offers the MN PSR education program to farmers across the state, and evaluations from this course are discussed in chapter five.

2.5. Extension in the 21st Century

The US Cooperative Extension System was established in 1914 to deliver useful, practical, science based information to communities in nontraditional settings (N. K. Franz, 2014). However, the role of Extension in the dissemination of information is evolving as a result of wide internet availability and use (N. Franz, 2015). Concomitantly, funding streams are becoming more limited, while public expectations, anti-government and anti-intellectual sentiments rise. As a result, Extension must do more with less to remain relevant and competitive (Ahmed & Morse, 2010; Peters & Franz, 2012). Additionally, Extension professionals need to better articulate the public value (for individuals, families, businesses and communities) accrued from administered programs, in response to increased demand for accountability (N. Franz, 2015; Kalambokidis, 2004, 2011). Peters and Franz contend that Extension professionals could benefit from crafting and strategically telling stories that reflect the public value of their work (Peters & Franz, 2012).

“Public value” can be classified into four aspects, a) narrowing information gaps, b) fairness or justice of resource distributions, c) reducing costs or increasing benefits for

stakeholders, and d) public good. All four pivot on a type of market failure to meet a need. So, in establishing the public value of a program, accurately pinpointing and clearly articulating the failure being addressed is crucial (Kalambokidis, 2004). Unfortunately, values are not static, and as the public changes what is considered important, Extension professionals must adapt accordingly. However, Extension has been considered resistant to change, which could inhibit organizational growth and relevance. This can be frustrating for innovative scholars and practitioners (N. K. Franz & Cox, 2012). In instances where Extension embraces the public value movement, external accountability rather than program improvement appears to be the driving factor (N. K. Franz, 2013).

From another perspective, Rumble *et al.* argue that Extension's viability is now closely linked to involvement with public policy, (Rumble, Lamm, & Gay, 2018), a reasonable point of view considering the highly regulated systems we now live in. In other words, it is not enough for Extension professionals to deliver practical, timely and science based information. Now they must understand and effectively communicate this information within the policy contexts of diverse audiences, taking into account demographic changes, climate/environmental conversations and broader implications.

It is against this multi-faceted backdrop that the current status of three food safety courses offered through UMN Extension are evaluated. This task is undertaken in the context of the different systems discussed within this section, with a focus on improving future programming. In the final chapter, both private and public values are discussed.

2.6. Summary

While the ambiguity in regulations may be designed to accommodate various scenarios, this makes interpretation difficult, even for educated individuals. As such, an ongoing collaboration between policy makers, regulators, Extension educators and program end users is absolutely necessary if the desired goals are to be reached. The author understands that this is a broad complex area of research. Nonetheless, an attempt is made to scope the current status of three education programs as a foundation for future programming, in the broader context of the project goals previously stated. The next section covers project methodology.

3. Research Methodology

3.1. Problem statement

In addition to developing and effectively delivering relevant, timely, science based information, Extension food safety educators need to clearly articulate the private and public value of education programs because taxpayers and government officials consider this information in funding related discussions.

3.2. General objectives

The general goal of this project is to assess the end user experiences in three food safety education programs offered through UMN Extension, with a focus on continuous program improvement. The private and (perceived) public value of these programs are also assessed.

3.2.1. Specific objectives

1. To develop a better understanding of cottage food producers in Minnesota, by looking at recent post-training evaluations. To access the results of a needs assessment and the role these results played in the development and delivery an acidified food course (see Chapter 4).
2. To contextualize the Serve It up Safely™ learners considering other programs available in the state (see Chapter 5).
3. To determine the progress made by farmers in adapting the new Produce Safety Rule and the role Extension plays in addressing compliance gaps/challenges (see Chapter 6).
4. To explore these three education programs within the greater public, thereby highlighting the private and public values (see Chapter 8).

3.3. Data acquisition and analysis

Data was obtained from UMN Extension and MDA. Details for each set is provided in context. All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008). First, all comments were summarized using short phrases that capture the content being communicated (open coding). These phrases ‘emerged’ from an initial read through the comments. Phrases addressing similar content were then grouped together to further eliminate repetition and redundancy.

However, phrases that could not be grouped were classified individually. In so doing, it was easier to interpret the information and quickly determine which concerns were mentioned by most learners. In instances where written entries were part of a

multiple choice question under the option “other”, the entries were evaluated to determine whether they would realistically fit within any of the choices. If so, the entry was tallied under the appropriate choice. If not, it was treated as a stand-alone entry.

While it is possible to manage qualitative data using software such as ATLAS.ti and NVivo, a manual curation would still be necessary (Burnard et al., 2008; Wong, 2008). Because the amount of data was reasonably small, manual analysis was used. Moreover, minor details in the comments may be important for the development and improvement of courses.

4. Minnesota Cottage Food Law Tier 2 education program

4.1. Part 1: Post-training evaluations

4.1.1. Context

This chapter explores the cottage food industry in Minnesota, by looking at data from post training evaluations and considering the results around the learner experience. These types of evaluations are useful in determining the effectiveness and reach of training programs (Murphy, 2013; Swackhamer & Kiernan, 2005). An emphasis is put on the comprehensive Tier 2 program offered through UMN Extension. The course teaches CFPs how to produce, package, label, store, and transport food products safely. It also addresses risk factors of foodborne illness associated with food handlers (Scallan, Hoekstra, et al., 2011), and stresses the value of abstaining from food production during a foodborne illness episode. The course covers food allergens and cross-contact prevention measures to protect public health, as well as the impact of pH and water activity on microbial growth. The learners have time for hands-on experiences, during which they

can test their products, learn proper food processing techniques and the instances and frequency of pH and water activity testing (UMN Extension Food Safety, 2019).

According to data provided by MDA, there were 3,969 actively registered CFPs, at the end of 2019 (Heather Stewart, personal communication, May 12, 2020). The cumulative annual registration breakdown since the CFL went into effect in 2015 is shown in Table 1. Tier 1 producers are restricted to \$5,000 annual sales, while Tier 2 can sell up to \$18,000 worth of approved products. The numbers represent active registrants and do not account for non-renewed registrations. The consistent increase in the number of people seeking registration each year matches the general increased demand for local foods in the state, according to a report on MN local foods commissioned by The McKnight Foundation (Walljasper, 2012).

Table 1: Cumulative Annual Cottage Food Producer Registration in Minnesota

Year	Tier 1 (<\$5,000)	Tier 2 (\$5,000 - \$18,000)	Total
2015	433	31	464
2016	1,717	98	1,815
2017	2,453	103	2,556
2018	3,305	124	3,429
2019	3,773	196	3,969

Both Tier 1 and 2 prospective producers are required to take an approved training. Tier 1 producer training is free and administered through MDA. While the City of

Minneapolis offers free Tier 2 training for its residents, the statewide UMN Extension option costs \$50. Tier 2 training is required every three years, and registration with MDA is annual at a cost of \$50. It is not clear why more CFPs are registered under Tier 1, but there are a few possibilities, which would need to be verified through further research. First, the time and financial commitments for the Tier 2 course could be a hindrance. Second, some producers could be taking the Tier 1 class to explore business options without the intention of growing beyond it. And third, the idea of needing to take a formal course might be intimidating for some CFPs. In any case, the data and these possibilities are informative for better Extension programming.

In this chapter the author seeks to address three fundamental questions:

1. Where within the state do cottage food producers live and why are they taking the Tier 2 course?
2. What products do they produce and how does that compare to others around the country?
3. What information do learners expect and is not covered by the course?

4.1.2. Methodology

Data acquisition: 2018 – 2019 online post-training evaluation data was obtained from UMN Extension, managed in Qualtrics^{XM} (<https://www.qualtrics.com/>) and downloaded for analysis. Examples of questions in the evaluation include:

1. As a result of the course, how much did your knowledge of these topics increase?
2. Something I hoped to learn from this course, but didn't...

3. Something I will implement to improve the food safety of my cottage food products...
4. What cottage foods do you produce? (Select all that apply)
5. How many years have you been producing and selling cottage foods?

For detailed evaluation questions, see **Appendix A**.

Data analysis: All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard et al., 2008). See methodology in Chapter 3 for details.

4.1.3. Results and Discussion

The Tier 2 course is offered in-person several times a year across the state. It is also available online to accommodate potential CFP learning preferences and travel concerns. Between 2015 and 2019, 41 in-person sessions were offered to a total of 647 producers. The online version of the course was launched in late 2017 and had served 364 learners by the end of 2019.

This work focuses on evaluations administered in 2018 and 2019 to online learners. A total of 230/339 (68%) producers participated in the online post-training evaluations within this period, although some skipped questions. The responses ranged from 212 to 230, depending on the question. Because this work is about capturing as much program end user experience as possible, a decision was made to keep the incomplete evaluations and account for the varying n-values in respective calculations where necessary.

Majority of the producers were female (71%), which is consistent with the observation that the cottage food industry is primarily attractive to women (McDonald,

2017). Also, the majority identified as white (84%), which reflects the population profile of MN that is more than 80% white (<https://www.census.gov/quickfacts/MN>). Less than half (41%) of the learners were registered CFPs at the time of the course. Of these, many had less than one year of experience in the industry (30%). Only 18% had been producers for more than three years, which is reasonable given that the MN CFL went into effect in 2015.

1. Where within the state do cottage food producers live and why are they taking the Tier 2 course?

To address this question, a combination of data from the evaluations and MDA was used. Based on the evaluation data, it was determined that CFPs taking the Tier 2 course live primarily in the Minneapolis - St. Paul metropolitan area (see yellow dots in Figure 1). Nonetheless, participation from other parts of the state was also observed, which is indicative of the widespread interest in the cottage food industry. Data obtained from MDA was more comprehensive and included both Tier 1 and 2 producers. More producers in the metropolitan area reflects the general population density of the state (Cubit Planning, 2020). Because the evaluation data and the MDA data overlap, only the comprehensive MDA map is included (Figure 1).

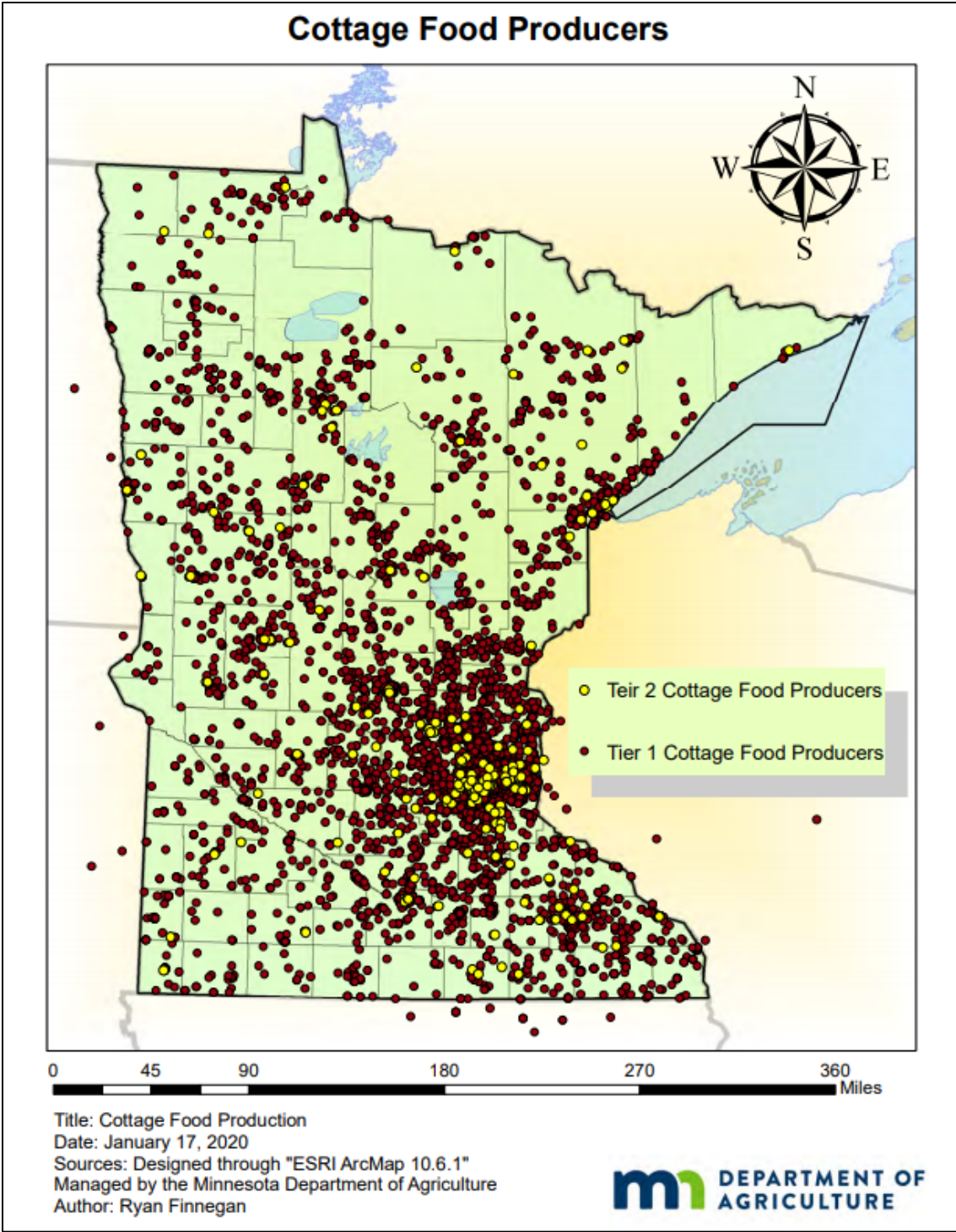


Figure 1. Cottage Food Producers in Minnesota. Image used with permission from Minnesota Department of Agriculture.

In considering the reasons why producers take the Tier 2 course, it was noted that the evaluation aggregated two questions into one. Specifically, the multiple choices included reasons one would consider for taking the course and reasons for taking the course *online* as opposed to an in person session. With this in mind, convenience and flexibility were the primary motivators for taking the course online (34%). However, some simply preferred online classes rather than attending an in-person class (16%). Others liked that the online version was self-paced or self-directed (8%) and a few did not have in-person offerings near them (6%). On the other hand, some producers took the course in order to renew their registrations (22%), learn about cottage food production in general (12%), or for some other personal reasons (2%). The author recommends restructuring of the relevant question in the evaluation to address these two clearly different ideas. Alternatively, users may be allowed to select more than one reason which would (ideally) be better than the current set up.

The amount of time needed to complete the online course varied widely. While 4% of the producers took less than 2h and 18% needed more than 5h, 14% needed 2-3h, 35% used 3-4h and 29% spent 4-5h. The process went smoothly for 79% of the learners, while 21% experienced some form of technical difficulty primarily around navigation and completion notifications. These concerns have been addressed during an update in the content management system, resulting in a dramatic decrease in navigation issues. The majority (80%) of the learners felt that the course met expectations, while the rest were either somewhat satisfied (11%) or had no expectations (9%).

This course covers five main topics: Cottage Food Law (CFL), food processing methods, safe food handling, product labelling and packaging and product points of sale.

Given that some learners were already registered before taking the Tier 2 course, increase in knowledge in these topic areas varied broadly (Figure 2). The CFL was reasonably the area in which many producers learned “a lot or a great deal” (65%), because as mentioned earlier, more than half of the learners were unregistered at the time of the course. Safe food handling seemed to be new, familiar or an area of good mastery for about the same number of producers (34%, 30% and 36% respectively).

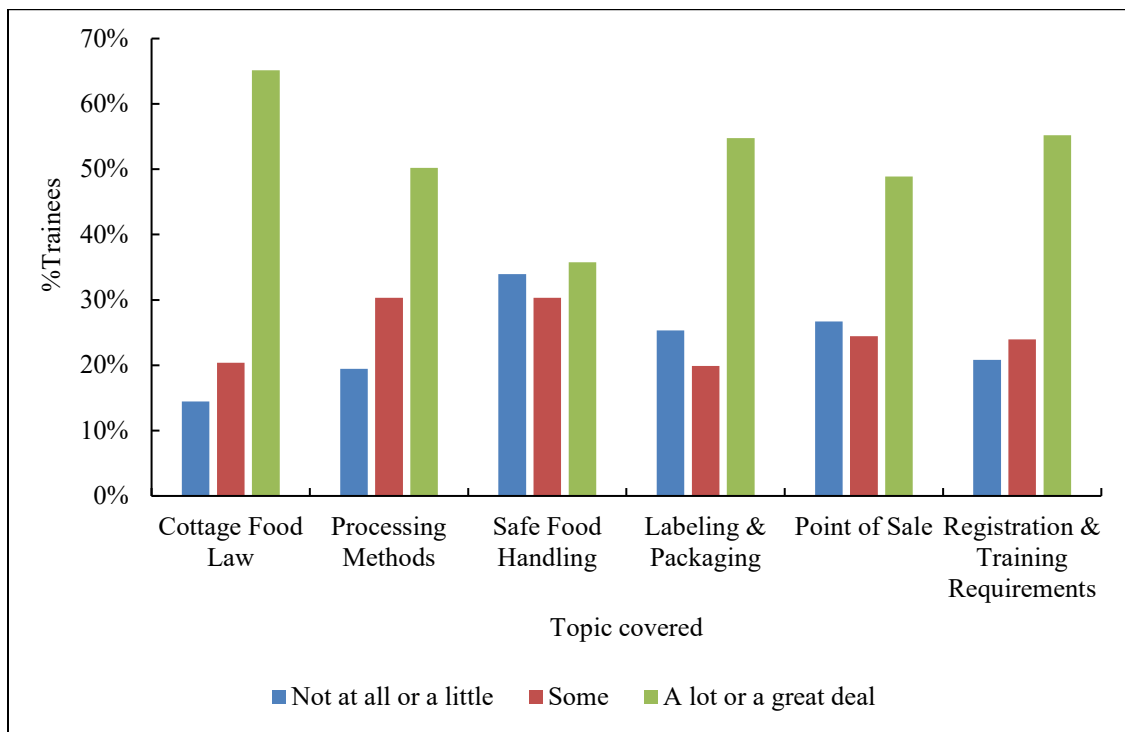


Figure 2: Producer self-reported increase in knowledge in five key topic areas

Learners also provided feedback on practice implementation goals, as summarized in Table 2. The top 3 were improved safe food handling practices (118 mentions), product labelling and packaging (55 mentions) and processing methods (35 mentions). Based on the data in Figure 2, one might have expected that most of the

implementation goals would be around processing methods and product packaging and labelling, because these were the areas where learners learned a lot or a great deal. So, it was interesting to see safe food handling practices at the top of list, suggesting an inherent commitment among the learners to prevent foodborne illnesses. However, the concepts covered in all these key areas revolve around safety practices, so this observation is not unusual.

Table 2: Practice implementation goals listed by learners

Implementation goal	#Mentions
Safe food handling practices	118
Proper product labelling and packaging	55
Processing methods	35
Cottage Food Law	4
Point of sale	2
Registration and training requirements	1

2. What products do they produce and how does that compare to others around the country?

Registered producers in MN are involved with a wide variety of products. Baked goods are the most commonly produced items (43%). Others include canned goods, candies, confections, icings, frostings and pickled products. Unregistered producers had similar interests (Figure 3). Some learners provided entries under the “other” category,

most of which were dried/dehydrated products and seasonings. All these are typical of the cottage food industry across the country (Forrager Inc., 2020; Hensley et al., 2018).

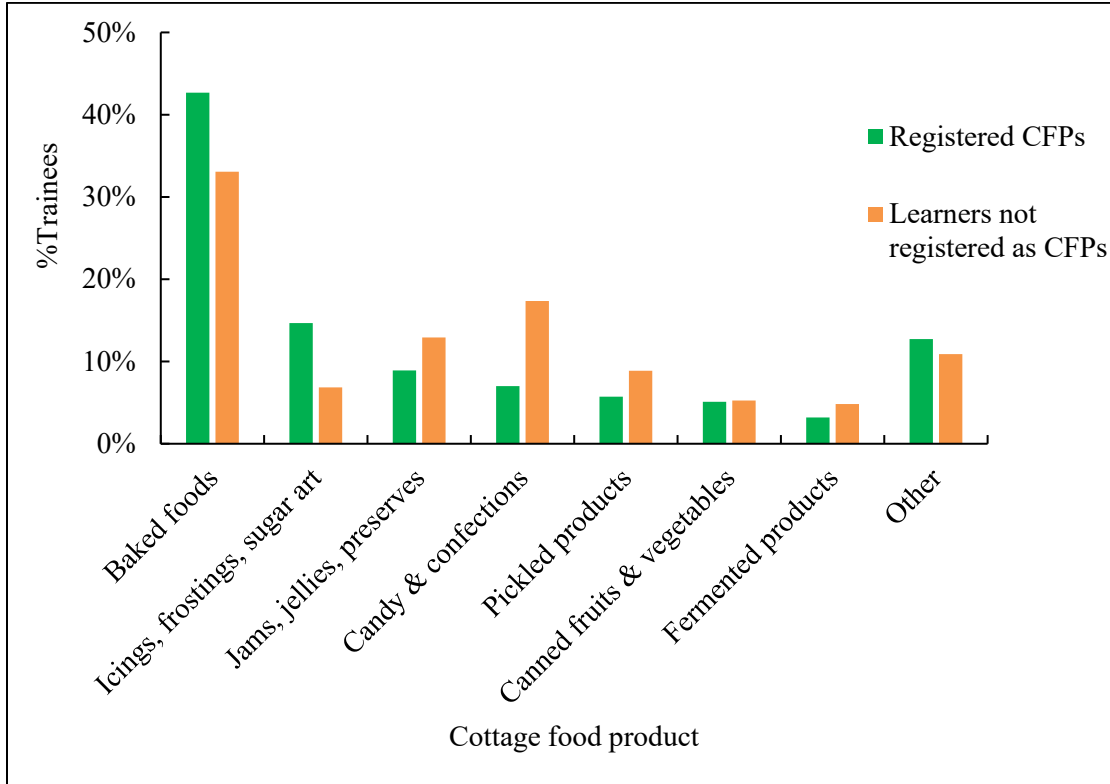


Figure 3. Cottage foods produced in Minnesota

Based on the data shown in Table 1, it was estimated that the cottage food industry has the potential to contribute >\$22 million annually to Minnesota’s economy, if all the registered producers achieved their maximum allowable sales (Equation 1). This figure would be higher if the producers purchase their ingredients and other raw materials locally.

Equation 1: Estimated annual economic impact of the CFI in MN

$$\begin{aligned} & (\textit{Tier 1 total registrants} * \textit{Max annual sale allowed for Tier 1}) \\ & + (\textit{Tier 2 total registrants} * \textit{Max annual sale allowed for Tier 2}) \\ & = (3,773 * 5,000) + (196 * 18,000) = \mathbf{\$22,393,000} \end{aligned}$$

3. What information do learners expect and is not covered by the course?

The data in Table 3 summarizes some of the content that learners expected to learn but did not. Only entries listed by two or more are shown, because the rest were specific to individuals, and generally about individual products or situations. Business acumen was repeatedly listed, including best practices on budgeting, marketing, pricing, sales and taxes. This is a need that has also been identified by Extension educators and related resources are now provided as part of the broader Tier 2 course educational portfolio. The educators maintain a blog with addresses commonly asked questions, including the concerns listed in Table 3 (UMN Extension, 2020c).

Table 3: Something producers hoped to learn from the course but did not

Comments	#Mentions
General product questions, including testing	25
Business basics (budgeting, marketing, pricing, sales, taxes)	13
Cottage Foods registration and commercial licensing	6
More on growing beyond cottage foods	2
How to cook	2

Another gap mentioned was the need for more information for producers seeking to grow beyond the cottage food industry. Extension educators are considering options to address this gap as well. The next section (4.3), discusses results from such an effort. However, some of the entries mentioned content that was covered in the course, including product labelling and testing. This reflects areas where further emphasis and continuing education might be helpful. “How to cook” was an unexpected comment because it was assumed that those interested in the industry already had a product they knew how to make. This presents a potential opportunity for collaboration with the UMN Cooking Matters Minnesota program, which currently focuses on teaching families how to prepare affordable healthy meals (UMN Extension, 2020b).

4.1.4. Summary

The 2018-19 Tier 2 post-training evaluations indicated that 80% of cottage food producers were satisfied with the program. Producers shared some of the key areas in which they would implement changes to ensure safety of their cottage food products, including, safe food handling practices, proper product packaging and labelling, and processing methods. Extension educators maintain a question and answer blog providing resources, feedback to address related concerns as well as timely updates (UMN Extension, 2020c).

It is reassuring that the producers formed an association in 2019 (Minnesota Cottage Food Producers Association), to promote a sense of community and support for one another (<https://www.mncfpa.org/>). That the producers are spread across the state could also minimize the potential feelings of isolation. In this sense, newer producers can benefit from those that are more familiar and comfortable with the CFL and the related

business challenges. In the 2020 MN legislative session, a bill was introduced to amend the Cottage Food Law to eliminate the cap on sales, and require all producers to take the advanced food safety training. Due to the impact of the COVID-19 global pandemic, this bill was put on hold and will be revisited when the session resumes.

Overall, the program seems to be meeting the needs of most producers/learners, and with continued improvement should sustain the value it currently holds in the state.

4.2. Part 2: Follow up Evaluations

4.2.1. Context

As mentioned in the previous section, evaluations are useful in assessing the impacts of programs, including end user experiences. In this section, results from two follow up evaluations administered in 2018 and 2019 are discussed. A lag period (≥ 2 months) was allowed between training and evaluation. The evaluations were created and administered to CFPs in Qualtrics^{XM} in two phases: those that took the course between January 2016 and October 2017 participated in the 2018 evaluation, while those that took the course between November 2017 and August 2019 participated in the 2019 evaluation. This included online and in-person learners.

The author seeks to address three questions:

1. Where are the producers selling their cottage foods, and how much money on average do they make?
2. What actions did learners take after the Tier 2 course?
3. What feedback did the learners give about their experiences after the course and how can future programming improve based on this?

4.2.2. Methodology

Data acquisition: 2018 and 2019 online follow up evaluation data were obtained from UMN Extension, managed in Qualtrics^{XM} (<https://www.qualtrics.com/>) and downloaded for analysis. Examples of questions in the evaluation include:

1. After the cottage food training course, did you register as a cottage food producer?
2. Where are you selling products?
3. Did you use pre-tested recipes for preserved foods?
4. Did you test products for pH/water activity?
5. After taking the course, I had the knowledge, resources and determination to safely prepare and sell cottage foods?

For detailed evaluation questions, see **Appendix B**.

Data analysis: All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard et al., 2008). See methodology in Chapter 3 for details.

4.2.3. Results and Discussion

For simplicity, data from the two evaluation periods were merged where possible, and indications made where such aggregation was not feasible. A total of 143 learners (out of 582 delivered email invitations; 25%) responded to the follow up evaluations (84 in 2018 and 59 in 2019). Of these, 39% were registered CFPs prior to taking the course. Of these registered producers, 33 repeated the course to prepare for re-registration, 28 wanted to learn more about the CFL, one person hosted the event and another thought it was an advanced course.

1. Where are producers selling their cottage foods, and how much money on average do they make?

The data summarized in Figure 4 shows that the CFPs primarily sell their products from home (25%), the farmers markets (25%) or deliver directly to customers (23%). This is consistent with information about the industry across the country (Forrager Inc., 2020; Rice et al., 2018). Other less common avenues mentioned by learners included craft shows, and direct sale to chefs.

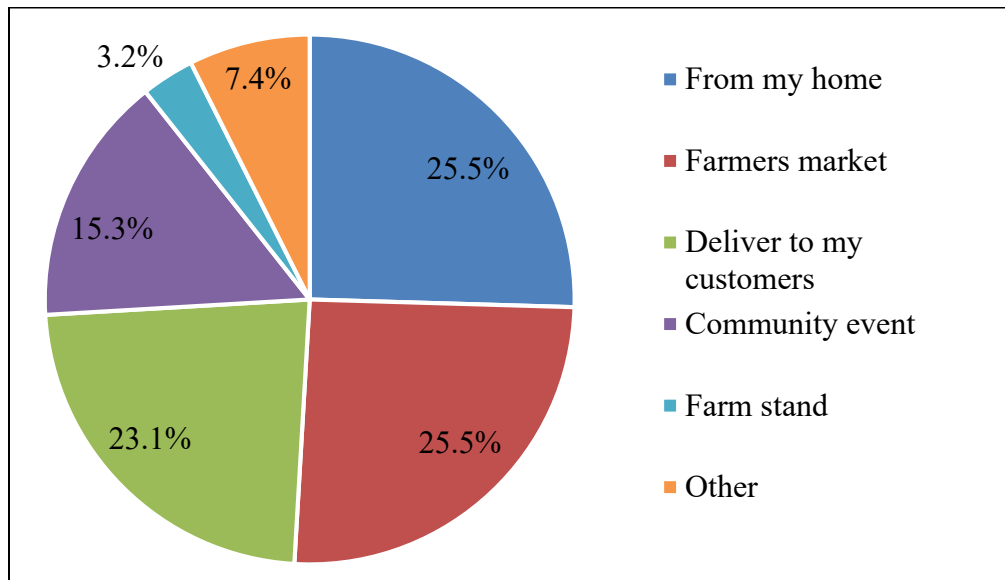


Figure 4: Point of sale for cottage food producers in Minnesota

Over half of the respondents (86/143), provided feedback on annual sales from the previous year. Of these, 22 individuals reported \$0, while the rest had a wide range of annual sales (from \$10 to >\$10, 000). Majority of the producers who reported sales (69%) earned \leq \$5,000 in the previous year. The average was about \$4,500. It was unclear why some respondents opted not to provide information on sales, but it is reasonable to

infer that they may not have had any sales to report or simply preferred not to. These sale ranges make sense considering that some producers registered after the course while others have been in the business for over three years.

2. What actions did learners take after the Tier 2 course?

After the course, there are some predictable actions that producers could potentially take including but not limited to:

1. Registering their cottage food businesses;
2. Changing to approved recipes for preserved foods where necessary;
3. Testing products for pH or water activity;
4. Adhering more closely to stipulated food safety practices; and
5. Sharing CFL information with others.

With this in mind, it was determined that 55 (66%) of the previously unregistered learners obtained registration, while 28 (34%) did not. Among those that opted not to register, majority (18/28) planned to register in the succeeding calendar year. A few (6/28) reported taking the course to learn more, with no intention of becoming registered. One person chose to obtain a commercial license, while three people had extenuating circumstances. Of the producers that were registered before or after the course (56 and 55 respectively), 83% mentioned that they planned to continue as cottage food producers.

Because the safety of cottage foods depends in part on pH or water activity and the use of approved recipes for preserved foods, it was important to evaluate the level of compliance among registered producers. This question was relevant to 111 of the learners registered before or after the course. To start with, 45% reported using recipes for

preserved foods, 59% tested pH and 78% tested water activity. A closer look at the relationship between the type of products sold and these three practices (Table 4), revealed that:

1. Baked goods are the most popular product type, which was consistent with prior observations mentioned in chapter 2;
2. Very few producers involved in production of baked and dried products tested water activity (a_w); and
3. While many of the producers involved in production of preserved foods like fermented and acidified foods used approved recipes, very few tested product pH.

Table 4: Number of producers engaged in three product related practices

Product type	Product produced?	Approved recipes?	Tested pH?	Tested a_w*?
Baked goods	55	13	16	10
Jams, jellies, preserves	34	28	7	4
Acid and acidified foods**	25	17	6	0
Dried/dehydrated products	14	10	3	3
Candy and confections	19	7	6	1
Pickled products	6	6	1	1
Fermented products	5	4	2	1
Spices/spice-mixes	6	2	4	1
Sauces	5	3	0	1
Icing, frostings, sugar art	2	0	2	0
Other (please specify)	14	5	5	0

* a_w = water activity

**Only in 2018 evaluation. Later divided into fermented and pickled products in 2019 evaluation for clarity

With regards to behavior change, the two different evaluation groups were analyzed separately. First, the learners who responded to the 2018 evaluation provided feedback on their behaviors before and after the course (if they were registered cottage food producers at the time of the course), or simply after the course (if they were not previously registered). In both instances only 22-25 participants provided feedback, even though 62 were eligible. The primary focus was on adherence to key food safety practices for greater than 75% of the time during food production.

These practices were grouped into eight expected learning outcomes, as indicated in Figure 5. From these data, it was clear that the learners understand the value of proper handwashing in maintaining food safety (Ghering, n.d.). The major positive changes were observed in the food labelling requirements, point of sale signage and use of barriers between hands and food. Before the course, the level of compliance was as low as 54% for one of the eight learning outcomes, but after the course, the lowest was 78%.

The aforementioned behavior change question was restructured in the 2019 evaluation. Two new learning outcomes were added and the rating scale was re-worded in response to the poor response rate of this question in the 2018 evaluation. It was suggested that the learners may have had difficulty in rating behavior in percentages. Instead, the more familiar words, 'little', 'some' and 'much' were used. The data indicates that for five out the 10 key learning outcomes, >80% of the responding learners were already in compliance before the course. Only in the case of product pH and water activity testing was a compliance level of most respondents noted to be "little" (46%), which is consistent with the product testing discussion earlier in this section. Further details are provided in Figure 6, which is presented on a different rating scale. The reader

is cautioned against comparing these results with those in Figure 5, because the metrics are different.

Were you a registered cottage food producer when taking the course?	Yes		No
	Before course	After course	After course
Compliance with practice $\geq 75\%$ of the time			
Postponing food production due to illness	92%	87%	78%
Inspecting hands for cuts before preparing food	83%	91%	100%
Handwashing prior to preparing food	100%	100%	100%
Use of gloves, utensils or another barrier to avoid bare-hand contact with RTE-foods	75%	96%	92%
Washing, rinsing and sanitizing food contact surfaces	83%	91%	92%
Keeping pets out of the kitchen and storage areas	88%	96%	96%
Labelling products with name, address, date prepared, all ingredients and allergens	54%	96%	88%
Signage "These products are homemade and not subject to state inspection" at point of sale	68%	100%	96%

Figure 5: Percentage of respondents to the 2018 evaluation who reported engaging in the respective practices more than 75% of the time, before and after training. Learners who were not registered cottage food producers before the course were only evaluated on behavior after the course.

Complicance level	A	B	C	D
Washing, rinsing and sanitizing food contact surfaces	0%	2%	12%	85%
Product testing (pH, water activity)	50%	16%	13%	21%
Use of barriers to handle ready-to-eat foods	5%	8%	21%	67%
Postponing food production due to illness	3%	3%	3%	93%
Use of science-based recipes (after 1994)	24%	8%	18%	50%
Proper signage at point of sale	8%	13%	33%	48%
Keeping pets out of the kitchen and storage areas	0%	0%	15%	85%
Inspecting hands for cuts before preparing food	3%	5%	13%	80%
Proper product labeling	13%	13%	28%	48%
Handwashing prior to preparing food	0%	0%	5%	95%
A: Little B: Some C: Much D: I was already doing this				

Figure 6: Percentage of respondents to the 2019 evaluation who reported engaging in the respective practices after the course. Red highlights indicate practices where greatest changes were observed.

In this new evaluation, it was also determined that the majority (71%) of the CFPs produced and sold the same products after the course. However, a small number (9%), found ideas during the course and either changed or expanded the scope of products produced and sold. Additionally, 59% of producers responding to the 2019 evaluation reported sharing the resources and information acquired from the course (e.g. registration process, safety and business of cottage foods) with others (customers, families, friends, other producers, vendors that the farmer’s market, etc.). This was useful for the educators to know, because it is encouraged during the course, as an indirect way to provide

relevant food safety information to people across the state. This question was not in the 2018 evaluation.

In both evaluations, some learners shared that since becoming registered cottage food producers, they have either:

1. A better understanding of the legal requirements as stipulated in the Cottage Food Law (31 mentions); or
2. Started or grown organized, successful businesses (15 mentions); or
3. More confidence and sense of responsibility in producing and selling safe food (9 mentions); or
4. Acquired and/or shared knowledge/information with consumers and other vendors, through various networking opportunities (4 mentions); or
5. Tried out product prototypes (2 mentions).

3. What feedback did the learners give about their experiences after the course and how can future programming improve based on this?

Product pH or water activity testing is an important part of the safety of cottage foods and relevant information is covered in the course (pH meters are under \$100 while water activity meters are about \$2,000). Based on the discussions thus far, the few number of producers testing products may be a reflection of challenges in obtaining pH and water activity meters. This is especially meaningful because for example, of the 29 producers that provided information on pH testing methods, 21 used personal meters, five tested in class during an in-person course and three used a borrowed meter. None of them

sent samples to a lab, which would only be necessary if a producer created a new recipe. Ongoing discussions among producers and Extension educators about obtaining and effectively using the meters might be helpful.

About two thirds of the respondents (94/143), reported that after the course, they had the resources and determination to safely prepare and sell cottage foods. One person said 'no', while many (34/143) skipped this question. Considering the relevance of this question in assessing general competence among producers, it would be beneficial to understand why so many of them opted not to respond. The fact that only two choices were provided may explain this observation, if there were producers who may not have been completely confident but did not feel that "no" as a fitting option. So, including a third option could be helpful in capturing where the rest of the producers fall in relation to level of confidence in producing and selling safe cottage foods. An example of such an option is "somewhat".

4.2.4. Summary

A program evaluation is a useful tool in Extension education, which can help determine the effectiveness and reach of programs. The data obtained aid in revisions and continuous course improvements and the online version allows educators to make immediate changes. Depending on purpose, evaluations can be designed to quantitatively and qualitatively measure participant reaction, learning and increase in confidence (Breece & Sagili, 2019; Murphy, 2013; Swackhamer & Kiernan, 2005).

The results presented here show that the producers implemented the skills and knowledge they acquired as expected by the law, to varying extents, and some even

shared the information with others. In addition, the producers reported having confidence in their food safety practices during the production process. As noted in section 4.1, the Tier 2 food safety course is invaluable to the cottage food industry in Minnesota because it remains a primary source of information and training on the Cottage Food Law.

4.3. Beyond Cottage Foods: A Needs Assessment

4.3.1. Context

In Extension education work, conducting a needs assessment or situation analysis can lay the foundation for programming and priority setting by identifying education gaps within a community (Caravella, 2006; Chlipalski, Quick, Auld, & Baker, 2018; Strohbehn et al., 2018). Taking the time to evaluate these needs and providing an opportunity for the community to participate has several advantages. First, it ensures that programs developed are relevant and acceptable to the target audience. Second, co-creating programs with the community inspires a sense of ownership and value. Third, this strategy saves time and resources because the community communicates exactly what is needed. Needs assessments take the people-centered approach to problem solving, which starts with people and then builds on other resources. The following section reflects upon the findings from a needs assessment performed to identify a suspected food safety education gap among food entrepreneurs in Minnesota, which in the end added value to the cottage food education portfolio.

4.3.2. Needs Assessment Background

The food safety project lead at UMN Extension was approached by a working group seeking to address a potential education gap among MN food entrepreneurs. Specifically, the existing programs do not address the needs of food entrepreneurs

interested in producing acidified foods outside of the CFI. The group also needed help identifying relevant process authorities and developing a central web page for course related information. The working group comprised of representatives from:

1. Minnesota Department of Agriculture (MDA) (<https://www.mda.state.mn.us/>);
2. Minnesota Department of Health (MDH) (<https://www.health.state.mn.us/>);
3. Agricultural Utilization Research Institute (AURI) (<https://www.auri.org/>); and
4. University of Minnesota, Department of Food Science and Nutrition (FScN) (<https://fscn.cfans.umn.edu/>)

According to the FDA, supervisors or persons in charge of food processing and packaging operations that produce acidified foods need relevant, proper food safety training (US Food and Drug Administration, 2019a). Acidified foods are:

Low-acid foods to which acid(s) or acid food(s) are added; these foods include, but are not limited to, beans, cucumbers, cabbage, artichokes, cauliflower, puddings, peppers, tropical fruits, and fish, singly or in any combination. They have a water activity (a_w) greater than 0.85 and have a finished equilibrium pH of 4.6 or below (US Food and Drug Administration, 2019a)

The primary pathogen of concern in this context is *Clostridium botulinum*, which causes botulism. Also, potential spoilage microorganisms often produce gases, which lead to the swelling of canned products (Louisiana Department of Health, n.d.; Rushing & Foegeding, n.d.; US Food and Drug Administration, 2019a). Given these facts, it is fundamental that all producers of acidified foods in Minnesota and across the country, undergo the proper education before beginning production on a commercial scale.

While there was anecdotal information by MDA, MDH and AURI that there was a need for an acidified foods course to be taught in MN, concrete data was missing on how many people would need the course and their preferred mode of learning. Thus the group undertook a needs assessment to try and get more information, in form of an online survey collaboratively developed with Extension food safety educators and distributed in Qualtrics^{XM} (<https://www.qualtrics.com/>). In addition to the general questions, the Extension food safety team included specific questions to assess the need for an acidified foods course among existing cottage food producers, who may want to scale up beyond cottage foods.

Without access to an aggregated mailing list, the collaborative working group enlisted the help of other existing collaborators in distributing the survey, with the goal of reaching as many food entrepreneurs in the state as possible. These other existing collaborators included, Minnesota Farmers' Market Association - MFMA (<https://www.mfma.org/>), Minnesota Institute for Sustainable Agriculture - MISA (<https://www.misa.umn.edu/>) and commercial kitchens in Minnesota, e.g. Kindred Kitchen (<https://kindredkitchen.org/>).

With this context, the three questions addressed were:

1. What type of food entrepreneurs responded to the needs assessment and was an acidified foods course identified as a need?
2. What sources do entrepreneurs in MN use for information on food processing?

3. What do small scale entrepreneurs and those that work with them consider the biggest challenges of doing business in MN?

4.3.3. Methodology

Data acquisition: The 2018 online needs assessment data was obtained from UMN Extension, managed in Qualtrics^{XM} (<https://www.qualtrics.com/>) and downloaded for analysis. Examples of questions in the evaluation include:

1. What type of food business do you have?
2. Have you taken an acidified foods course?
3. What do you want/need to learn about to scale up?
4. What is the biggest challenge that you face as a food entrepreneur in Minnesota?
5. How important do you think that it is to offer an acidified food class in Minnesota?

For detailed evaluation questions, see **Appendix C**.

Data analysis: All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard et al., 2008). See methodology in Chapter 3 for details.

4.3.4. Results and Discussion

- 1. What type of food entrepreneurs responded to the needs assessment and was an acidified foods course identified as a need?**

A total of 189 food entrepreneurs responded to the assessment, designated by business type/status (Figure 7). Depending on the response type in this figure,

respondents who were asked relevant questions, and the distinction is made within the context of result discussions. The clearest observation was that more than half (55%) of the respondents identified as cottage food producers.

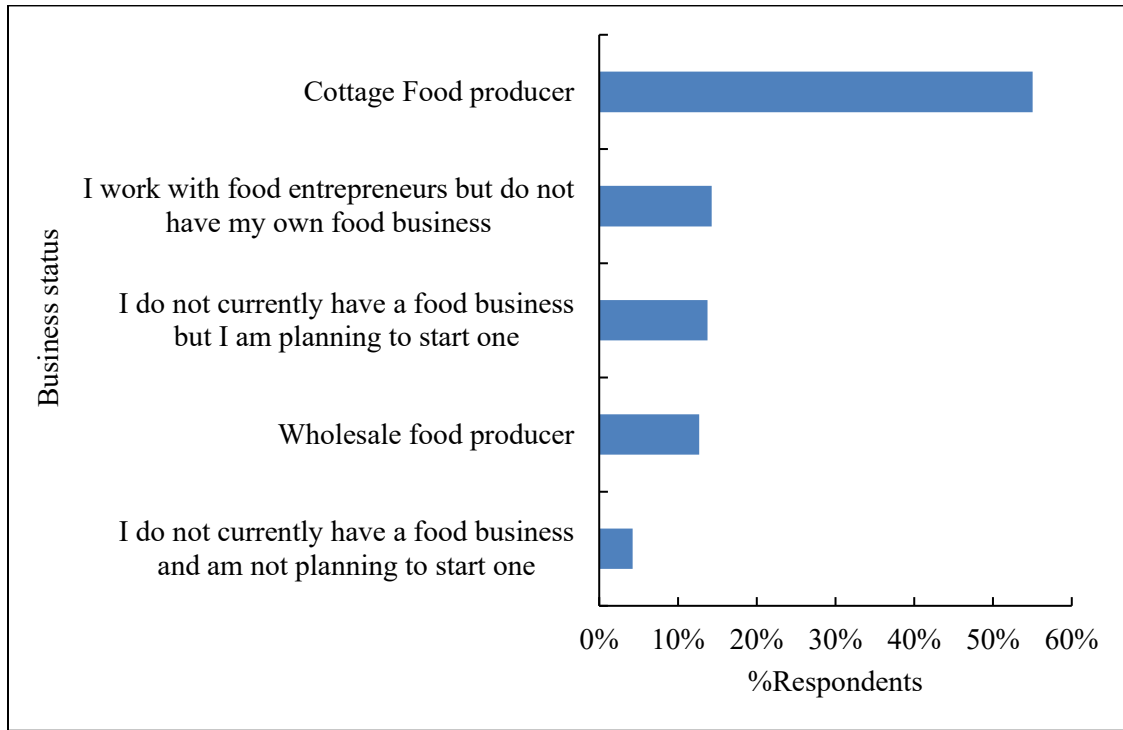


Figure 7: Business types reported by entrepreneurs responding to the needs assessment.

At first glance the data skew towards CFPs was surprising because the goal of the food safety team was to reach a wider audience of food entrepreneurs. However, it was a reasonable observation because the entities that sent out the survey cater significantly to the cottage food industry. Moreover, cottage food production is a popular budget friendly option for many food entrepreneurs exploring options, before committing to more financially demanding alternatives like commercial kitchens (Rice et al., 2018).

Of the 146 respondents that provided information of products, the top five most common food products of interest reported were baked goods (27%), jams and jellies (16%), acidified foods (12%), candy and confections (11%) and snack foods (8%). These data are reflective of previous observations about food products typically produced by CFPs (Forrager Inc., 2020; Rice et al., 2018). Some of these respondents (50%) planned on producing the foods they process, which is also common among CFPs (Finland Food Chain, 2020; Gwin, Brekken, & Trant, 2018).

Of the 24 respondents that identified as wholesale producers, 15 said they had a food safety plan for their products. Food safety plans are required for this type of business under the 2011 FSMA regulations, to ensure safety of food during manufacturing, processing, packing and holding. The plan can only be developed by a Preventive Controls Qualified Individual (PCQI), who has obtained the necessary training requirements (US Food and Drug Administration, 2020).

Some CFPs (35%) would like to scale up to commercial production within the next five years, and reported several needs (Figure 8). Understanding licensing regulations (24%) and resources for production (24%), were the most commonly mentioned. The theme around understanding regulations will continue to be reflected throughout this work as one of the key challenges that small scale food producers face in the state. In many ways, this feedback and other earlier discussions underline the private value that direct clientele receive through Extension food safety courses.

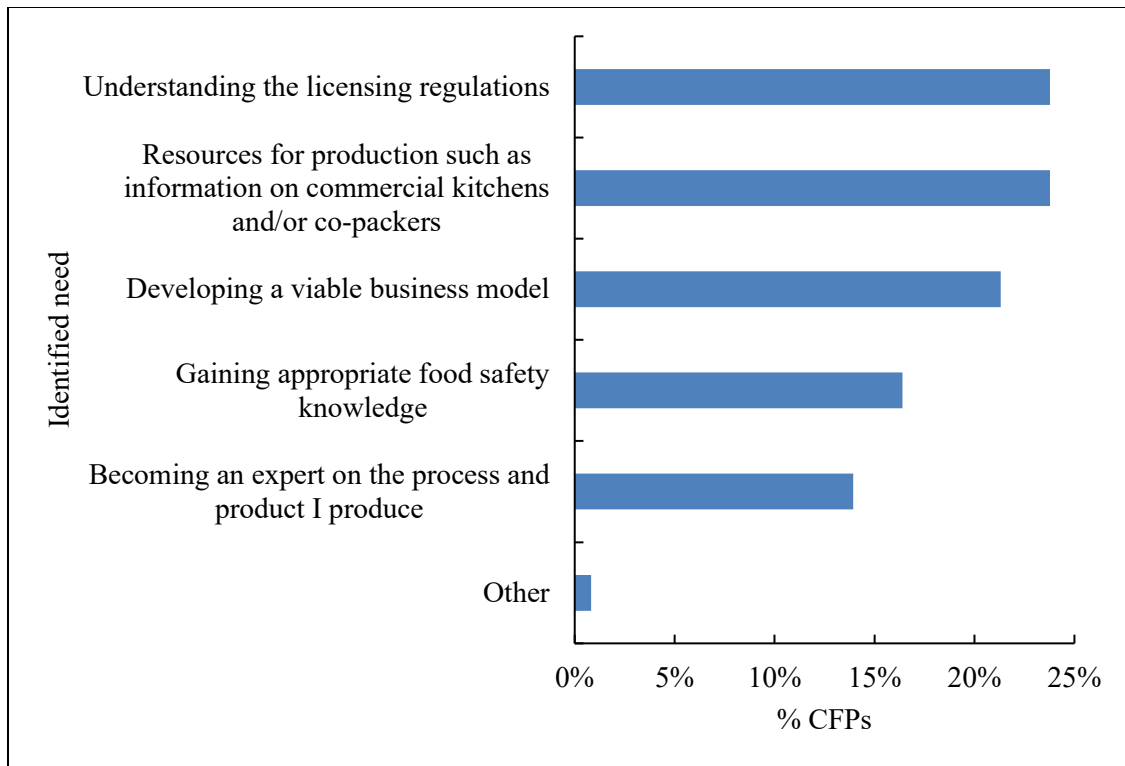


Figure 8: Needs reported by cottage food producers interested in scaling up to commercial production

Of 146 entrepreneurs, 40% reported to have taken an acidified foods course and 64% of these wanted to retake one. Of those that had not previously taken a course, 52% wanted to take one. However, after further exploration, it became apparent that some respondents were referring to CFP course offerings, based on the locations mentioned. It was therefore assumed that many of them have never taken an acidified foods course before, especially because more than half of them were CFP and not commercial license holders. It is important to mention that cottage food producers can produce and sell approved acidic and acidified foods under the MN CFL exemption. However, they can only sell their products directly to the consumer (Minnesota Department of Agriculture, 2020b), as discussed earlier in the chapter. For those that wanted to take a course, 57%

want it fully online, 12% prefer a 2-day in-person session and 30% prefer a combination of online plus one day in-person class.

Based on the information presented in this subsection, it was difficult to gauge the need for an acidified foods course among the respondents. Part of this can be explained by the confusion between production of acidic and acidified foods under the MN CFL exemption, and the need for a commercial license when production is scaled beyond cottage foods. To obtain the commercial license, an approved food safety course is required (Louisiana Department of Health, n.d.; Rushing & Foegeding, n.d.; US Food and Drug Administration, 2019a). Nonetheless, 36 CFPs indicated an interest in scaling up, and would need to take an approved course if they were interested in producing acidified foods. Also, when the respondents who don't have a personal business but work with food entrepreneurs were asked how important they thought it was to offer an acidified foods class in the state, eight of them said "extremely important", 11 said "very important" and three said "moderately important".

While these results did not conclusively indicate the need for an acidified foods course, the number of respondents interested in one prompted the working group to offer a course through the UMN Department of Food Safety and Nutrition (UMN Extension, 2020a). The course was offered twice in 2018 and it was determined that some individuals in attendance did not need to take it. Based on this information, it might be worthwhile to have a clear description of the differences between the MN CFL exemption around acidic and acidified foods to help CFPs understand what a required course is for and what it would cover.

2. What sources do the entrepreneurs use for information on food processing?

More than half of the respondents (57%) rely on UMN Extension for information about food processing. They also use information from state agencies (55%) and UMN FScN (48%) (Figure 9).

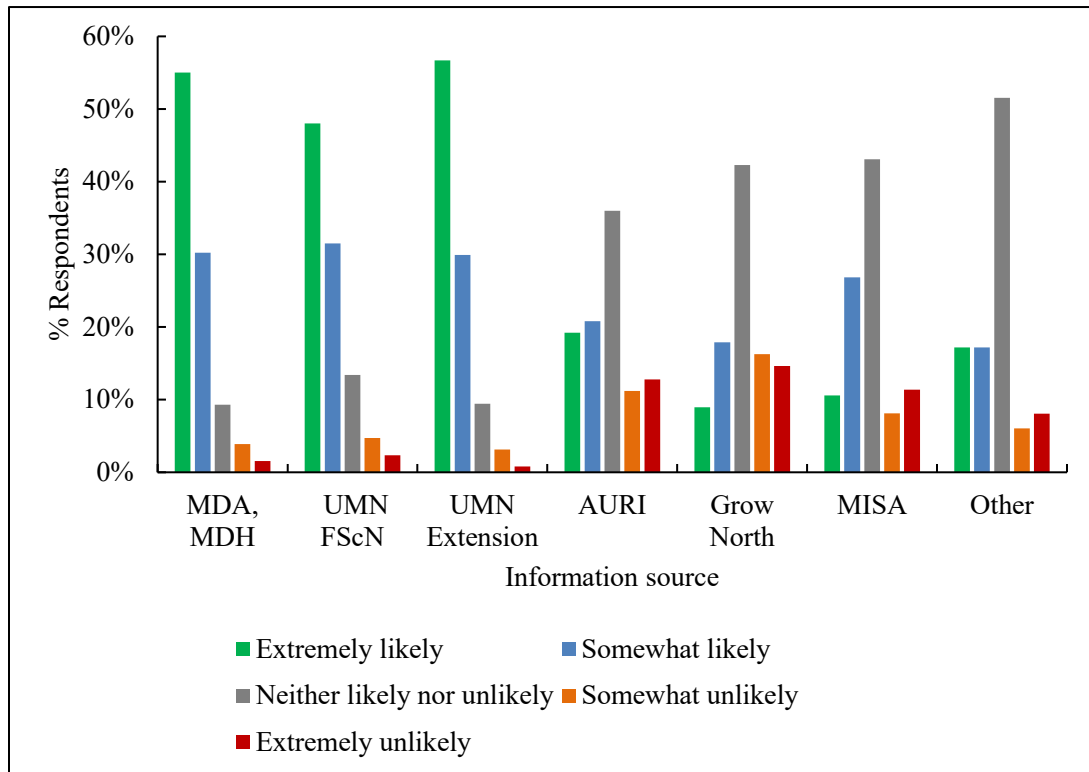


Figure 9: Sources of information for responding entrepreneurs. MDA – MN Department of Agriculture, MDH – MN Department of Health, UMN FScN - University of Minnesota Food Science and Nutrition, AURI - Agricultural Utilization Research Institute, MISA - Minnesota Institute for Sustainable Agriculture

In addition, the entrepreneurs subscribe to listservs, blogs and newsletters from several organizations to stay informed. The most commonly used are the UMN Extension Cottage Food Connection (45%) and the MN Farmers' Market Association (27%). Other resources mentioned were Grow North - an initiative through the UMN Carlson School

(<https://carlsonschool.umn.edu/grownorth>) and Sustag, a MISA listserv. This information is helpful for UMN Extension and state agencies in organizing resources and making it easily accessible online.

3. What do small scale food entrepreneurs and those that work with them consider the biggest challenges of doing business in MN?

The entrepreneurs reported very similar challenges, summarized in Table 5. A need for better business acumen was the primary concern, mentioned by 68 individuals. Specifically, the entrepreneurs mentioned needing help with advertising, budgeting, marketing, pricing, sales and taxes. Secondly they needed to understand and/or navigate regulatory requirements (50 individuals), including registrations, licensure, product restrictions and permitted points of sale. The third challenge was financial difficulty, ranging from acquiring startup capital to the budget restrictions resulting from slim profit margins. These challenges are typical of many small businesses in general (Moutray, 2009).

Looking at this list of concerns raises the question of how Extension educators can help entrepreneurs navigate their way and maintain successful businesses. University of Maine Extension created a resource website for this very purpose (University of Maine Cooperative Extension, n.d.). In realizing the connection between business acumen and business success, Redmond *et al.* went one step further and proposed a new training model (community-based education), that brings the training to entrepreneurs and mitigates the aloofness associated with formal business training/courses (Redmond & Walker, 2008).

Table 5: Challenges faced by small scale food entrepreneurs in Minnesota

Comment themes	#Mentions
Business acumen (pricing, sourcing, marketing, etc.)	68
Regulatory requirements	50
Financial challenges, slim profit margins	20
Centralized sources of (multi-lingual) information	17
Production space, commercial kitchens	11
Time management; work-life-balance	10
Easily accessible, affordable courses	10
Contacts for question and answers	9
Unfair competition from rule breakers	6
Product testing and labelling	3
Weather	1

Finding a centralized source of information and proper contacts to answer questions were also listed as challenges (Table 5). For small business owners balancing all the different aspects of day to day activities, this can be frustrating. Extension educators should try as much as is within reason to determine who to contact for clarification about commonly asked question. Often times, the point of contact is the state food licensing liaison. Extension then adds (or should add) value for clientele, by going beyond course delivery to being a central point of contact between regulators and communities served.

Small business owners also need to consider financial constraints and this explains why the cottage food industry is popular for those seeking to try out less risky ventures, before investing heavily (McDonald, 2017; Rice et al., 2018). Despite the financial safety net, CFPs in MN interested in going beyond \$18,000 a year in sales must

upgrade from a cottage food registration to a commercial license (Minnesota Department of Agriculture, 2020b). Change in license type also implies a change in regulations to follow, and in the case of CFPs, an upgrade means no longer being able to prepare food at home. Basically, a commercial kitchen space or some other inspected facility becomes a requirement, and that adds to the financial investment. For entrepreneurs living outside the Twin Cities Metropolitan area, finding space in commercial kitchens is not always easy.

Time limitations and work-life-balance were also listed as a concern, which often ties into the need for easily accessible information and online courses (Walker, Redmond, Webster, & Le Clus, 2007). Considering that more than half of the assessment respondents were cottage food producers who are more likely to be women (McDonald, 2017), it is not surprising that these entrepreneurs struggle to balance different aspects of their businesses and family dynamics.

Aside from this, the respondents reported noticing unfair competition from others who do not follow the rules. Following the rules includes taking approved food safety courses, proper registrations/licenses, investing in proper equipment, producing and selling within the stipulated limits. For instance, CFPs under Tier 1 registration cannot sell more than \$5,000 worth of approved products a year. However, no regulatory oversight keeps track of how much a producer sells. Additionally, CFPs prepare food at home, creating a potential loophole for selling products to neighbors and friends without a registration or the required training. So, it is understandable when those that follow the rules consider this unfair.

4.3.5. Summary

Needs assessments can be effectively used to examine programming gaps within a community. The work presented herein exemplifies a case, where the perceived need was not definitively supported by assessment data, partly because a part of the target audience was missed. Nevertheless, the assessment underlined the continued need for existing food safety education programs, because respondents needed business skills and navigating regulatory requirements in Minnesota. The assessment was, therefore, valuable overall.

4.4. Chapter Conclusions

Until a federal system is put in place to regulate cottage food production, each state must continue to manage the producers independently. This work highlights lessons learned since the Cottage Food Law went into effect in 2015 in Minnesota. It presents a better understanding of the market and the producers, who enter the business for a variety of reasons, with a wide spectrum in understanding of food safety practices. A recent study evaluated the impact of the CFI on other related food business, and determined that Cottage Food Laws lower the barrier to entry and promote the creation of such non-employer businesses. However, the lack of data makes it difficult to assess the impact of related technical assistance programs (O'Hara, Castillo, & McFadden, 2020). This present work is a stepping stone for current and future programming of the Extension food safety education portfolio and an effort towards addressing this data gap.

Given the ongoing trend of consumer demand for locally produced, value added food products, the cottage food industry is set to grow and as a result, serve a wider range of people (Hensley et al., 2018; International Food Information Council, 2019; Low et al., 2015). While in the past CFPs mainly sold their products to neighbors and friends, now

the products are featured in farmers' markets, restaurants and retail stores depending on the state. In the City of Minneapolis alone, there are 29 farmers' markets (City of Minneapolis, 2019). This poses an added risk for foodborne illness including hepatitis A, norovirus, *Shigella* and *Staphylococcus aureus*, which are primarily associated with food handlers (Clayton, Griffith, Price, & Peters, 2002; Scallan, Hoekstra, et al., 2011).

Two known cases of outbreaks associated with cottage foods have been previously reported. The first was a *C. botulinum* related outbreak in Ohio in 2014, and was attributed to canned pesto (Burke et al., 2016). The other occurred in Minnesota in 2018 and was linked to norovirus attributed to decorated cookies (Melius et al., 2018). While these two instances do not vilify the CFI, they do indicate a risk that needs to be continuously addressed through proper food safety training. Given the change in American food regulations from reaction to prevention, the Tier 2 course is well placed to continue contributing to that overall goal. Consequently, UMN Extension has to continue adapting programs accordingly to address the increasing need for food safety training as the CFI grows, and expand capacity on resources around business acumen.

This chapter addresses a critical gap in research on the cottage food industry (Gwin et al., 2018), by laying a foundation and looking at direct questions that better inform future programming and inquiry directions.

5. Minnesota Certified Food Protection Manager

5.1. Context

In Minnesota, a certified food protection manager (CFPM) is an individual recognized in the State of Minnesota Food Code as having the knowledge, skills and abilities to ensure that food offered in food establishments is safe. The MN Department of Health administers the certification process and currently maintains a list of 325 approved initial and renewal courses. According to data obtained from MDH, there are 36,524 CFPM in the state, as of 03/09/2020 (Zerwas, Personal Communication, 03/09/2020). The UMN Serve It Up Safely™ (SIUS) course is one of the continuing education course options (Minnesota Department of Health, 2019).

Given the risks associated with food establishments (L. E. Lipcei et al., 2019), and the fact that more Americans are choosing to eat away from home (US Department of Agriculture, 2018), it is critical for Extension professionals in the state ensure that this food safety training program meets regulatory and CFPM expectations. More importantly, the course is available to all food service employees globally, whether or not they are CFPMs. The course is divided into 12 topic specific modules, each designed and approved for one continuing education credits. These modules provide learners with choices based on their interest and business sector needs.

Because each module is designed to redirect to identical but separate evaluations, it was necessary to aggregate data from the different modules to have a comprehensive course evaluation. From an industry stand point, these modules really are 12 different mini-courses, and the design makes it easier for Extension educators to relate comments

and feedback to the relevant module for improvement purposes. These modules are (University of Minnesota Extension, 2020b):

- **Cleaning and Sanitizing – Basics:** introduces learners to the MN Food Code requirements, foodborne outbreaks, proper cleaning and sanitizing and corrective actions to mitigate the risk of foodborne illness.
- **Cleaning and Sanitizing – Advanced:** builds on the Basics course with a focus on prevention of biofilm formation, cross-contact and cross-contamination and chemical safety. Sanitation standard operating procedures (SSOPs) are also covered.
- **Catering, Take-out and Delivery:** considers food safety when the food is handled outside a food establishment, and includes green initiatives such as waste reduction through food donations and composting.
- **Cooling Practices:** teaches about temperature requirements to control microbial growth and prevent foodborne illness.
- **Emergency Readiness:** prepares learners to address unexpected occurrences such as power outages that increase the risk of foodborne illness.
- **Employee Health and Hygiene:** covers the major role played by personnel hygiene in prevention of foodborne illness.
- **Food Allergens:** addresses the often overlooked seriousness of food allergies, and provides handling practices to ensure consumer safety.
- **Preventing Foodborne Illness:** offers a broad review on foodborne outbreaks and related pathogens, including prevention control strategies.

- **Ready-to-eat Foods:** focuses on the special handling requirements of foods that require no further kill-steps and are ready for consumption.
- **Responding to a Food Recall:** underscores the value of pre-determined recall strategies in minimizing the impact of contaminated foods.
- **Keeping Produce Safe Throughout the Flow of Food:** teaches the risks associated with fresh fruits and vegetables, which are frequently implicated in food service related outbreaks.
- **Food Management Systems:** highlights the relationship between the first 11 modules and the leadership necessary to ensure consumer safety.

The questions addressed in this chapter were:

1. How would one characterize the learners taking the UMN SIUS certification renewal courses?
2. How do these learners rate the UMN SIUS certification renewal courses?
3. What are learners doing differently as a result of taking the UMN SIUS certification renewal courses?

5.2. Methodology

Data acquisition: 2019 online evaluation data was obtained from UMN Extension, managed in Qualtrics^{XM} (<https://www.qualtrics.com/>) and downloaded for analysis. Examples of questions in the evaluation include:

1. Did this course meet your expectations?
2. How would you rate the knowledge gained from each of section in this module?

3. Rate your general learning and change:
4. How many years have you worked in the food service industry?
5. Which best describes your food service facility?

For detailed evaluation questions, see **Appendix D**.

Data analysis: All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard et al., 2008). See methodology in Chapter 3 for details.

5.3. Results and Discussion

Three main assumptions were made in collecting and analyzing data:

1. Each module registration was viewed as a unique participant, even though a learner could register for more than one module. This was primarily due to the design of the registration system.
 2. As a result of the previous assumption, each evaluation was viewed as unique even though a learner could evaluate more than one module. Therefore, there is an inherent multi-counting of learners between modules, which was deemed acceptable in this context.
 3. In line with both previous assumptions, it was further assumed that learner experience and evaluation of one module did not affect the experience and evaluation of succeeding modules, in the case of multiple registrations.
-
1. **How would one characterize learners taking the UMN SIUS certification renewal course?**

Given that the course is offered online, most of the learners found it through the MDH (37%) and UMN Extension websites (33%). However, some were referred by others through word-of-mouth (10%), health inspectors (7%) or other sources (11%) including employers and general internet searches. A small number did not remember how they came across the course (2%).

Based on zip code entries, it was determined that learners came from across the state (Figure 10). Two individuals were from China and one from Denmark. Slightly more than half of the respondents identified as female (55%), while 37% were male. This is consistent with the observations by the Aspen Institute, with slightly more women than men in the food service industry overall (The Aspen Institute, n.d.). Majority of the respondents were over 18 years old (93%), 45% had >16 years of experience, and only 7% had worked for ≤ 3 years, which reflects the education level and/or years of experience required for food service manager positions (U.S. Bureau of Labor Statistics, 2020).

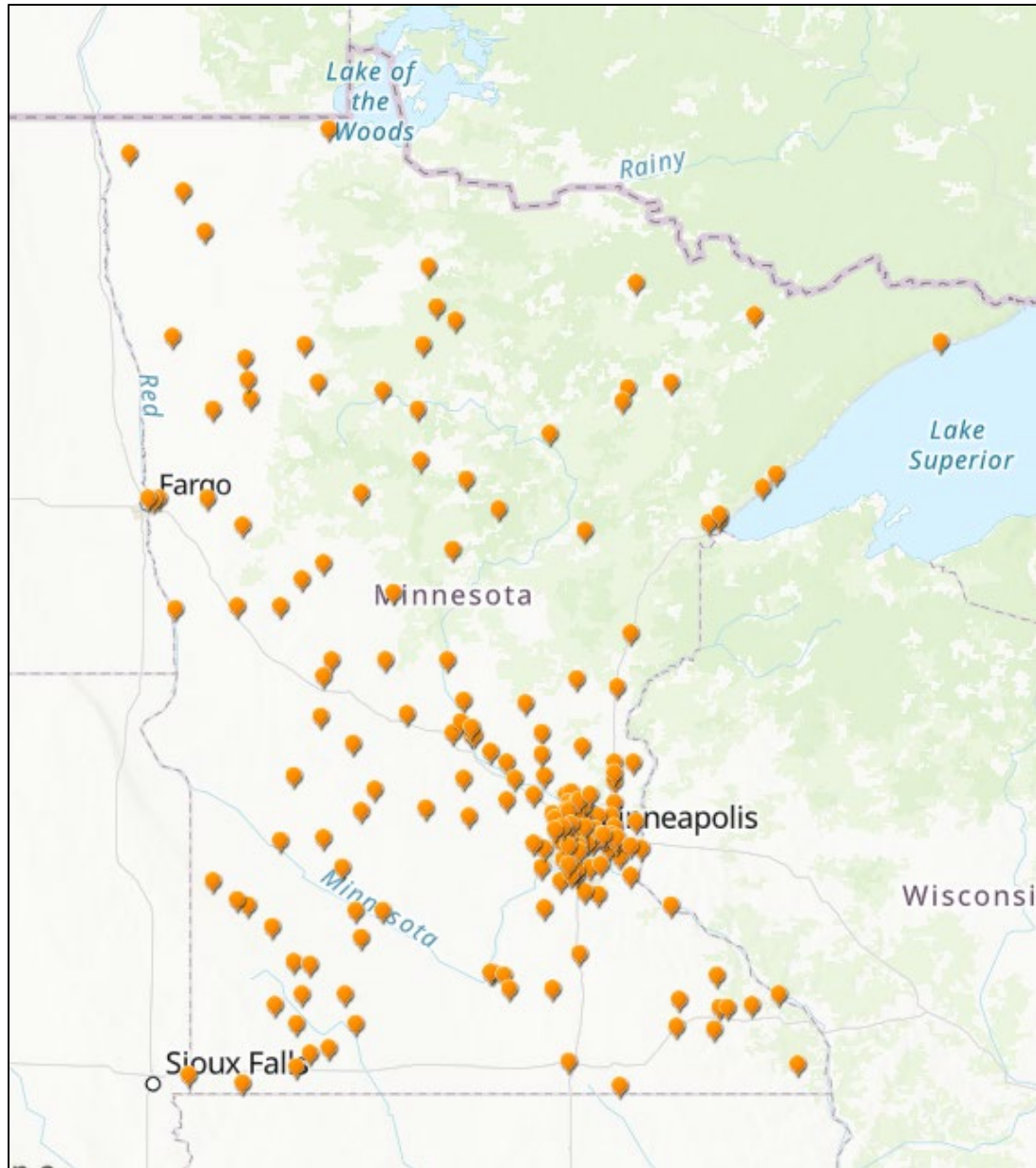


Figure 10: Location of learners taking the UMN Serve It Up Safely™ certification renewal course. Only unique zip codes are shown for clarity. Map created in ArcGIS.

The learners were predominantly White (92%). The rest were Asian (4%), Black or African American (2%), American Indian or Alaska Native (1%) or Native Hawaiian or Other Pacific Islander (<1%). Most identified as non-Hispanic or Latino (90%). These race demographics are more reflective of Minnesota’s profile (Cubit Planning, 2020) than

the food service industry data which reported 11% African American, 6% Asian, and 22% Hispanic or Latino (The Aspen Institute, n.d.).

The learners work at a wide range of food establishments (>20 mentioned), although restaurants (17%), retail stores (17%), schools (12%) and health care facilities (12%) were the most common (Figure 11). This observation is consistent with data from the occupational outlook handbook which reports that 45% of food service managers work at restaurants and other eating places, while 38% are self-employed, 4% work in special food services and 2% work in accommodation (U.S. Bureau of Labor Statistics, 2020).

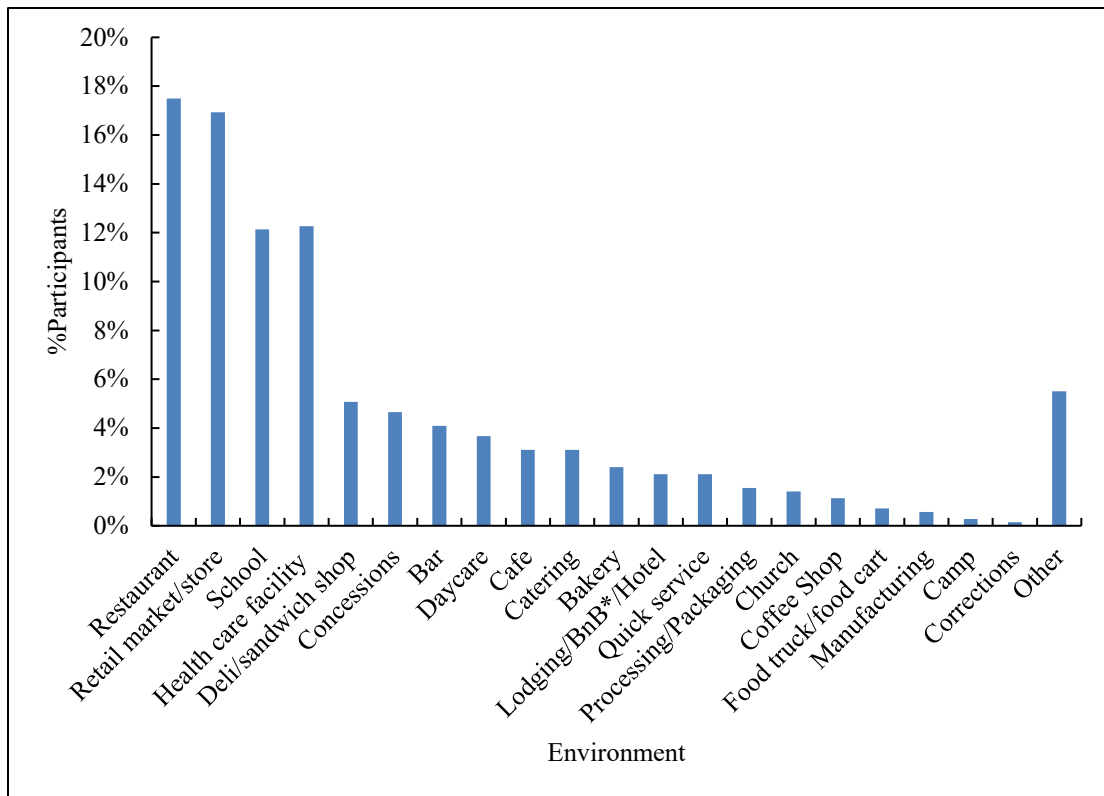


Figure 11: UMN Serve It Up Safely™ certification renewal course participant work environment. BnB* - bed and breakfast type accommodation.

2. How do learners rate the UMN SIUS certification renewal courses?

A total of 1,624 registrations were recorded and 747 evaluations completed (46% response rate). Module registration numbers are shown in Figure 12, in decreasing order of popularity. The Cleaning and Sanitizing Basics module had the highest registrations (272; 17%). This is expected, because it is a foundational module that provides a broad understanding of food safety practices (University of Minnesota Extension, 2020b).

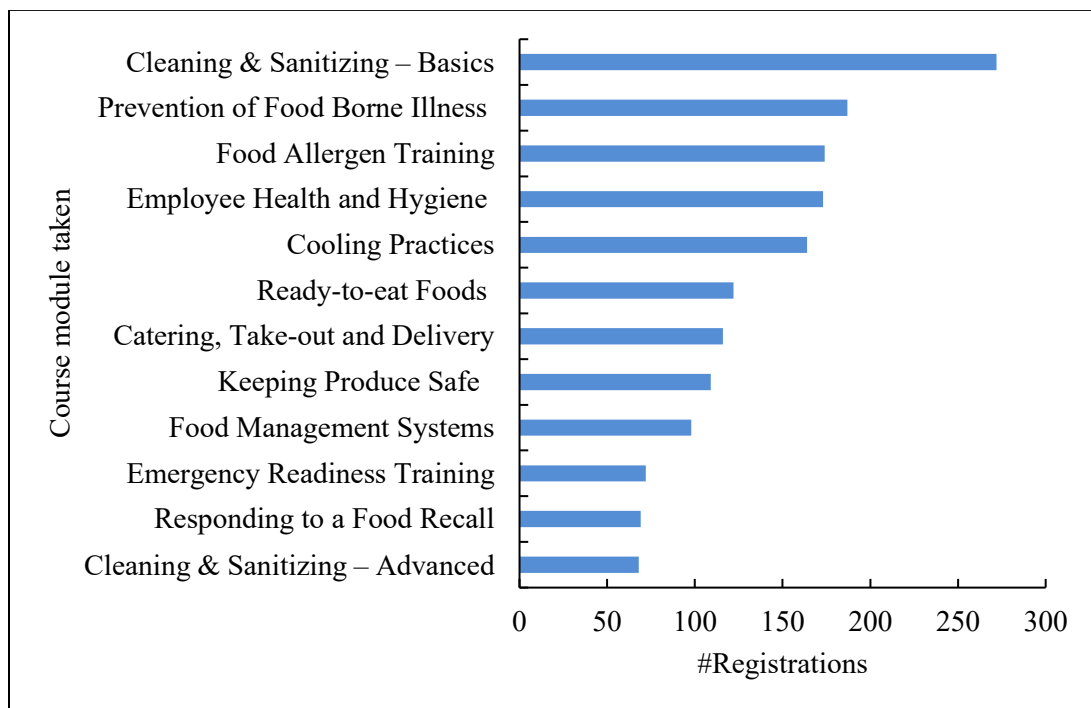


Figure 12: UMN Serve It Up Safely™ certification renewal course module registrations

Although the average course satisfaction rate was 94% ($\pm 6\%$), Catering, Takeout and Delivery rated the lowest at 78%. Nonetheless, only 4% of learners reported having navigation issues, most of which were reported in the Food Allergens module. Video related issues and page navigation were the most problematic (Table 6). These issues were related to the technology used to build the course before it was uploaded into the

online platform (requiring content upload on the user’s end). To resolve this, the course was rebuilt directly into the current online learning platform in late 2019, which reduced the navigation issues.

Table 6: Navigation issues encountered by learners taking the UMN Serve It Up Safely™ certification renewal course

Navigation Issue	#Mentions
Video not loading, low volume	25
Difficulty scrolling through page or to next page	18
Content freezing, timing out	10
Broken links, trouble loading content	10
Pop up blockers and other errors	4
Interactive slides not working	4
Trouble finding quiz, printing certificate	2
Unclear visuals	1
Inconsistency in content (heating temperatures)	1
Difficulty login in	1

Majority of the learners (66%) took the online modules to meet re-certification deadlines. As previously mentioned, the UMN SUIS courses are one of the state approved continuing education courses, so this observation is reasonable (Minnesota Department of Health, 2019). Convenience (16%), preferred mode of learning (12%), lack of closely located in person classes (4%) and general content interest (2%) were other reasons mentioned. This part of the evaluation was similar to that discussed previously in chapter 4, where two questions were merged into one (section 4.1.3, page 22), so no repeated discussion is provided here.

Learners were also asked to rate the knowledge gained from four sections in the respective modules (content, resources/links, activity/case study and certification quiz). These sections were primarily evaluated as “Excellent” or “Very Good” (Figure 13). A slightly lower rating of activities reflected the previously discussed concerns around videos and navigation. Specific lessons learned were consistent with the expected learning outcomes for each module described earlier in the chapter.

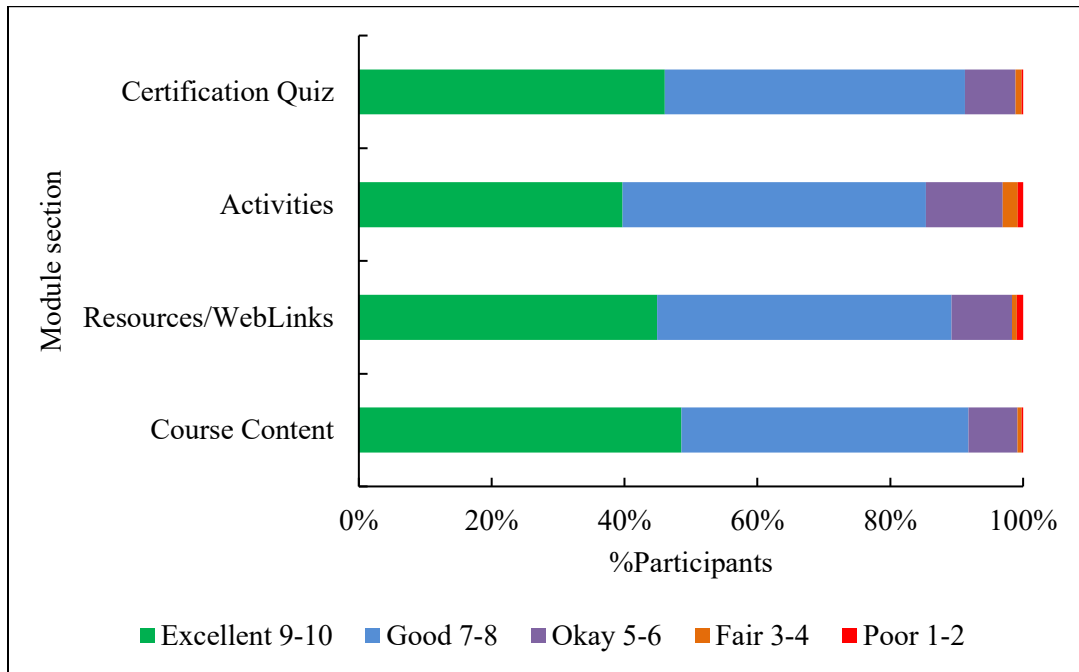


Figure 13: UMN Serve It Up Safely™ certification renewal course section ratings

3. What are learners doing differently as a result of taking the Serve It Up Safely™ certification renewal courses?

Majority (89%) reported having a deeper understanding of the respective subject matter as a result of the course, 92% said they could use the content learned at their jobs and 90% planned to use the lessons learned to train others at work. While 76% intended

to change food safety practices, 85% would add or update existing standard operating policies/procedures. Additionally, 40% would suggest the respective modules to others and 20% would retake the module again. Given that food establishments only need one CFPM, it was encouraging to see that 40% of the learners would recommend the respective courses to others. It also made sense that only a few would retake the corresponding modules because of the variety available. Over time, and the fact that four hours of continuing education are needed for certification renewal every three years, this section of the evaluation would probably vary widely.

The specific changes that learners would implement depended on the module completed and were consistent with objectives presented earlier in the chapter. These “goals” are summarized below by respective modules, for convenience (Table 7). In all instances, employee training and changes to relevant plans/policies/procedures were mentioned and goals.

Table 7: Implementation goals reported in different modules

Catering, Take-out and Delivery	#Mentions
Proper catering equipment and safety techniques	18
Organic composting; food donations	7
Assess catering possibilities better	5
Employee training	3
Cleaning and Sanitizing modules (Basic and Advanced)	#Mentions
Employee training, monitoring, documentation and involvement	44
Proper cleaning and sanitizing; use biohazard (vomit, diarrhea) kits	25
Create and implement a cleaning and sanitizing list/plan	17
Relevant posters and other references for employees	8
Use test strips where needed	8
Allergen management	4
Cooling Practices	#Mentions
Implement best practices around cooling of foods	23

Employee training, monitoring, documentation	18
Create, update or change standard operating procedures	7
Emergency Readiness module	#Mentions
Create, review or update emergency plan	15
Monitor activities in and around establishment	5
Employee handbook (awareness/training)	2
Food Allergens	#Mentions
Employee training/involvement in allergen control	31
Best practices to minimize risk associated with allergens	27
Employee training/involvement in allergen control	31
Food Allergens - continued	#Mentions
Awareness of allergens and allergy management	10
Create, review or update allergy management plan	14
Employee Health and Hygiene	#Mentions
Employee training, monitoring, documentation	27
Best practices around employee hygiene	25
Post proper signs on employee hygiene	13
Food Recall	#Mentions
Create, review or update recall plan	11
Employee training; mock recalls	9
Quickly respond to recalls and effectively manage recalled products	4
Check information on recalls regularly	2
Management Systems	#Mentions
Employee training, monitoring, verification, documentation	20
Create, review or update management plans	8
Preventing Foodborne Illness	#Mentions
Best safety practices, including handwashing and temperature requirements	35
Employee training and monitoring	25
Produce Safety	#Mentions
Wash produce properly; use produce brush	9
Best practices in produce handling	7
Employee training	4
Proper produce storage	4
Ready-to-Eat (RTE)	#Mentions
Create and implement cleaning, sanitizing and maintenance schedule	16

Best practices for RTE food handling	4
Employee training, monitoring	4
Follow temperature requirements	3

5.4. Chapter Conclusions

The prevalence of foodborne illnesses associated with away-from-home eateries has multiple implications for many stakeholders. Regulatory agencies often work to address outbreaks days or weeks after consumers eat contaminated food, which then complicates the traceability process. At the 2020 Food Defense Training offered through the UMN Food Protection and Defense Institute, this challenge was highlighted as an ongoing concern (van de Ligt & Freedman, 2020).

For consumers, the unfortunate experience of a foodborne illness episode can have a wide range of repercussions, including mental health problems (Bolton & Robertson, 2016). The implicated food establishment suffers financial loss and negative publicity that can take years to overcome. A good example is the 2015 – 2018 multistate outbreak attributed to *Clostridium perfringens* and norovirus at several Chipotle locations. In the end, 1,100 people were sickened and a \$25 million criminal fine accrued, the largest ever in a food safety case (Marler, 2020).

It rings true then that food establishments should make food safety a priority, which includes having properly trained individuals managing the systems. With 10,861 eating and drinking places in MN by 2018 (National Restaurant Association, 2019), it was surprising that the number of learners taking the UMN Serve It Up Safely™ certification renewal course represents a small percentage of food service employees in the state. However, given that MDH has 324 other approved sources of training, this low

number makes sense retrospectively. The comments from learners regarding video and picture quality, navigation concerns and preferred modes of presentation were addressed in improving the course content and delivery.

6. The Produce Safety Rule in Minnesota

6.1. Context

The Minnesota Department of Agriculture provides a four step process for produce farmers in the state, from initial inquiry to farm inspection: 1) grower questionnaire, 2) Produce Safety Rule (PSR) training, 3) an optional on-farm readiness review and 4) a mandatory PSR inspection for covered farms (Minnesota Department of Agriculture, 2020f).

The PSR education program is offered through UMN Extension, and is based on the only approved nationwide curriculum (Produce Safety Alliance, 2020). UMN Extension educators encourage all farmers to take the course to understand GAPs and PSR requirements, including those whose farms are exempt or qualified exempt. Ideally by understanding the PSR, farmers are better prepared to manage on-farm food safety, address customer questions, anticipate scaling-up challenges and explore new market opportunities (University of Minnesota Extension, 2020a). Educators work in teams consisting of 1-2 farmer educators and MDA staff (Minnesota Department of Agriculture, 2019a).

With this understanding, the goal of this project is to assess the impact of the course from post-training evaluation data. For ease of presentation and clarity, results are

subdivided into post-training and follow up evaluation data. Questions addressed were as follows.

A. Post training evaluation data:

1. How would one characterize produce farmers in MN?
2. What challenges are MN produce farmers facing while adapting their farms into compliance with the PSR?
3. How do produce farmers evaluate the MN PSR course content and delivery?

B. One year follow up evaluation data:

1. What sources do produce farmers in MN use for information on farm status?
2. What microbial risks do produce farmers consider relevant to their farms and how confident are they in managing the identified risks?
3. How can UMN Extension, produce farmer trainers or MDA be helpful during this time of change?
4. How are MN produce farmers dealing with COVID-19 related challenges?

6.2. Methodology

Data acquisition: Evaluation data used in this chapter was obtained directly from MDA's Food and Feed Division through the public request form available online (Minnesota Department of Agriculture, 2020g). Data provided was de-identified and summarized to protect the identity of individuals and farms involved. Subsequently, data was handled and presented in accordance with the stipulated policy requirements explained during the request phase (Minnesota Department of Agriculture, 2020g). For

detailed evaluation questions, see **Appendix E and F**. Other accompanying data were obtained from relevant sources that are clearly stipulated herein.

Data analysis: All analysis was done in MS Excel. Qualitative data was analyzed following thematic content analysis (Burnard et al., 2008). See methodology in Chapter 3 for details. Non-English comments were translated on Google Translate (<https://translate.google.com/>) before analysis.

6.3. Results and Discussion

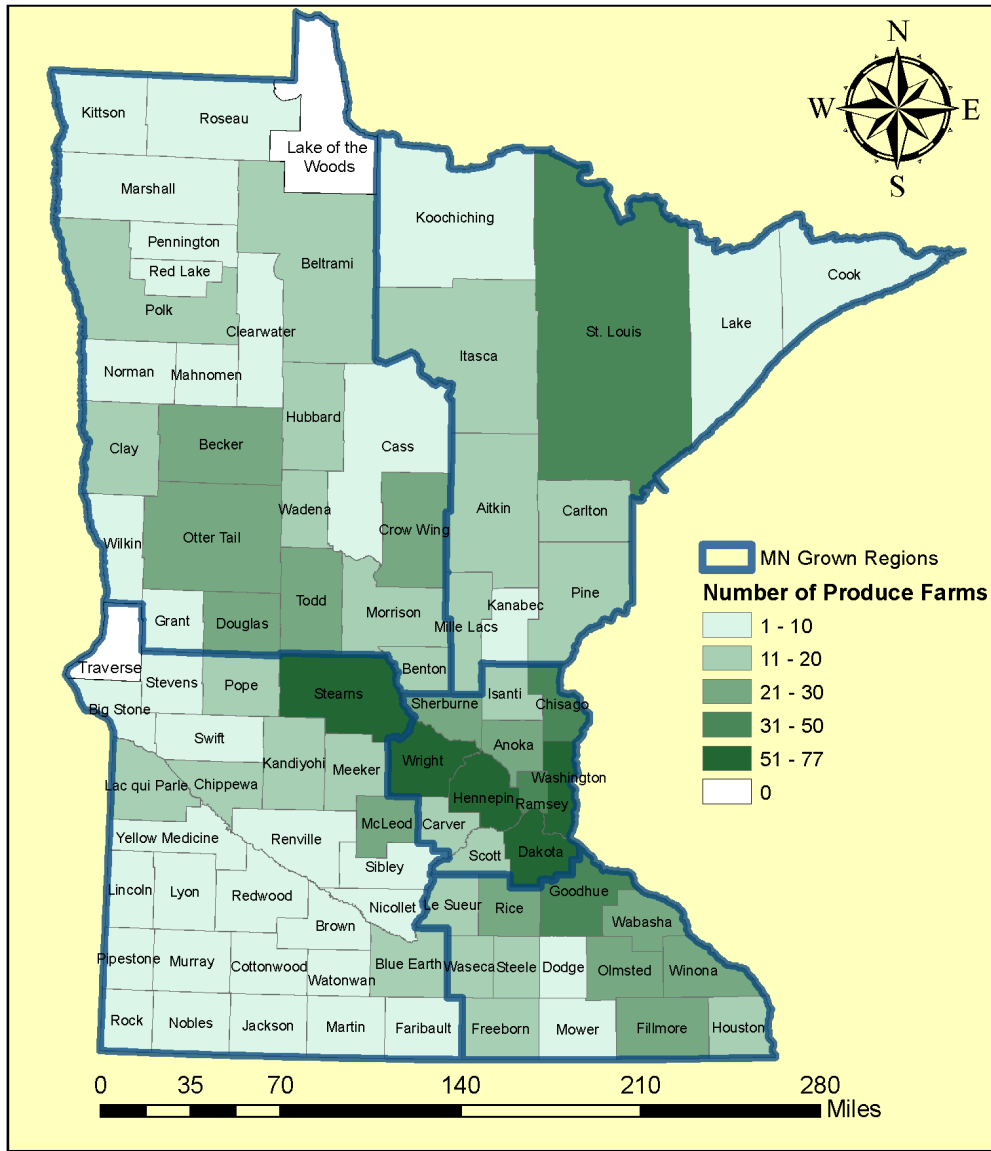
6.3.1. Current produce farm inventory in Minnesota

According to MDA's 2019 annual report, about 3% of the farms in Minnesota are currently in inventory as produce farms (see Figure 14). This equates to 1,806 farms, which based on the previous three-year income average are classified as excluded (<\$27,500; 64.3%), very small (\$27,500 – \$250,000; 24.7%), small (\$250,000 – \$500,000; 4.3%) or large (>\$500,000; 6.7%) (Minnesota Department of Agriculture, 2019a).

The report further stipulates (based on responses from 599 farmers) that there are several commonly grown crops, some of which are not covered by the PSR like winter squash (20%) and sweet corn (19%) (Figure 15). Of those covered by the Rule, tomatoes are the most common (21%), followed by cucumbers (18%). This is important to note because berries, cucumbers, green onions, herbs, leafy greens, melons, sprouts and tomatoes account for majority of produce-related foodborne outbreaks (Angelo et al., 2015; Barak & Liang, 2008; Carstens et al., 2019; Cevallos-Cevallos, Danyluk, Gu, Vallad, & Van Bruggen, 2012; Guo, Chen, Brackett, & Beuchat, 2001; McDaniel &

Jadeja, 2019; Wadamori et al., 2016). These products are sold through a wide range of outlets, including farmers' markets (26%), community supported agriculture (CSA) (11%) and food hubs (2%). Nonetheless, on farm sale (41%), is still the most common income stream (Minnesota Department of Agriculture, 2019a).

Farms Growing Produce By County - 2020



Title: Farm Growing Covered Produce_2020
 Date: May 15, 2020
 Purpose: 1356 Inventory farms unverified & verified to be growing covered produce in a non-confidential choropleth
 Sources: Designed through "ESRI ArcMap 10.6.1"
 Managed by the Minnesota Department of Agriculture
 Author: Ryan Finnegan



Figure 14: Produce farm locations within Minnesota counties. Choropleth image used with permission from MDA.

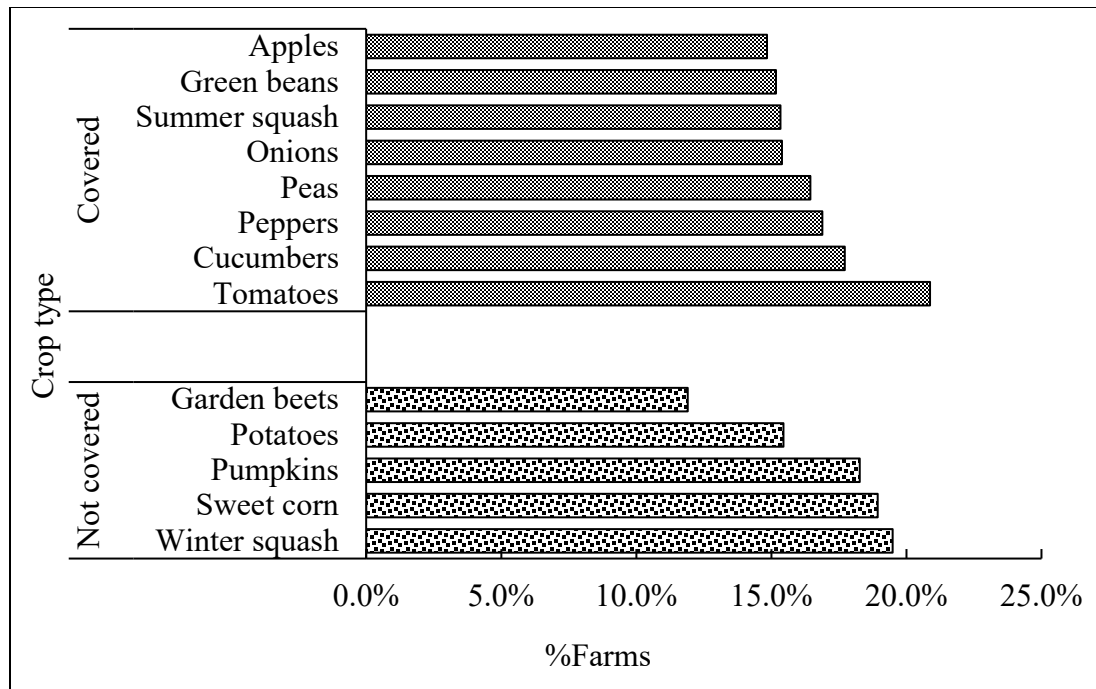


Figure 15: Types of fresh produce grown in Minnesota, categorized as either covered, or not covered by the Produce Safety Rule. Data adopted from the 2019 MDA Annual Produce Farm Inventory Report.

6.3.2. Post-training evaluations

A total of 344 growers attended the FSMA Produce Safety Rule training in 2018-19, 60% of whom were farm owners/operators. The rest were either farm workers (13%), government employees (3%), Extension educators (1%) or workers in the produce industry (1%). About 10% listed their profession as “other”, including an accountant, a food hub employee, a lawyer, a non-profit employee, a restaurateur, a retiree and a writer. Some participants skipped the question (13%).

1. How would one characterize produce farmers in Minnesota?

Most (83%) of the participants had completed some level of formal education as follows: 8th grade (2%), high school graduate/GED (19%), associate's degree (13%),

bachelor's degree (36%), master's degree (11%) and doctorate degree (1%). Of the 250 farm owners/operators and workers, 67% have at least an associate's degree. All the doctorate degree holders (4) were farm owners/operators. Some participants skipped the question (17%).

Historically, farmers have not needed a college degree (Henderson, 2015), or more objectively, many farmers could not afford the cost of college education (Bertone, n.d.). However, with the rise in the number of universities offering related courses (<https://datausa.io/profile/cip/agriculture>), it seems that current and future farmers do benefit from higher education. This is true especially in light of modern technology and precision agriculture (<https://nifa.usda.gov/topic/agriculture-technology>). It may also be important to understand the techniques around organic farming and sustainability. In this context, farmers not only focus on effective food production, but rather more comprehensively on the science behind successful farming. With or without formal education, however, farmers need to stay informed of current agricultural developments (<https://nifa.usda.gov/topic/farmer-education>).

Contrary to the expectation of more men than women in Midwestern agriculture (Sullivan & Peterson, 2015), the data showed an overall homogeneous mix of men and women in the course, at 42% each. Although 16% of the participants did not self-identify into these two categories, the 84% that did were 143 male, 145 female. Additionally, women are historically under-represented as principal operators, but make up the majority of second and third operators, usually as the spouse or family member of a principal male operator (Peterson, 2015; Sullivan & Peterson, 2015). These data showed an almost equal number of female and male farm operators/owners (90 and 95

respectively). However, the data did not provide enough information to determine whether these female operators were primary, second or third. Nonetheless, this suggests a trend, albeit a modest one, of more women in small scale farming.

Of the 285 participants that provided data on ethnicity, 91% identified as White. The others were Asian/Pacific Islander (4%), Hispanic/Latino (3%), Native American (1%), Black/African American (<1%) or Multicultural (<1%). This disparity is typical of farming in the Midwest. In 2019, Minnesota Public Radio (MPR) News released a summary report on the status of agriculture in Minnesota (Gunderson, Dunbar, & Choi, 2019), based on data from the USDA census on agriculture (<https://www.nass.usda.gov/>). This report highlighted farming in Minnesota as overwhelmingly “white”, reflecting the difficulty underrepresented communities face in breaking into the occupation. Two obvious hurdles are land acquisition and the cost of setting up a farming business (Sullivan & Peterson, 2015).

The age of participants ranged from 15 years to >66 years, with more than half below the age of 55 years (56%) (Figure 16). It is noteworthy that for those aged 15-25 years, three are farm owner/operators, 14 are farm workers, and one is an Extension educator. Even so, the average age of a farmer in Minnesota is 55 years, according to a 2015 report by the Minnesota State Demographic Center. This indicates the difficulty in land access among young people and the overall challenges of being a farmer in the 21st century (Fedor, 2019; Peterson, 2015; Sullivan & Peterson, 2015). Sullivan and Peterson published a document highlighting some of the lawmaker initiatives “designed to assist beginning, women and non-White farmers” (Sullivan & Peterson, 2015).

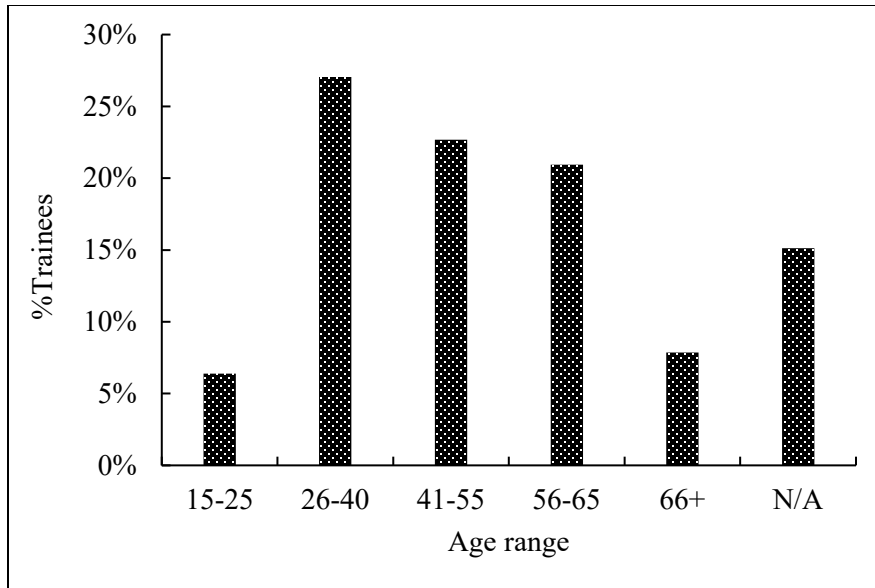


Figure 16: Age profile of participants

The participants involved in produce production (224) reported four primary types of agricultural practices, namely conventional (41%), certified organic (17%), organic but not yet certified (38%) and mixed practice or “other” (5%), (numbers add up to >100% due to rounding off). Interestingly, even though 224 participants provided a response on practice type, 269 listed types of fruits and vegetables produced. These were mixed vegetables (56%), leafy greens (38%), tree fruits (32%), berries (26%), peanuts/tree nuts (1%) and “other” (11%). Items listed by more than one participant under “other” were garlic (5 entries), herbs (5 entries), potatoes (4 entries), melons (3 entries), edible flowers (2 entries), microgreens (2 entries) and pumpkins (2 entries). Majority of the producers (58%) had 0-10 acres of land for production, and the years of farming experience varied greatly. While 34% had less than 5 years of farming experience, the rest range from 6 years to >50 years (Figure 17 A and B).

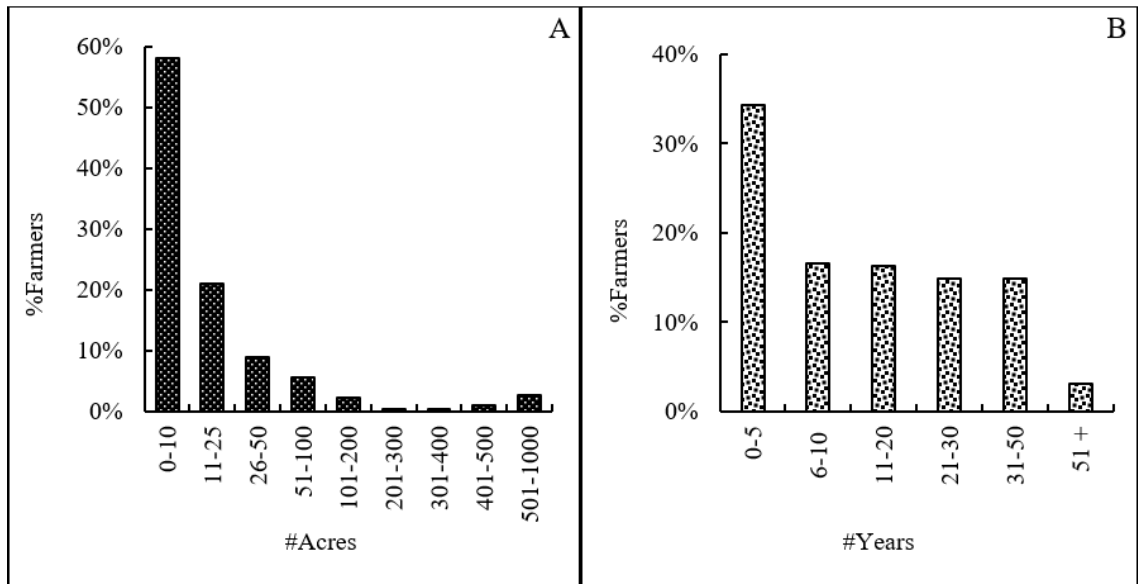


Figure 17: A: Number of acres of fruit and vegetables grown by participants; B: Years of farmer work experience

2. What challenges are produce farmers in MN facing while adapting their farms into compliance with the PSR?

Hypothetically, based on the PSR farm classification stated earlier, 46% of the farms represented by the participants would be considered exempt because they earn <25,000/year in sales, 45% would be qualified exempt (\$25,000 – 500,000/year) and 4% would be fully covered (\$500,000/year) (US Food and Drug Administration, 2020).

In comparing the reported 3-year average sales to the farm classification it was clear that some farmers need more help understanding how the Rule classes work (Figure 18A). Of the farmers not covered due to low sales (<\$25,000), eight think they need to follow the Rule and 19 are not sure whether they should. For those in the qualified exempt category (>\$25,000 - \$500,000), 26 are not sure whether or not they qualify for

the available exemptions. Unfortunately, three farmers who are definitely covered (>\$500,000) think they are not, and one is not sure yet.

The qualified exempt groups may or may not be covered depending on the amount of and points of sale. For many producers, this is a difficult category to be in, because the exemptions generally apply to specific produce types (rarely consumed raw or meant for further processing, including a kill step), and/or when more than 50% of the produce is sold to a “qualified” individual. So the farmer must understand what that means and maintain proper documentation (US Food and Drug Administration, 2020).

All farmers earning <\$25,000 should not be concerned about this because they are not subject to the PSR. Nonetheless, 32 of them think they will qualify for exemptions and another 32 were not sure. Also, 28 farmers who could qualify for exemptions were not sure about it yet (Figure 18B). Because this course is the first comprehensive food safety training for many farmers (71%), the challenges in understanding the difference between “exempt” and “qualified exempt” are understandable. Hopefully, with time and continued experience, the difference will become more apparent.

Overall, 20% of farms are subject to the rule. Although only 30% are subject to qualified exemptions, 39% of farmers reported having exempt produce, which are rarely consumed raw. As previously mentioned, the lack of expected synergy in the numbers is probably due to the confusion in the “exempt” and “qualified exempt” classes. Fewer farmers have produce meant for commercial processing, which includes a kill step (10%).

Average 3 year sale	Covered under FSMA PSR? A			
	Yes	No	Not Sure	N/A
<\$25K	8	98	19	2
>\$25K-\$250K	39	27	23	6
>250K-\$500K	6	12	3	0
>\$500K	10	3	1	0
N/A	7	13	11	56

Average 3 year sale	Qualify for a FSMA PSR Exemption? B			
	Yes	No	Not Sure	N/A
<\$25K	32	50	32	13
>\$25K-\$250K	51	13	25	6
>250K-\$500K	13	5	3	0
>\$500K	1	12	1	0
N/A	5	8	15	59

Figure 18: **A:** Number of farms classified under PSR coverage based on farmer’s 3-year annual sale average. **B:** Number of farms that qualify for a PSR exemption based on farmer’s 3-year annual sale average

3. How do MN farmers evaluate the PSR course content and delivery?

On a sliding scale of one to five (one meaning poor and five meaning excellent), module ratings ranged from 4.4 to 4.7, with an average of 4.6. The ratings for each day of the 16 course offerings were ≥ 4.2 , except for the first day that scored at 3.7. It makes sense that as a first time offering, the educators learned a lot about content and delivery and made necessary changes. Majority of the learners (318/334; 92%) were satisfied with the materials included or referenced in the training. A small number (20/334; 6%) suggested new material or ideas for future consideration, including:

- *All supplemental materials shown on slides during presentation (2 mentions);*
- *An example of a food safety plan;*
- *Best practices for beginning farmers/those on a limited budget*

- *Information on cottage foods for community supported agriculture (CSA) and farmers' markets*
- *Names of the speakers and titles included in the agenda*
- *Materials about cannabidiol - CBD (2 mentions);*
- *Materials specific to FSMA and covered agriculture - hoop houses, green houses;*
- *Internet Center for Wildlife Management, cooler operation/cooler inspection;*
- *More examples of post-harvesting handling, and actual farms practicing these methods (2 mentions);*
- *More farm examples on techniques and issues e.g. runoff, wildlife, floors (2 mentions);*
- *More GAP related references and related comparisons;*
- *More interactions especially during meal breaks; and*
- *Safety signage on USB to be printable on personal printers*

While 92% of the learners felt that the level of information provided in the curriculum was sufficient to guide them in implementing regulatory requirements, 2% felt otherwise due to some personal unmet need. One of these regulatory requirements is the development of an on-farm food safety plan as previously mentioned. At the time of the evaluations, 68% of the participants did not have a plan. Nonetheless, 38% planned on completing a plan within a year, while 28% were not sure when they would have one.

Moreover, 80% of the participants had never participated in a 3rd party audit to verify implemented on-farm food safety practices, yet 42% had already received some type of request from buyers regarding food safety. A written food safety plan was requested in 33% of those cases. Other requests were 3rd party audits (27%), adherence to marketing orders or agreements including some food safety elements (13%), compliance with the PSR (12%) or some other food safety requirements (15%). Future research could follow up on these requirements and the impacts on farmers who are not covered by the Rule, but feel the market pressure to fulfil the requirements anyway.

Developing a food safety plan requires the farmer to complete a thorough risk assessment of the farm and operations, and then decide how to sufficiently address these risks. Because FMSA regulations focus on prevention rather than end-product testing, farmers must now be actively engaged in preventive measures at all stages of production (US Food and Drug Administration, 2020). The third party audits simply help the farmer determine how well the implemented measures are working, relative to benchmarks.

One year after these 344 participants completed the PSR course, MDA sent out a follow up evaluation to determine the long term impact of the program. The results are presented in the next sub-section.

6.3.3. One year follow up evaluation

A total of 85 farmers completed the follow up evaluation (25% response rate). For clarity in presentation and discussion, the number of respondents at each key point between training and evaluation are described below:

- A. Completed the 2018-19 PSR training = 344
- B. Responded to the follow up evaluation = $85/344 = 25\%$
- C. Self-identified as farm owners or employees on produce farms = $70/85 = 82\%$
- D. Provided information about the farms they own or work on = $59/70 = 85\%$

The 59 farmers who provided feedback on farms (group D)

1. What sources do farmers in MN use for information on farm status?

Although farmers can use multiple sources of information to determine farm status, the most common avenue mentioned was the grower training (69%). This was not

unusual because the PSR is new and official federal and state programs are the most reliable information sources at this time. Some farmers filled out the MDA grower questionnaire and received a status confirmation letter (37%), personal online research (31%). Others had direct conversations with UMN Extension educators (15%), MDA (10%) or farmer trainers (8%). Word of mouth (8%) and other information sources (5%) were also reported. Many of the farmers doing online research were most likely finding what they need through the MDA and UMN Extension websites. (Minnesota Department of Agriculture, 2020f; University of Minnesota Extension, 2020a).

Majority of the farms (44%) were identified as qualified exempt, meaning the farmers earn <\$500,000 in food sales including produce and >50% of these sales are to qualified end-users. A smaller number of farms are excluded (37%), which means the PSR does not apply to them. Only 12% of the farms are covered by the rule, and unfortunately about 7% of the farmers are still not sure where their farms fall (Minnesota Department of Agriculture, 2020f; University of Minnesota Extension, 2020a). Given the small number of farmers providing feedback on farms, and data from the post-training evaluation discussed earlier, it is reasonable to anticipate that this group of unsure farmers is higher, when all the farms across the state are considered.

The resources provided during training were used by the farmers to varying extents (Produce Safety Alliance grower manual, 87%; handouts in a folder, 47%; flash drive, 40% - percentages add up to >100% because learners were allowed to select more than one option). In a farming environment, this order of preference makes sense, because the manual and handouts as hard copies do not require electronic devices. It is also easier for a farmer to take notes and add to the content. However, tablets and phones

can also be effectively used if the flash drive content can be uploaded. Two farmers preferred the training itself, however, and one of them stated that *“talking with the other farmers there and using real-world examples helped solidify my understanding”*.

Most farmers (95%) were confident that they understand the required PSR farm operations and 85% understand the difference between a PSR inspection and a GAP audit. While the PSR inspection is mandatory for covered farms, a GAP audit is voluntary and any produce farmer can request one from the USDA. In some instances, customers ask for the audit reports, which can be uploaded into industry commercial supply chain databases and shared as needed (US Department of Agriculture, n.d.-b, n.d.-c).

2. What microbial risks do MN farmers consider relevant to their farms and how confident are they in addressing these risks?

Farmer beliefs about on-farm food safety were captured in four aspects, on a sliding scale, where 0 meant strongly disagree, 50 meant neutral and 100 meant strongly agree. (Figure 22). The average score was 87 (± 19 SD) on whether the farmers believe that on-farm produce safety practices are important. It was lower at 69 (± 30 SD) for farmer belief that bacteria, viruses and parasites are a potential risk on their farms.

Farmer belief that the course made them more confident in managing the potential risk of these microorganisms on the farm received an average score of 82 (± 19 SD), and the belief that there will be a return on investment from adopting on-farm produce safety practices was scored at 74 (± 25 SD). This information is important for trainers because individuals are generally more likely to make necessary changes if they believe there is

some kind of benefit accrued in the process, whether monetary or esthetic (Vakola, 2014).

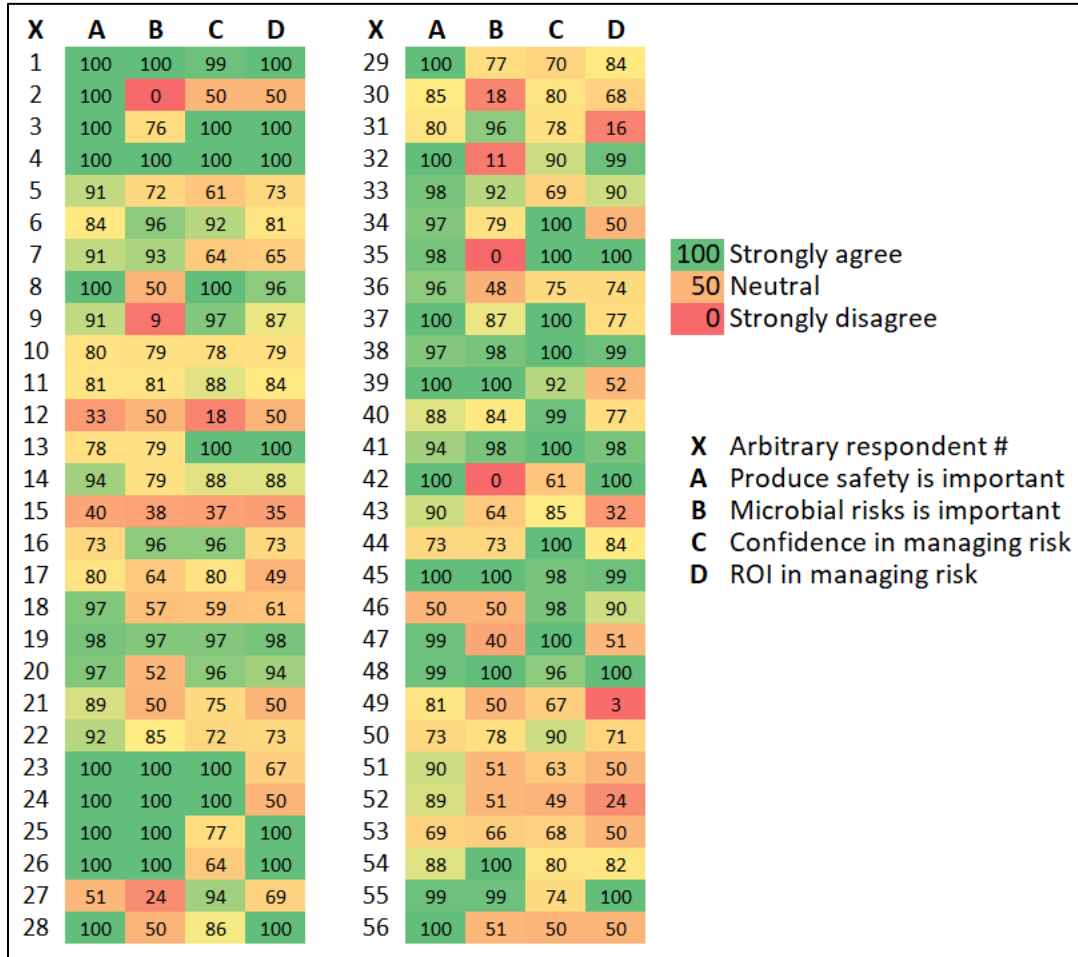


Figure 19: Beliefs among farmers that: **A** (on-farm produce safety practices are important, average = 87%); **B** (bacteria, viruses, and parasites are a potential risk on the farm, average = 69%); **C** (the grower training made them more confident in managing the potential risk of bacteria, viruses and parasites on the farm, average = 82%); **D** (there will be a return on investment from adopting produce safety practices on the farm, average = 74%). **X** = farmer’s arbitrary number. Rates were generated from a sliding scale, where 0% – strongly disagree, 50% - neutral and 100% – strongly agree.

These numbers reflect the challenge of helping growers make a connection between the general farming environment and the safety of produce. Specifically, it is

counter intuitive to worry about “germs” in relation to food that is grown in the soil. Therefore, the slightly lower scores from farmers who believe that microorganisms pose a potential risk on the farm is indicative of the need for targeted education around the concepts of pathogens, as a small but natural part of the soil (usually from run off and animal waste) and manure microbiomes (Bicudo & Goyal, 2003; Brackett, 1999; Solomon, Yaron, & Matthews, 2002). The rewarding observation was that after the program, 82% of the growers felt more confident about managing these risks.

In addition to beliefs, the learner’s willingness to change behavior or adapt a new cause of action also impacts the long term effectiveness of training. The results in Figure 23 indicate that about half of the farmers were adequately meeting the necessary requirements. For many, improvements or incorporation of new practices since training were reported. The biggest change was noted around food safety planning, where only 34% were in compliance before the training, but afterwards, 34% improved the plans and another 25% developed new plans. Some specific on-farm changes within these broad categories were shared by 46 farmers. The top three were cleaning and sanitizing equipment and sheds (17 mentions), improved handwashing (14 mentions) and employee training on best practices (5 mentions). Other types of on-farm changes are summarized in Table 8.

More than 75% of the farmers feel confident managing the risks associated with the presence of wildlife on the farm, water quality, biological soil amendments, worker health and hygiene, as well as farm equipment (Harris et al., 2012; Keenan, Spice, Cole, & Banfi, 2015; US Food and Drug Administration, 2020). While this data is reassuring, the small number of farmers still not confident about managing risks posed by wild

animals and biological soil amendments implies that continuing education may be helpful. The specifics of all these risk categories were previously discussed in the literature review.

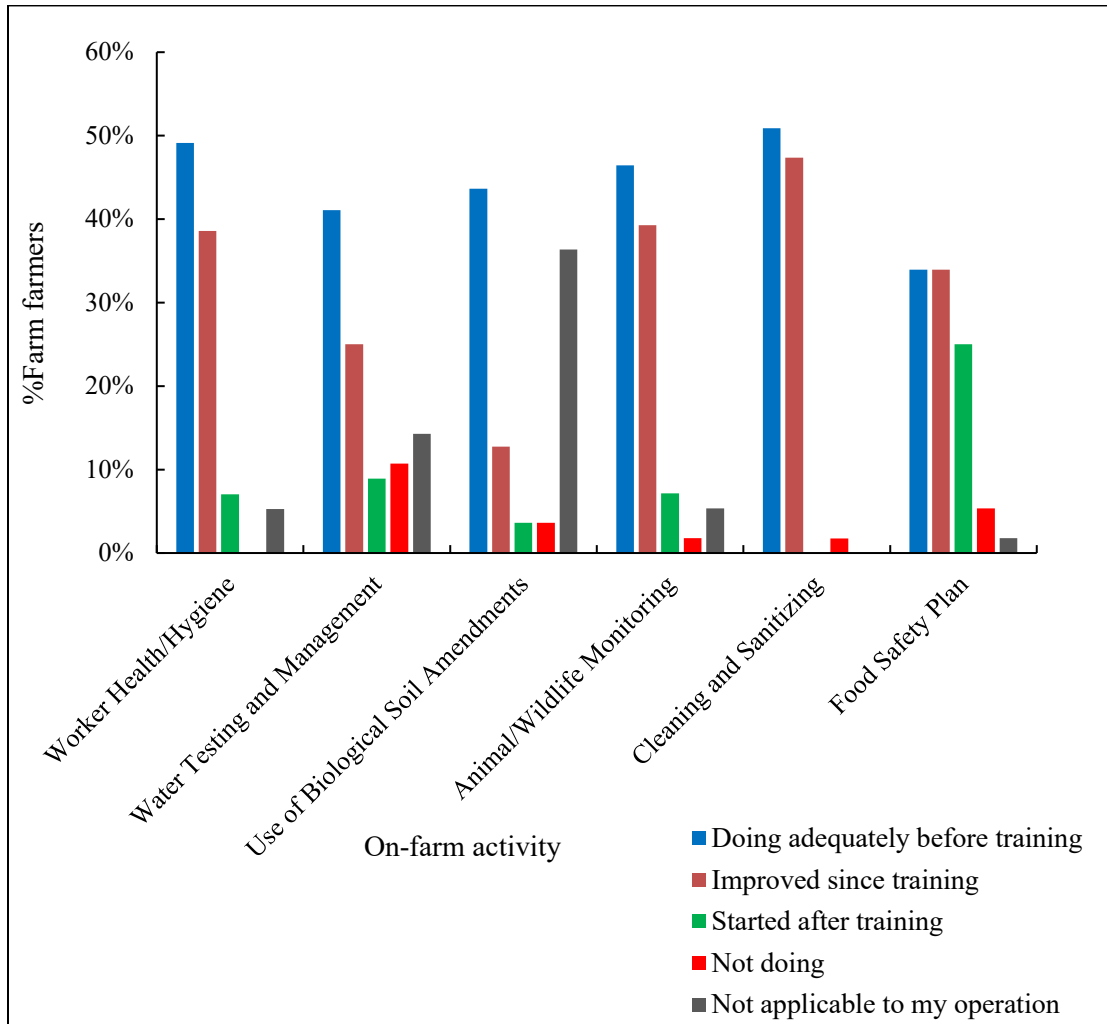


Figure 20: Farmer practice implementation or adaption around on-farm risk areas after training (N = 43)

Table 8: On-farm food safety related changes undertaken by farmers

Changes	#Mentions
Cleaning and sanitizing equipment and sheds	17
Handwashing (stations)	14
Employee training (best practices, videos, take-home manual)	5
Careful, minimal produce handling (not selling any handled by guests)	4
Documentation; Standard Operating Procedures	3
Zoning and designated footwear and tools for different farm operations	3
Restrooms and field sanitation	2
New or improved processing area	2
Food safety practices awareness and compliance	1
Limited access to packing shed for non-employees	1
Constant review and change of practices as needed	1
Personal hygiene	1
Water quality monitoring	1
Risk assessment	1
Proper manure use	1
Watch out for wildlife	1
Using clean water to wash produce when need be	1

Very few farmers (26) provided feedback on the challenges they are facing while adapting their farms into compliance. The two most common concerns were time constraints around documentation and employee training (8 mentions) and financial limitations (6 mentions). Other less common concerns were financial limitations, personnel related issues, and animal containment. Expectedly, during change phases people encounter periods of unlearning, relearning, thought restructuring and personal feelings of gain and loss (Desplaces, 2005). All of these factors play a role in the willingness and speed with which the necessary changes are made.

3. How can UMN Extension, farmer trainers or MDA be helpful during this time of change?

Aside from farm related questions, participants were also asked to provide feedback on a wide range of post-training experiences. The rest of this section included responses from all respondents, whether or not they own/work on a produce farm (see group B at the beginning of this sub-section, 6.3.3).

Predictably, most learners attend training with predetermined expectations, and this case was not any different. The most pressing issue for these participants was understanding the PSR, how to implement on-farm safety practices and determine whether or not their farms are covered (Figure 24). The learners proposed alternative formats for the course, the most common of which was an online course followed by an in person field day at a farm (27%). An online course with no in-person time appealed to 25% of them, while an online course followed by a food safety plan writing workshop was favored by 22%.

Other options presented were a 2-day in person course with time on the second day dedicated to writing a food safety plan (21%), or separate in-person workshops for each course module (8%). Beyond this, they shared how they think MDA, farmer trainers and UMN Extension (Table 9) could be a future resource or improve delivery of information and resources. For MDA and Extension educators, availability to answer questions, provide guidance and relevant resources was certainly the most mentioned recommendation. The farmer trainers were well received for their hands-on farming experience.

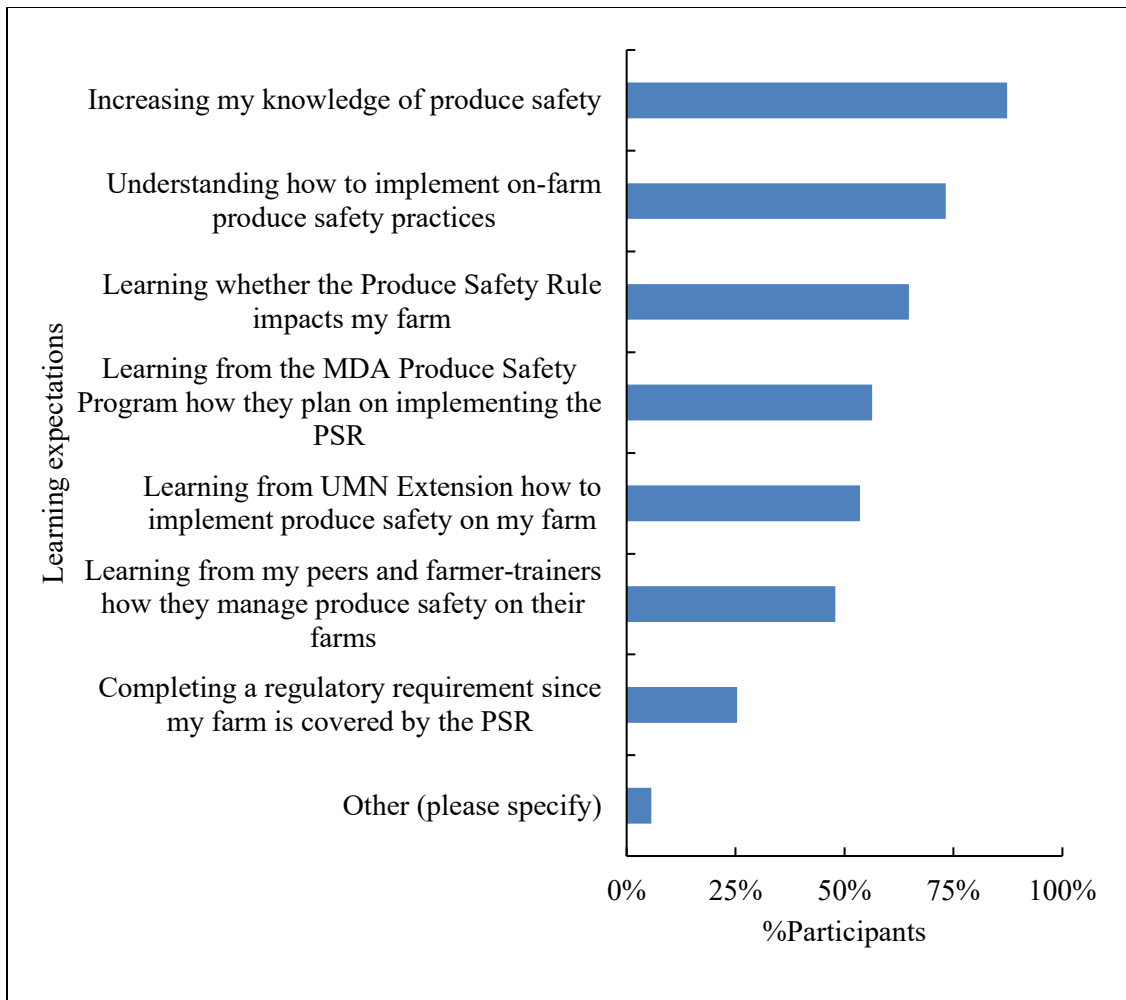


Figure 21: Extent to which learner expectations of the course were met

This was not surprising, and was probably the best reflection of the value of having more farmers trained to deliver the modules. It was also a reflection of how the farmers view MDA and Extension educators – as a source of trustworthy, timely, relevant information, but not necessarily as people who have a clear understanding of farming and its challenges. While it is not realistic to try and change this view, it might be beneficial to consider the farmer recommendation for more participation in on-farm visits, so that trainers have a general sense of life on the farm, as it relates to produce safety requirements.

Table 9: Participant recommendations to MDA, farmer trainers and UMN Extension

Recommendations for MDA	#Mentions
Availability (phone, email, hotline, emergency call line)	23
Farmer resources (multi-lingual), website, social media	15
Continued training, outreach, writing workshop, on-farm visits	8
One stop keepers of the rules, regulations and resources	6
Timely emails, newsletters, updates on Rule, grant opportunities	5
Provide course online and have a link about each module	2
Free/subsidized training for farmers	2
Adapting Rule to greenhouse	1
Attend regional conference, farmers' market meetings	1
Funding for small businesses	1
Meetings by grower size, rather than one big one	1
Recommendations for farmer trainers	#Mentions
Trainers real farm experience were viewed as relatable/credible	40
Consider farm size (small vs. large farm experienced trainers)	4
Quarterly meetings/newsletter, follow up at MFVGA conference, social media	3
Motivation/peer support	2
More time for questions and answers; balance time and content	2
On farm classes; farm visits	1
More discussion on best practices	1
More in-person workshops at more locations around the state	1
Recommendations for UMN Extension educators	#Mentions
Availability (phone, email, hotline, emergency call line)	28
Email reminders, updates refreshers of concepts/tools	15
Better online resources (website, newsletter, blog, social media, forums, links about each module, posters for new growers)	13
Farmers opinions, case studies, discussions, farm tours	9
Continued outreach or training opportunities; online options	4
More regionally specific trainings; more train-the-trainers	3
Guided food safety plan writing	2
Best practices for very small/small growers	1
Information on setting up zones on the farm	1
Food safety practices on urban farms	1
Farm safety info for retailers, encourage retailers to buy local	1
Maybe a review of standard operating procedures	1
Only deliver information when it is finalized	1

6.4. Considerations

The course module evaluations presented at the beginning of this section (subsection 6.3.2) included open-ended comments that highlighted a clear variation in the reception of different trainers. Emphasis was placed on prior farming experience and enthusiasm during course delivery. While there were 120 mentions of positive feedback for the instructors, course content and course delivery, 48 instances of negative comments were also noted. These primarily mentioned presentation speed and presenter attitude. Other notable comments by several participants were the value of real life on-farm examples (24 mentions), the need for instructors to balance content and time (14 mentions), usefulness of various course activities (9 mentions), and binders missing supplemental content (6 mentions). To a lesser extent, participants suggested course offerings at other locations or online (4 mentions), and the need for an example or time to develop a food safety plan (3 mentions). Other comments were farm specific and would need to be addressed individually.

By comprehensively looking at the data presented here, the author proposes potential factors that could affect the acceptance and impact of the produce safety education program. As these factors have been inherently discussed throughout, only a brief description is provided here for completion:

1. Type of trainer (farmer, Extension educator or agency staff) – as discussed earlier, learners are more engaged and welcoming when the trainer has prior farming experience. This seems to reflect an understanding beyond technical knowledge, which farmers relate to.

2. Trainer competency and consistency – learners were keen to mention when the trainers seemed to struggle or lack confidence. They also highlighted inconsistencies between presentations and provided resources.
3. Trainer attitude towards the curriculum – learners also noted when the trainers were excited and engaged, rather than simply presenting the content, especially reading of slides.
4. Learner attitude towards formal food safety training – it was mentioned previously that farmers rated pathogens as a concern on their farms at only 69 out of 100 points. This general attitude needs to change for some farmers, to effectively take the measures necessary to mitigate on-farm produce contamination.

Another observation that should be considered is the number of farms that are not covered by the PSR. While these farms are exempt from the comprehensive Rule, the farmers are seeking out the knowledge. So how does MDA and UMN Extension provide the necessary information without burdening the small and very small scale farmers with material that does not directly apply to their farms? Perhaps an upgrade to the GAPs training program to incorporate some of the PSR fundamentals could address this gap.

Minnesota farmers represent a diverse group of people from various cultures. The author attended a training offered in Hmong as an observer, and noted that this offer did not provide certification because there was no way to definitively verify that the translated content was equivalent to the federal standards. The only reasonable way around this type of concern is to train a Hmong speaker at the train the trainer standard, which then allows the individual to effectively offer the course commensurate with the

deferral requirements. The ability to diversify the PSR curriculum delivery could be beneficial, with the caveat that several variables such as funding and the need to maintain the federal training requirements must be considered.

6.5. Farmers and COVID-19: A story of resilience and adaptation

Despite the efficiency of Minnesota's produce market outlets, recent events associated with the COVID-19 global pandemic have disrupted businesses (Minnesota Department of Health, 2020). Some farmers essentially lost direct market sales as schools, restaurants and other businesses closed down (Chaloux, 2020; Minnesota Department of Agriculture, 2020e). An early report from the University of Missouri estimates that US Agricultural losses could reach \$20 billion by end of 2020 (Westhoff, 2020). Consequently, farmers and supportive stakeholders have proposed solutions to circumvent the hurdles. Online sales, home delivery, Uber/Lift delivery, CSA drop-offs/pickups and coordinated neighborhood product aggregations are some examples (Farm Commons, 2020; Hoidal & Overgaard, 2020).

In all of these cases, food safety measures are important to protect consumers from foodborne illness (Minnesota Department of Agriculture, 2020c; Minnesota Institute for Sustainable Agriculture, 2020). Additionally, MDA and Minnesota Farmers' Market Association (MFMA) have adapted food safety guidelines to address the increased risk which is not directly associated with the produce but rather with human interactions (Minnesota Department of Agriculture, 2020d; Minnesota Farmers' Market Association, 2020b).

Minnesota Grown provides an avenue for consumers looking for local food sources to find farmers more easily (Minnesota Department of Agriculture, n.d.). Minnesota Department of Education has an initiative to which farmers can contribute apples, carrots and salad greens in wholesale for the grab-and-go school lunches. Commendably, the grab-and-go lunch program continues to be available to school-aged children even though schools are closed, and is coordinated through Minnesota Cooks, a Minnesota Farmers Union initiative (Keaveny, 2020; Minnesota Farmers' Union, 2020).

Besides thinking about the immediate impacts of the pandemic, farmers must strategize for the future. UMN Extension educators recommend that farmers should stay in contact with customers to create a sense of community and build support during the different phases ahead. It is also important to create a plan and prepare for reduced cash flow, by taking advantage of local opportunities like loans and unemployment benefits where applicable (Hoidal & Overgaard, 2020; Zimmerli, 2020). Farm Commons, MFMA and UMN Extension continue to hold webinars and podcasts to answer questions and provide relevant updates to help farmers make the best decisions (Armstrong, 2020; Minnesota Farmers' Market Association, 2020a; UMN Extension, 2020d). Farmers' Legal Action Group released a farmers' guide on using the Coronavirus Aid, Relief, and Economic Security (CARES) Act (Kuehn & Lindsay, 2020). Minnesota Farmers Union has aggregated resources from different sources onto one platform for easier navigation (Minnesota Farmers Union, 2020).

All these initiatives indicate a willingness among different stakeholders to change with the constantly changing landscape. Ideally, as more farmers become aware of the options and opportunities available to them, the negative impacts will continue to

diminish. Sadly, one of the real but scarcely mentioned challenges is the ongoing mental health issues among farmers in general (Hagen et al., 2019; Yazd, Wheeler, & Zuo, 2019). Fortunately, several resources are now available to this effect (American Farm Bureau, 2020; Minnesota Department of Agriculture, 2020a; Rural Health Information Hub, 2019; Upper Midwest Agricultural Safety and Health Center, n.d.). The UMN Extension continues to support farmers and provides related resources around advocacy, counseling, legal needs and referrals within the state (UMN Extension, 2020e).

6.6. Chapter Summary

In summary, the PSR curriculum introduces farmers and relevant stakeholders including government employees and Extension educators to the regulatory requirements around produce safety. The breadth of content covered can be overwhelming, and understandably, it will take more than a single class interaction for farmers to have a clear picture of what is required on their produce farms. The role of education and outreach in this context cannot be overstated (Keenan et al., 2015; Yang & Swinburne, 2016). Also, empathizing with the underlying beliefs and assumptions among learners can help in program design and delivery.

In essence, there needs to be an ongoing open-ended communication between the farmers, MDA and Extension educators, either through formal channels like evaluations or informally over phone calls and face to face conversations. By taking into consideration the various insights provided by farmers and learners in general, the instructors and curriculum developers can continue to fine tune the PSR program from one year to the next. Resources are provided as part of the course, but ongoing

communication with MDA and Extension educators should ease the learning curve as farmers adapt their farms into compliance.

A recent study assessed the costs and returns of on-farm food safety improvements and concluded that the costs and benefits increase with farm size at decreasing rates. This means that the cost incurred by small farms investing in food safety is offset by the relatively higher market sales per acre, which is good news for all the small farms that may not necessarily be covered by the PSR, but need to invest in food safety. Third party audits were also deemed beneficial for farms that had them, and especially those targeting wholesale opportunities (Schmit Id, Wall, Newbold, & Bihn, 2020). Data such as these help support the need for the PSR, and the ongoing supporting GAPs resources.

7. Private and Public Values of UMN Food Safety Education Programs

To this point, this volume has primarily addressed the private value of UMN Extension food safety education programs. However, as indicated in the literature review, current trends indicate that Extension educators should consider the public value of their programs as well. This requirement is considered in this chapter, by proposing ways that these three programs benefit different stakeholders in the state, with the appreciation that follow up discussions and research are necessary to better articulate this thinking.

The ideas presented are based on ongoing discussions about establishing and communicating public value of Extension programming across the country (Kalambokidis, 2013). Special attention is given to ideas in the newly revised UMN Extension strategic plan. This plan takes into account emerging trends including,

“globalization and a competitive marketplace of ideas; an increasingly diverse society; game-changing technological advances; broad and variable funding streams; and eroding public trust of hierarchical, traditional systems”. By fine-tuning the interplay between engagement, people, scholarship and systems, the new plan creates a platform for a holistic approach to community friendly, science-based problem solving (UMN Extension, 2020f).

7.1. Private value

Private value lies in the participant’s motivation for taking the course, which as discussed throughout this work, is primarily to meet the regulatory requirements of running a successful business. The opportunity to learn how to comply with relevant food safety practices is consequential when the learner applies the lessons directly towards mitigating the spread of foodborne pathogens. This leads to safe food products, which maintains consumer confidence. In the case of a cottage food producer and a produce farmer, this means ongoing product sales. For the food service employee, this means the restaurant stays open longer. With respect to individuals taking the courses for other reasons such as personal curiosity, the value is in the knowledge acquired and whatever they decide to use it for. In the matter of UMN Extension, programming is part of the land grant mission of bringing science-based solutions to communities around the state (UMN Extension, 2020f).

7.2. Public value

7.2.1. Value to consumers

Consumers are the most obvious beneficiaries of properly trained food handlers. Regardless of the inherent risks associated with a food product, food handler hygiene

plays a critical role in ensuring food safety, as discussed in Chapter 4, 5 and 6. Even the safety of low risk cottage foods depend on the ability and willingness of a cottage food producer to follow safety procedures in processes like canning. The food itself may be safe, but if the handler does not practice proper personal hygiene, there is an added risk of contamination.

7.2.2. Value to the community

Every individual taking a UMN Extension course is part of a community. While the lessons learned are primarily geared towards the individual's job environment, immediate family members and friends may benefit if the individual applies the food safety practices learned at home and around family and friends. It is especially helpful if the person chooses to share the information with others and teach them how to prepare food safely.

From a business standpoint, the trained individual can be a mentor or a trend setter for others. A cottage food producer or a farmer may choose to share the information gained with others at the farmers' market around the neighborhood. This could lead to others considering similar business models because the uncertainty around food regulations wouldn't seem so daunting if some else has tried it successfully. Cottage food producers and farmers are especially placed to be trend setters as consumer demand for local, value added, sustainably produced food continues. A food service employee may encourage or teach others at work to follow food safety practices, for the sake of consumers and themselves.

7.2.3. Value to the state

The state benefits from the ongoing collaborative community based research and engagement, which helps identify the needs of communities and in a broader sense, the needs of the state. Because Extension educators interact extensively with local communities, it is reasonable to think of them as the “eyes” and “ears” of the state in the respective areas. In the specific case of food safety education, these Educators convert the mostly abstract regulations into manageable, practical information that food entrepreneurs can use and remain in compliance. Additionally, through post-training evaluations, educators provide feedback to relevant state officials regarding regulations and the end user experiences, which then drives policy updates and/or change.

Gupta *et al.* suggest that “Extension can achieve its greatest relevance in policy circles when it weaves together its ability to provide trustworthy technical knowledge with its capacity to influence policy dialogue, debate and practice across multiple settings and over the long term”. The author agrees with this sentiment in light of the discussions throughout this volume. It seems that policy and related programming is Extension’s competitive advantage because this so-called dialog brings together major stakeholders in the state.

Work by Rumble *et al.* echoes these thoughts, and further underscores the value of effective policy communication. This work is particularly interesting because it mentions the need for Extension to be further involved in issues beyond those being directly addressed, as a way to remain relevant to the public. An example given is for educators to become advocates and change agents rather than primarily focusing on education (Rumble et al., 2018). This would mean among other things, taking an active

role in understanding the lives of clientele, capturing struggles that impact lives and deciding how and when to get involved. Taking into account variables and interconnectedness that give rise to the problems or successes observed in particular communities allows educators to truly be a part of the community by sharing directly in their lives.

7.2.4. Considerations

The evaluations discussed throughout this work focused on individual learners and the values gained. The piece that is missing is the fact that these participants live in communities and their behaviors are affected by many factors. It is therefore, almost impossible to pinpoint or claim that a decision made by an individual after the course, was a direct result of the course experience alone. For that reason, Extension's story on public value makes most sense as part of the bigger ongoing effort on food safety as a collaborative effort of many sectors across the state.

As such, the impact of the education programs becomes a cog on a large wheel – a contribution, rather than a definitive result. By considering this approach, the team then spends more time capturing the broader context within which these programs are offered and how the efforts fit into that landscape. Franz (N. K. Franz, 2014) mentions that Extension should consider how engagement with communities changes the economic, environmental, and social conditions. This shift in focus may require additional resources, most notably time, without necessarily increasing the amount of funding from legislature. Nonetheless, the goal is for Extension to remain relevant and competitive as the pressure to do more with less mounts on.

As conversations around public value begin or continue, it is important to consider the individuals in the discussion (Kalambokidis, 2013). Depending on the course being discussed, it might be beneficial to have economists, evaluators and/or communication specialists (N. K. Franz, 2014). It is not enough to have discussions or even document public values. These values must then be communicated to the right people, including public officials. One subtle group that could benefit from this communication are college level students interested in community based work, and will often look for clear descriptions of these impacts.

7.3. Conclusion

While the previous section suggests ways in which Extension education benefits others not directly involved, Craig and Borger indicate that telling the complete Extension story requires relevant data (Craig & Borger, 2019). This work has presented data on private value and proposed future areas of research that could be pursued to establish public value. This is obviously not a trivial matter, but it is one that is becoming more necessary as the pressure mounts on Extension to justify the need for public funding. While public input is pivotal, educators can and should invest time in discussing what value they see in their programs beyond the direct impact. Nonetheless, even when data is insufficient, Extension still needs to tell the story that captures progress. This work represents such an attempt.

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Appendix A. Online CFP evaluation questions

1. Did this course meet your expectations? (Yes, Somewhat, No, I had no expectations)
2. What was your primary motivation to take this online course? (Check only one answer)
 - a. Convenience and flexibility
 - b. Needed to renew my cottage food registration card
 - c. Prefer online classes rather than attending a class
 - d. Self-paced and self-directed
 - e. To learn more about cottage food production in general
 - f. No in-person sessions offered near me
 - g. Other, please specify:
3. Estimate the total number of hours you spent completing the course
4. Did you have any navigation issues with the course, i.e. video didn't load, problem with a check for understanding, etc.? (No/Yes)
 - a. Please explain the issue in detail so it can be corrected
5. As a result of the course, how much did your knowledge of these topics increase? (A great deal – New to me, A lot, Some, A little, Not at all – nothing new)
 - a. Cottage Food Law
 - b. Processing Methods

- c. Safe Food Handling
 - d. Labelling and Packaging
 - e. Point of Sale
 - f. Registering and Training Requirements
6. Something I learned from this course...
 7. Something I hoped to learn from this course, but didn't...
 8. Something I will implement to improve the food safety of my cottage food products...
 9. Are you currently a registered Minnesota cottage food producer? (No/Yes)
 10. What cottage foods do you produce? (Select all that apply)
 - a. Jams, jellies, preserves
 - b. Baked goods
 - c. Icing, frostings, sugar art
 - d. Pickled products
 - e. Fermenters products
 - f. Home canned fruits and vegetables
 - g. Candy and confections
 - h. Other, please specify:
 11. How many years have you been producing and selling cottage foods?
 - a. Less than 1 year
 - b. 1 or more but less than 2 years
 - c. 2 or more but less than 3 years
 - d. 3 or more years
 12. What types of cottage foods are you planning to sell? (Select all that apply)
 - a. Jams, jellies, preserves
 - b. Baked goods
 - c. Icing, frostings, sugar art
 - d. Pickled products
 - e. Fermenters products
 - f. Home canned fruits and vegetables
 - g. Candy and confections
 - h. Other, please specify:
 13. Your gender:
 - a. Female
 - b. Male
 - c. Prefer not to answer
 14. Select one of these ethnic categories:
 - a. Hispanic or Latino
 - b. Not Hispanic or Latino
 15. Select one or more of these racial categories:
 - a. American Indian or Alaska Native

- b. Asian
 - c. Black or African American
 - d. Native Hawaiian or Pacific Islander
 - e. White
 - f. Other, please specify:
16. Your zip code

Appendix B. CFP Follow up Evaluation Questions

6. Were you registered as a cottage food producer prior to the course? (No/Yes)
 - a. If yes, why did you take the course? (Check all that apply)
 - i. Plan to register for next calendar as Tier 2
 - ii. To learn about the Cottage Foods Law
 - iii. Other, please specify:
7. After the cottage food training course, did you register as a cottage food producer? (No/Yes)
8. If no, why not?
 - a. Decided not to pursue
 - i. Why didn't you pursue it?
 - b. Took course to learn but not to sell as a CFP
 - c. Haven't registered yet but plan to register next calendar year
 - d. Decided to sell/register for commercial production
9. Estimated 2017 total sales (in dollars):
10. Where are you selling products? (Select all that apply)
 - a. Farmers' market
 - b. Farm stand
 - c. Online
 - d. Community event
 - e. From my home
 - f. Deliver to my customers
 - g. Other, please specify:
11. What category of foods do you sell? (Select all that apply)
 - a. Acid and acidified foods (fermented, pickles, etc.)
 - b. Baked goods
 - c. Candy and confections
 - d. Dried, dehydrated
 - e. Jams, jellies, preserves
 - f. Other, please specify:
12. Did you use pre-tested recipes for preserved foods? (No/Yes)
13. Did you test products for pH? (No/Yes)

- a. How did you test products for pH?
 - i. A lab
 - ii. My own pH meter
 - iii. Someone else's pH meter
 - iv. Tested in class
 - v. Other, please specify:
 - b. What product did you test for pH and what was the result?
14. Did you test products for moisture (water activity)? (No/Yes)
- a. What product did you test for pH and what was the result?
15. After taking the course, I had the knowledge, resources and determination to safely prepare and sell cottage foods: (No/Yes)
16. Please rate your frequency of the following behaviors before and after the course: (Over 75% of the time, 51-75% of the time, 25-50% of the time, Less than 25% of the time). *Questions populates depending on answer to question 1.*

	Before program (registered CFPs only)	After program (all learners)
Displaying signage "These products are homemade and of subject to state inspection" at point of sale		
Inspecting hands for cuts prior to preparing food		
Keeping pets out of the kitchen and storage areas		
Labelling products with name, address, date prepared, all ingredients and allergens		
Postponing food production due to illness		
Use of gloves, utensils or another barrier to avoid hand contact with ready-to-eat food		
Washing, rinsing and sanitizing food contact surfaces		

17. Do you plan to continue as a cottage food producer in 2018? (No/Yes)
- a. If no, why not?
18. Since becoming a cottage food producer, I have been able to:
19. Your ZIP code:

Appendix C. Minnesota Food Entrepreneurs Needs Assessment Questions

1. What type of food business do you have?
 - Cottage food producer
 - Wholesale food producer
 - I do not currently have a food business but I am planning to start one
 - I work with food entrepreneurs but do not have my own food business
 - I do not currently have a food business and I am not planning to start one
2. (If 1 = any of the first 3 entries) what category of foods do you sell or plan to sell? (Select all that apply):
 - Acidic foods
 - Acidified foods (fermented, pickles, etc.)
 - Baked goods
 - Beverages
 - Candy and confections
 - Dried, dehydrated
 - Jams, jellies, preserves
 - Processed produce
 - Snack foods
 - Other (please specify)
3. Do you grow or plan to grow all or part of the food that is processed? (No/Yes)
4. (If 1 = wholesale) do you have a food safety plan for your product? (No/Yes)
5. (If 1 = any of the first 3 entries) have you taken an acidified foods course? (No/Yes)
6. (If 5 = No), are you interested in taking one? (No/Yes)
7. (If 5 = Yes), are you interested in taking one again? (No/Yes)
8. (If 6 or 7 = Yes) choose your preferred format for an acidified foods class:
 - 100% online
 - Combination of online plus one in-person class
 - 100% in-person (2 days)
9. (If 5 = Yes) where did you take the acidified foods class?
 - University of Minnesota
 - Online
 - University of Wisconsin Extension
 - Other in-person course. Where?

- Other. Please identify
10. (If 1 = cottage food producer) do you want to scale up to commercial production?
(No/Yes)
11. (If 10 = Yes) what do you want/need to learn about to scale up (check all that apply):
- Understanding the licensing regulations
 - Developing a viable business model
 - Gaining appropriate food safety knowledge
 - Becoming an expert on the process and product I produce
 - Resources for production such as information on commercial kitchens and/or co-packers
 - Other:
12. (If 11 = choice #4) list product(s) and process(es):
13. (If 10 = Yes) when do you want to scale up to commercial production?
- Within 1-2 years
 - 3-5 years
 - More than 5 years
14. (If 1 = first 3 choices) what is your preferred way to receive food safety education (please check all that apply):
- Attend a workshop
 - Take online course
 - Live online presentation/webinars
 - Web based resources, self-study
 - Other:
15. (If 1 = first 3 choices) how likely are you to look at the following sources for information about processing food?
- Minnesota State Agency (Agriculture, Health)
 - University of Minnesota Food Science and Nutrition
 - University of Minnesota Extension
 - Agricultural Utilization Research Institute (AURI)
 - Grow North
 - Minnesota Institute for Sustainable Agriculture (MISA)
 - Other

16. (If 1 = first 3 choices) to which of the following listservs/blogs/newsletters do you subscribe (please check all that apply)?
- Grow North
 - Minnesota Institute for Sustainable Agriculture (MISA)
 - MN Farmers' Market Association
 - Sustag
 - U of M Extension Cottage Good Connection
17. (If 1 = first 3 choices) what is the biggest challenge that you face as a food entrepreneur in Minnesota?
18. (If 1 = first 3 choices) are there any other comments that you would like to share?
19. (If 1 = choice #4) how important do you think that it is to offer an acidified food class in Minnesota?
- Extremely important
 - Very important
 - Moderately important
 - Slightly important
 - Not at all important
20. (If 1 = choice #4) how helpful do you think that it would be to offer a food safety class for cottage food producers who want to scale up production?
- Very helpful
 - Moderately helpful
 - Slightly helpful
 - Neither helpful nor unhelpful
 - Slightly unhelpful
 - Moderately unhelpful
 - Extremely unhelpful
21. (If 1 = choice #4) what do you think are the biggest challenges that food entrepreneurs face in Minnesota?

Appendix D: Serve It Up Safely™ evaluation

1. Did this module meet your expectations?
- Yes
 - Somewhat

- No
 - I had no expectations
2. Did you have any navigation issues with the course (i.e. video didn't load, link broken, etc.)?
- Yes
 - No
3. If Yes, please explain the navigation issue(s)
4. One thing I learned was:
-
5. Something I will do as a result of taking this course is?
-
6. What was your primary motivation to take this online course? (Check only one answer)
- Convenience
 - Needed to meet my re-certification deadline
 - No class offering near me
 - Self-paced and self-directed
 - To learn more about the subject area in general
 - Other, please specify:
7. On a scale of 1-10, how would you rate the knowledge gained from each section in this course?

Section	Poor (1-2)	Fair (3-4)	Okay (5-6)	Good (7-8)	Excellent (9-10)
Course content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resources/web links	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certification quiz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. General learning change:

Learning change	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
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	Disagree	Disagree	Agree	Agree	Agree	Agree
I have a deeper understanding of this subject matter as a result of this course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can use what I learned in this course at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will change my food safety practices based on what I learned in this course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will use what I learned at my job training others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will use what I learned by adding or updating SOPs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. I will: (check all that apply)

- Suggest this course to others
- Take this online course again
- Share the information with others in my facility

10. To what degree do you model and embrace food safety culture at your facility?

- 100% of the time
- 75% of the time
- 50% of the time
- 25% of the time
- It's not a priority to me
- Unaware of food safety culture concept

11. Other comments about this course (i.e. things you liked/didn't like, changes needed etc.)

12. What topics could you like covered in future courses?

13. How did you hear about this course? (choose all that apply)

- Minnesota Department of Healthy website
- University of Minnesota Extension website
- Health inspector
- Word-of-mouth
- Don't remember
- Other; please specify:

14. How many years have you worked in the food service industry?

- 0-3
- 4-6
- 7-10
- 11-15
- 16+
- I don't work in food service

15. Which best describes your food service facility?

- Bakery
- Bar
- Café
- Camp
- Catering
- Church
- Coffee shop
- Concessions
- Corrections
- Daycare
- Deli/sandwich shop
- Food truck/food cart
- Health care facility (nursing home, hospital, etc.)
- Lodging/B&B/hotel
- Quick service
- Manufacturing

- Processing/packaging
 - Restaurant
 - Retail market/store
 - School
 - Other; please list:
16. Your gender
- Male
 - Female
 - Other
 - Prefer not to respond
17. Your age
- Under 18 years
 - 18 years or over
18. Please select one of the ethnic categories:
- Not Hispanic or Latino
 - Hispanic or Latino
19. Race
- American Indian or Alaska Native
 - Asian
 - Black of African American
 - Native Hawaiian or other Pacific Islander
 - White
20. List your zip code. If outside the USA, list your country:
-

Appendix E: MDA PSR post-training evaluation

1. Module evaluation

QS code	Question

1a	Module 1: This increase my knowledge of produce safety requirements in the FSMA Produce Safety Rule
1b	Module 1: I am committed to implementing produce safety practices on my farm
1c	Module 1: The instructor was able to answer questions
1d	Module 1: The instructor was effective at delivering the content
2a	Module 2: This module increased my knowledge of worker health, hygiene, and training requirements in the FSMA PSR
2b	Module 2: I am confident that I can implement practices to address food safety risks related to worker health, hygiene, and training
2c	Module 2: The instructor was able to answer my questions
2d	Module 2: The instructor was effective at delivering the content
3a	Module 3: This module increased my knowledge of soil amendment requirements in the FMSA Produce Safety Rule
3b	Module 3: I am confident that I can implement practices to reduce food safety risks related to soul amendments
3c	Module 3: The instructor was effective at delivering the content
3d	Module 3: The instructor was able to answer my questions
4a	Module 4: This module increased my knowledge of wildlife, domesticated animals, and land use requirements in the FSMA Produce Safety Rule
4b	Module 4: I am confident that I can implement practices to address food safety risks related to wildlife, domesticated animals, and land use
4c	Module 4: The instructor was effective at delivering the content

4d	Module 4: The instructor was able to answer questions
5.1a	Module 5.1: This module increased my knowledge of production water requirements in the FSMA Produce Safety Rule
5.1b	Module 5.1: I am confident that I can implement practices to address food safety risks related to production water
5.1c	Module 5.1: The instructor was effective at delivering the content
5.1d	Module 5.1: The instructor was able to answer questions
5.2a	Module 5.2: This module increased my knowledge of postharvest water requirements in the FSMA Produce Safety Rule
5.2b	Module 5.2: I am confident that I can implement practices to address food safety risks related to postharvest water
5.3c	Module 5.2: The instructor was effective at delivering the content
5.3d	Module 5.2: The instructor was able to answer questions
6a	Module 6: This module increased my knowledge of postharvest handling and sanitation requirements in the FSMA PSR
6b	Module 6: I am confident that I can implement practices to address food safety risks related to postharvest handling and sanitation
6c	Module 6: The instructor was effective at delivering the content
6d	Module 6: The instructor was able to answer questions
7a	Module 7: This module increased my knowledge of developing a food safety plan
7b	Module 7: This module increased my knowledge of developing a tractability system

7c	Module 7: I am confident that I can develop a food safety plan
7d	Module 7: I can develop a tractability system
7e	Module 7: The instructor was effective at delivering the content
7f	Module 7: The instructor was able to answer questions

2. Will your farm be subject to the FSMA Produce Safety Rule?
 - Yes
 - No
 - Not Sure
 - N/A

3. Will your farm be eligible for a qualified exemption and therefore, be subject to modified requirements?
 - Yes
 - No
 - Not Sure
 - N/A

4. Is some or all of your farm's produce not subject to the FSMA Produce Safety Rule because it is rarely consumed raw?
 - Yes
 - No
 - Not Sure
 - N/A

5. Is some or all of your produce not subject to the FSMA Produce Safety Rule because it will receive commercial processing?
 - Yes
 - No
 - Not Sure
 - N/A

6. Are there any other education materials that should be included or referenced in the training?
 - Yes
 - No

N/A

7. Do you feel that the level of FSMA Produce Safety Rule information provided in the curriculum materials was sufficient to guide you in implementing regulatory requirements?

Yes

No

N/A

7. Have you ever attended a GAPs or produce safety training before?

Yes

No

N/A

8. Do you currently have a Food Safety Plan?

Yes

No

N/A

9. Have you ever participated in a third-party audit to verify you have implemented food safety practices on your farm?

Yes

No

N/A

10. Gender?

Male

Female

Other

11. Ethnicity?

White

Hispanic/ Latino

Black/ African America

Native Am./ Am. Indian

Asian/ Pacific Islander

12. Education?

No formal schooling completed

8th grade

- High school graduate/GED
- Associate's degree
- Bachelor's degree
- Master's degree
- Doctorate degree
- Other

13. Occupation?

- Farm owner/operator
- Farm worker
- Extension educator
- Produce industry
- Government employee
- Other

14. Number of years farming?

- 0-5 years
- 6-10 years
- 11-20 years
- 21-30 years
- 31-50 years
- 51 + years

15. Type of production practice?

- Conventional
- Certified organic
- Follow organic practices, but no currently certified
- Other

16. Number of acres of fruits and vegetables?

- 0-10
- 11-25
- 26-50
- 51-100
- 101-200

- 201-300
 - 301-400
 - 401-500
 - 501-1000
 - 1001+
17. Type of produce grown?
- Leafy greens
 - Tree fruit
 - Peanuts/tree nuts
 - Berries
 - Vegetables, mixed
 - Other
18. Average annual produce sale?
- <\$25,000
 - \$25,001-\$250,000
 - \$250,001-\$500,000
 - \$500,001+

Appendix F: MDA PSR 1 year follow up post-training evaluation

1. Are you a produce grower or an employee on a produce farm?
- Yes
 - No

Please answer the following questions in regards to your farm and/or the farm you work for

2. My farm's status per the Produce Safety Rule(PSR) is:
- Excluded: The PSR does not apply to my farm
 - Qualified Exempt: I sell less than \$500k in total food sales, including produce, and more than 50% of my sales are to qualified end-users
 - Exempt Kill Step: I am eligible for a commercial processing exemption Covered: The full PSR applies to my farm
 - Not sure
3. I learned my status through: (check all that apply)

- Attending the Grower Training
 - Filling out the Grower Questionnaire and receiving a status confirmation letter from the Minnesota Department of Agriculture (MDA)
 - Direct conversations with University of Minnesota (UMN) Extension Direct conversations with the MDA
 - Direct conversations with Farmer Trainers My own research/ Online resources
 - Word of mouth
 - Other (please specify)
4. I am confident that I understand what is required of my farm operation by the Produce Safety Rule.
- Yes
 - No
5. How can we better support you in understanding what is required of your farm under the Produce Safety Rule?
-
6. I understand the difference between a PSR inspection and a GAP audit.
- Yes
 - No
7. The Grower Training and the Produce Safety Rule identify the following topics as potential areas of risk on produce farms. Rank how confident you feel managing these areas of risk on your farm:

Risk area	I feel confident	I feel somewhat confident	I don't feel confident
Worker Health and Hygiene (e.g. hand washing, ill workers)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use of Biological Soil Amendments (e.g. applying manure to produce fields)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water Management (e.g. adjusting farm practices based on test results)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal/Wildlife Monitoring (e.g. when/how to not harvest due to animal contamination)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Cleaning and Sanitizing
(e.g. establishing protocols
for when/how to clean and
sanitize all necessary
equipment/surfaces)**

8. What additional information would have better prepared you to assess and manage produce safety risks on your farm (e.g. detailed steps on how to do a water test, resources for on farm composting, other, etc.)?

9. Have you used any of these resources provided to you at the training? Check all that apply:

The Produce Safety Alliance Grower Training manual

Handouts in the folder

Flash drive/USB resources Other (please specify)

10. Which of the above resources have been most useful? Why?

11. I believe on-farm produce safety practices are important.

Strongly Disagree	Neutral	Strongly Agree
<input type="radio"/>		

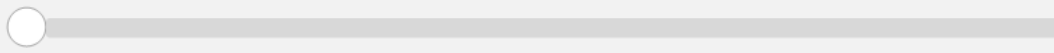
12. I believe bacteria, viruses, and parasites are a potential risk on my farm.

Strongly Disagree	Neutral	Strongly Agree
<input type="radio"/>		

13. The grower training made me more confident in managing the potential risk of bacteria, viruses and parasites on my farm.

Strongly Disagree	Neutral	Strongly Agree
<input type="radio"/>		

14. I believe there will be a return on investment from adopting produce safety practices on my farm.

Strongly Disagree	Neutral	Strongly Agree
		

15. Since the grower training, have you or anyone on your farm implemented new or different practices in any of the following areas: (Select 1 per row)

	Doing adequately before training	Improved since training	Not doing	Not applicable to my operation
Worker Health and Hygiene (e.g. hand washing, ill workers)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use of Biological Soil Amendments (e.g. applying manure to produce fields)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water Management (e.g. adjusting farm practices based on test results)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal/Wildlife Monitoring (e.g. when/how to not harvest due to animal contamination)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleaning and Sanitizing (e.g. establishing protocols for when/how to clean and sanitize all necessary equipment/surfaces)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. What are some of the practices you have implemented to improve produce safety?
(For example: built a hand washing station to have in the field, or changed how you clean and sanitize your pack shed)

17. What barriers have you encountered when trying to make changes to on-farm produce safety practices?

18. My expectations of what I would get from attending a grower training were: (Select all that apply)

- Learning whether the Produce Safety Rule impacts my farm Increasing my knowledge of produce safety
- Understanding how to implement on-farm produce safety practices
- Learning from my peers and farmer-trainers how they manage produce safety on their farms Learning from UMN Extension how to implement produce safety on my farm
- Learning from the MDA Produce Safety Program how they plan on implementing the Produce Safety Rule
- Completing a regulatory requirement since my farm is covered by the PSR
- Other (please specify)

19. Were your expectations met? Why or why not?

20. Do you feel that changes to the structure of the grower training would improve your learning about the Produce Safety Rule?

- Yes
- No

21. How would you have preferred to learn about the Produce Safety Rule and on-farm produce safety? Check all that apply

- 2-day in person course with time on the second day dedicated to writing a food safety plan Online course with no in-person time
- Online course followed by an in person field day at a farm Online course followed by a food safety plan writing workshop
- Separate in-person workshops for each course module (for example a half day workshop on applying and using biological soil amendments)

22. Other (please specify)

23. Would you have been interested to learn about the Produce Safety Rule in any of the below formats? Check all that apply

- 2-day in person course with time on the second day dedicated to writing a food safety plan Online course with no in-person time
- Online course followed by an in person field day at a farm Online course followed by a food safety plan writing workshop
- Separate in-person workshops for each course module (for example a half day workshop on applying and using biological soil amendments)
- None of the options appeal to me Other (please specify)

UMN Extension staff, MDA Produce Safety Program staff, & Produce Farmers worked together to provide the grower training you attended. The next three questions

will help each group evaluate how they can improve their teaching and be an on-going resource for you.

24. Please answer the questions below for University of Minnesota Extension staff

What is one way this group could be a resource to you in the future?

What could this group do to improve delivery of information and resources?

25. Please answer the questions below for the Minnesota Department of Agriculture Staff

What is one way this group could be a resource to you in the future?

What could this group do to improve delivery of information and resources?

26. Please answer the questions below for Farmer Trainers

What is one way this group could be a resource to you in the future?

What could this group do to improve delivery of information and resources?

27. Do you have any other feedback you'd like to share with us?