

# **Enhancing the Safety of Value Added Foods at Farmers' Markets**

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In

Food Safety and Biosecurity

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## **ABSTRACT**

Farmers' markets are increasing in popularity and becoming central community focal points, providing produce, baked goods, and value-added foods items such as hummus and guacamole, as well as jams and jellies. Farmers' markets often have an eclectic mix of consumers; toddlers to senior citizens. For both public health and economic reasons, food safety at farmers' markets is a central issue to be researched and addressed. A foodborne illness or outbreak traced back to a farmers' market and or a particular vendor could have huge financial implications, and potential health consequences. As part of a larger education outreach, *Enhancing the Safety of Value Added Foods at Farmers' Markets* and research initiative four additional fact sheets were created on high moisture refrigerated foods, jams and jellies, maple syrup and fermented vegetables. These sheets are designed for use by Extension professionals, farmers' market managers and vendors, consumers or the interested entrepreneur. It is our hope that combining these fact sheets with other educational tools and programs, food safety knowledge will increase followed by adoption of food safety best practices. Vendors, as well as market managers, will feel equipped with the knowledge and skills needed to create and continue to build a successful farmers' market.

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## Introduction

### *Background and Setting*

Within the last thirty years, the number of farmers' markets in the United States has more than quadrupled, with a reported 8,669 farmers' markets in 2016 (Yu, Gibson, Wright, Neal & Sirsat, 2017). Farmers' markets generate over a billion dollars in direct consumer sales (Harrison et al., 2013). Consumers shop and purchase food at farmers' markets for a variety of reasons; to support their local economy and farmers, environmental sustainability and for the variety of products offered (Dodds et al., 2014). Furthermore, many consumers believe that locally grown food products are a safer product; however foods sold at farmers' markets present unique food safety challenges, despite consumer confidence in the safety of the food product purchased at the market (Yu et al., 2017).

Fresh produce, baked goods, ready-to-eat foods such as hummus and guacamole, jams and jellies are popular farmers' market food items with distinctive food safety considerations. Many of the foods sold or used to create value-added items sold at the farmers' market are grown on small farms and may be exempt from food safety regulations under the Food Safety Modernization Act and produced on site or in a domestic kitchen (Boys, Ollinger & Geyer, 2015). Lack of infrastructure such as access and usage of handwashing stations and temperature control are additional potential issues related to food safety at the farmers market (Yu et al., 2017). Additionally, farmers' market consumers can vary greatly in age, may be pregnant or have pre-existing health condition such as diabetes and cancer, thus increasing their chance of developing serious complications from a foodborne illness. Sivaramalingam et al. (2015) note, "high risk populations are under-represented in the literature as targets of food-safety education strategies" (p.565). Significantly, high-risk populations are often unaware of their increased risk

of complications from a food borne illness (Sivaramalingam et al., 2015). To protect the health of high-risk population's market vendors must handle food in a way that minimizes the risk of contamination. The lack of enforced regulations at markets present a unique challenge as well. Behnke, Seo and Miller (2012) state, "Farmers' markets face issues similar to those inherent to other temporary foodservice establishments. They serve foods to many people; however, regulations governing them are often vague and less stringent" (p. 232).

#### *Statement of the Problem*

Considering that, farmers' markets present a unique set of food safety concerns, market customers can be vulnerable to foodborne illness and markets may be loosely regulated, market managers and vendors should be educated to ensure they are using best practices to provide a safe product at the market.

#### *Purpose of the Project*

Completion of this project will result in available educational fact sheets and resources to be used by farmers' market managers, vendors, Virginia Cooperative Extension employees, other Extension professionals and vendors in regards to selling value added food products at the market. Adopting best practices will help ensure that value added products sold at farmers' markets are safe and that necessary rules and regulations have been followed. Providing resource and educational fact sheets may increase likelihood of creation and sale of values added food products.

#### *Project Objectives*

In response to this need, fact sheets have been developed for Enhancing the Safety of Locally Produced Value-Added Foods. These fact sheets give food safety information on fermented foods, jam and jellies, high-moisture refrigerated foods and maple syrup.

## Review of Literature

According to the Center for Disease Control (CDC) there are an estimated 48 million cases of foodborne illness each year. Foodborne illness is responsible for 128,000 hospital visits and an estimated 3,000 deaths (Boys et al., 2015). The CDC recognizes five risk factors that contribute to foodborne illness: Inappropriate holding temperature for time and temperature control for safety foods; failure to cook foods to safe temperatures; cross contamination; lack of sanitation and personal hygiene and food from an unsafe source (CDC.gov). Since farmers' markets are often held outdoors, with limited access to handwashing stations and without clear regulatory guidance, they are vulnerable to foodborne illness outbreaks. For, example, in July of 2017, a *Salmonella* outbreak was associated with snap peas from a farmers' market in Wisconsin. The outbreak effected seven people and spread to four counties ("Salmonella Outbreak," 2017).

In 2015, Behnke and Seo, used smartphones to determine frequency of food safety practices at farmers' markets; they observed 3,650 transactions from seven separate farmers' markets. Smartphones documented food safety behaviors using a rubric that was later analyzed in Qualtrics Survey Software. The markets varied in size and location and both female and male market employees were observed. Nineteen correct hand sanitation behaviors were observed out of 300 transactions that require handwashing according to the Indiana Code. For this study, temperature and duration of handwashing were not taken into account. Farmers' market employees were also handling ready-to-eat foods with bare hands 10.3% of the time; eating, drinking and smoking and not washing hands upon returning to food handling 22.1% of the time and touching their face or hair without washing hands 19.7% of the time. Researchers also found employees handling money, clothing and his or her face, hair and nose without following with

proper handwashing procedures. Importantly, they found that small farmers' market employees and outdoor market employees were less likely to practice satisfactory food safety behaviors. This may be because small market employees often have a variety of task and handwashing stations in outdoor markets may not be as readily available (Behnke & Seo, 2015).

A majority of the value-added foods at farmers' markets are processed in kitchens without inspections. These foods are required to have specific labeling to inform the consumer. Other value-added food products sold at farmers' markets require a kitchen inspection. In Virginia the Virginia Department of Agriculture and consumer services (VDACS) completes kitchen inspections. In 2011, Kennedy et al., observed the food safety behaviors of food handlers in home kitchens. For their study, 60 participants prepared either a beef or chicken dish, preparation of the food was recorded via Webcam. Four separate locations in the kitchen were swabbed before and after to check for the presence of microbial contamination. The food preparers hands were also swabbed as well as their cooked product. The food handlers also completed surveys on the importance of food safety behaviors. Through observation they found that a majority of the food handlers were not using proper hand washing techniques. They found that 70% of food handlers did not thoroughly wash their hands after handling raw chicken and hands that had contacted the raw chicken also made contact with the faucet on the kitchen sink, and other kitchen equipment. After using the knife to prepare the raw chicken 71% of food handlers did not wash the knife correctly before using it to chop ready to eat raw vegetables. Improper checking of internal temperature was also observed. Instead of ensuring chicken had reached safe internal temperature with the use of a calibrated food thermometer, 38% of participants cut their chicken open to determine doneness and 5% used their hands to feel the temperature of the chicken. Researchers who were observing the beef handlers made similar

observations. Researchers found a large difference between the amount of microbes present before and after food preparation in sinks, on countertops and on cutting boards. Importantly, researchers concluded that, “high levels of hand cleanliness were correlated with high scores for food safety knowledge among participants.” Furthermore, “poor food safety behavior has been statistically linked with poor food safety knowledge (Kennedy et al., 2011).”

Research suggests that medical professionals such as physicians and midwives who interact with high-risk populations still lack the necessary knowledge to properly counsel patients on risks associated with food borne illness. Listeriosis, a serious condition with 20 to 30 deaths per 100-illness fatality rate, has a 17% increased likelihood of occurring in pregnant women but less than 40% of practitioners were counseling pregnant patients about risk factors. High-risk food for listeria contamination include unpasteurized milk, soft cheeses, deli meat and raw hot dogs. Outbreaks have been linked to foods commonly served at farmers’ markets including melons and hummus (Kirkham & Berkowitz, 2010).

In 2016, Nganje, Miljkovis and Voica researched food safety behavior and attitudes surrounding meat. Researchers hypothesized positive and negative food safety information would impact consumers risk awareness and food handling behaviors. Shortly after pathogen-reduction, hazard analysis and critical control point system (PR/HACCPs) was implemented there was a spike in food-borne illness. Nganje et al. (2016) speculate that, “when consumers buy, process, or consume meat products, their perceptions of food safety depend extensively on perceived regulation of the entire production process (p.4).” Furthermore, development and implementation of these regulations may increase consumer confidence in the product and influence the way the food product is handled after purchase. Over 2,500 consumers participated in three experiments in two-week intervals. Participants were asked identical questions

pertaining to hamburger preparation and risk of food borne illness. The first meeting the participants were given a survey and no food safety reference, the second meeting participants were given negative information about the safety of food and on the third experiment positive information about food safety regulations was provided. The negative information statement informed participants of the dangers of *E. coli* O157 and the number of hospitalizations and death because of the foodborne pathogen. The statement also spoke of the dangers of consuming hamburger that had not been properly prepared. The positive food safety statement informed participants of the effectiveness of HACCP at reducing pathogenic bacteria in processing plants (Nganje et al., 2016). Stated by Nganje et al. (2016), “When consumers are confident about the sources of their food or have greater information about how the food was handled they may be more lax about safe food choices” (p.16). Notably, as mentioned previously, many farmers’ market consumers believe locally grown foods are a safer food product (Yu et al., 2016).

Products such as breads, cookies and jams sold at the farmers’ market are processed in a kitchen without inspection from VDACS and conceivably by vendors with limited food safety knowledge. Of significance, foods made at home are one of the chief contributors to foodborne illness. Home kitchen tables and counters often serve as multiuse areas. Researchers noted purses on kitchen counters that had previously been on bathroom floors and note that houseplants and soil are commonly found in home kitchens (Bredbenner et al., 2013), state, “at least two studies have reported that the kitchen is more heavily contaminated with fecal coliforms than bathrooms” (p.4063). Consumers report washing their hands properly before preparing food and after handling raw meat but the data suggest otherwise. One study found after handling raw chicken 73 to 100% of consumers had *Campylobacter jejuni* on their hands. Kitchens are often pathogen hot spots. *Campylobacter*, *Salmonella*, *S. aureus*, *E.coli* and *L. monocytogenes* have

been found on kitchen sponges, towels, sink faucets and refrigerator handles. Overfilled refrigerators and lack of refrigerator thermometers increase the likelihood that home refrigerators are not kept cold enough. Consumers report not regularly using thermometers to ensure that foods have been cooked to proper temperatures. According to Byrd-Bredbenner et al. (2013), many consumers feel the food safety obligation belongs to producers, manufacturers and distributors and underestimate the importance of their role in the farm to table continuum in relation to food safety. Despite risk associated with certain foods, consumers tend to eat foods in alignment with food preferences, for example, undercooked hamburgers or raw oysters. Often consumers justify unsafe food handling behaviors because they believe their unsafe practices have not made them sick yet. Byrd-Bredbenner, et. al. (2013) state, “Tremendous legislative, agricultural, industrial, and public health efforts have been devoted to improving the safety of the food supply, but these efforts are in vain if not matched by safe food handling at home” (p.4073). How can these data help influence policies and educational strategies for farmers’ market vendors especially those preparing foods for sale at home?

### **Project Design and Methodology**

Four fact sheets on foods commonly sold at farmers' markets were developed and will be used as educational tools and guidelines (Appendices A-D). The fact sheets were created using research based on food safety recommendations, regulations from the Virginia Department of Health and Virginia Department of Agriculture and Consumer Services and food safety best practices. All facts sheets will be formatted consistently using a template developed by Dr. Boyer and the Virginia Tech College of Agriculture and Life Sciences Department of Communications.

### **Discussion and Recommendations**

Foodborne illnesses or illness outbreaks can have devastating effects for those involved throughout the farm-to-table continuum. There are many reasons for vendors and farmers' market managers to follow rules, guidelines and best practices. In addition to protecting the health of their consumers, avoiding devastating financial loss, maintaining trust among consumers and increasing the sale of their products are reasons to adopt food safety best practice (Hussain & Dawson, 2013). Fact sheets and other educational tools are an important piece of food safety education and may be more effective when paired with other learning tools and information. An interdisciplinary approach to food safety has the opportunity to increase knowledge as well as change behaviors. Some studies have found that an increase in food safety knowledge does not also correlate with an increase in adopting of best food safety practices (Feng, Bruhn & Marx, 2016). Uniquely, Virginia Cooperative Extension is positioned to continue research and education around food safety best practices and has the opportunity to not only disseminate information but build relationship and programs that extend beyond knowledge gain to behavior change.

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## References

1. Behnke, C., Seo, S., & Miller, K. (2012). Assessing food safety practices in farmers' markets. Des Moines: Allen Press Publishing Services.
2. Behnke, C., & Seo, S. (2015). Using smartphone technology to assess the food safety practices of farmers' market foodservice employees. *Journal of Foodservice Business Research*, 18(1), 1-19. 10.1080/15378020.2015.995748
3. Boys, K. A., Ollinger, M., & Geyer, L. L. (2015). The food safety modernization act: Implications for U.S. small scale farms. *American Journal of Law & Medicine*, 41(2-3), 395-405. 10.1177/0098858815591524
4. Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J., & Quick, V. (2013). Food safety in home kitchens: A synthesis of the literature. *International Journal of Environmental Research and Public Health*, 10(9), 4060-4085. 10.3390/ijerph10094060
5. Dodds, R., Holmes, M., Arunsopha, V., Chin, N., Le, T., Maung, S., & Shum, M. (2014). Consumer choice and farmers' markets. *Journal of Agricultural and Environmental Ethics*, 27(3), 397-416. 10.1007/s10806-013-9469-4
6. Feng, Y., Bruhn, C., & Marx, D. (2016). Evaluation of different food safety education interventions. *British Food Journal*, 118(4), 762-776. doi:10.1108/BFJ-10-2015-0372
7. Harrison, J. A., Gaskin, J. W., Harrison, M. A., Cannon, J. L., Boyer, R. R., & Zehnder, G. W. (2013). Survey of food safety practices on small to medium-sized farms and in farmers markets. *Journal of Food Protection*, 76(11), 1989-1993. 10.4315/0362-028X.JFP-13-158

8. Hussain, M. A., & Dawson, C. O. (2013). Economic impact of food safety outbreaks on food businesses. *Foods*, 2(4), 585-589.  
doi:<http://dx.doi.org.ezproxy.lib.vt.edu/10.3390/foods2040585>
9. Kennedy, J., Gibney, S., Nolan, A., O'Brien, S., McMahon, M. A. S., McDowell, D., . . . Wall, P. G. (2011). Identification of critical points during domestic food preparation: An observational study. *British Food Journal*, 113(6), 766-783.  
10.1108/00070701111140106
10. Kirkham, C., & Berkowitz, J. (2010). Listeriosis in pregnancy survey of British Columbia practitioners' knowledge of risk factors, counseling practices, and learning needs. *Canadian Family Physician*, 56(4), e158.
11. Nganje, W., Miljkovic, D., & Voica, D. (2016). Food safety information, changes in risk perceptions, and offsetting behavior. *Agricultural and Resource Economics Review*, 45(1), 1-21. 10.1017/age.2016.2
12. Salmonella outbreak linked to Wisconsin farmers market peas. (2017, August 11). Retrieved from <http://www.foodsafetynews.com/2017/08/salmonella-outbreak-linked-to-wisconsin-farmers-market-peas/>
13. Sivaramalingam, B., Young, I., Pham, M. T., Waddell, L., Greig, J., Mascarenhas, M., & Papadopoulos, A. (2015). Scoping review of research on the effectiveness of food-safety education interventions directed at consumers. *Foodborne Pathogens and Disease*, 12(7), 561-570. 10.1089/fpd.2014.1927
14. Yu, H., Gibson, K., Wright, K., Neal, J., & Sirsat, S. (2017). Food safety and food quality perceptions of farmers' market consumers in the united states. *Food Control*, 79, 266-271.  
doi:10.1016/j.foodcont.2017.04.010

## Appendix A

### What do I need to know to sell fermented vegetables at the farmers market?

#### What are fermented vegetables?

Fermented vegetables are vegetables that have been fermented in a anaerobic (no oxygen) environment using yeast, molds and bacteria. Vegetables are fermented through the lactic acid fermentation pathway. Vegetables can be fermented using one of the following three steps; spontaneous or natural, back-slopping or culture inoculation<sup>1</sup>. Some examples of commonly fermented vegetables are:

- Sauerkraut
- Kimchi
- Fermented pickles

Note: ALL fermented foods will require inspection of the facility by the Virginia Department of Agriculture and Consumer Services (VDACS).

The Virginia Tech Food Innovations program can evaluate your fermentation process for safety by assuring the following:

Proper cleaning and sanitation of equipment, proper maintenance of the mother culture, proper measurement of ingredients, proper monitoring and measurement of fermentation temperatures, proper monitoring of pH changes/acidity level changes, change in pH over time – progressing to below 4.6 with a measurable change in pH in the first 24 hours of fermentation.

#### Why prepare fermented vegetables?

Fermenting vegetables creates a value-added product. The fermentation process creates improved flavor and texture as well as increased nutritional benefits<sup>2</sup>.

#### What are the steps if I want to ferment vegetables to be sold at the farmers' markets?

1. Complete a food safety course- For examples ServSafe™ for Managers, which is provided by many Extension offices throughout the state of Virginia. This fact sheet will give a brief overview of what to do, but a good food safety course will provide a thorough background in safe food handling practices.
2. Decide where you are going to produce your product:
  - In the inspected home kitchen
  - In an inspected community or commercial kitchen
3. Understand the regulatory process of starting a food business.

Refer to: <http://www.vdacs.virginia.gov/dairy-kitchen-food-services-businesses.shtml>

4. Complete and submit the correct application that pertains to where you will be producing your refrigerated or frozen food (Application for Home Processing Operation or Application for a Commercial Kitchen Food Processing Operation)
5. After you submit your application, VDACS will contact you with further questions or schedule an inspection when your application is considered complete.

What are the most important food safety steps I need to consider when preparing my product?

1. Practice proper personal hygiene, including hand washing
2. Use proper cleaning and sanitation practices
3. Use proper temperature control
4. Purchase ingredients from approved, reputable sources

What are some guidelines for preparation of fermented vegetables?

1. Use freshly harvested vegetables<sup>3</sup>
2. Chopping and cutting vegetables to be consistently the same size will help ensure a more desirable and consistent fermented product.
3. Use only food grade storage containers and tools throughout the entire fermentation process. Avoid chemical contamination by ensuring containers are not made of metals that could contaminate your fermented product because of the acidity in the fermentation process.<sup>3</sup>
  - Plastic food grade containers and ceramic crocks are recommended for lactic acid fermentation but glass containers can also be used.<sup>3</sup>
  - Make sure your container is easy to clean and free of scratches, crack and chips.<sup>1</sup>
3. Use and accurately follow an approved tested recipe. The National Center for Home Food Preservation is a great recipe source, additional recipes can be found through various Cooperative Extensions. Virginia Tech Food Innovations program is another great fermentation resource.
4. Use the recommended amount of salt from a tested recipe. In lactic acid fermentation salt supports the fermentation process. Salt enhances flavor, helps the vegetable stay firm, decreases growth of unwanted microorganisms and aids the growth of necessary lactic acid fermentation bacteria.<sup>1</sup>
5. Additives in salt can cause an undesirable product. Iodine found in iodized salt can turn your vegetables brown. Remember to use canning or pickling salt.<sup>1</sup>
6. The vegetables need to be submerged 1-2 inches below the brine.<sup>1</sup>
7. Ideal fermentation temperatures are 60-72°F but temperatures up to 78°F are acceptable. If you product is being fermented within the ideal temperatures, the fermentation process should take 3-4 weeks. Using a properly calibrated thermometer will help ensure that your product is being fermented within the recommended temperature range.<sup>1</sup>

8. After the fermentation process products must be canned or kept in the refrigerator. Similar to fermentation it's essential to follow a tested canning recipe from an approved source such as the National Center for Food Home Preservation or various Cooperative Extensions.

For more information on boiling water bath canning refer to the Virginia Cooperative Extension publication 348-594, *Boiling Water Bath Canning Including Jams, Jellies and Pickled Products* by Renee R. Boyer, Assistant Professor, Food Science and Technology and Julie McKinney, Project Associate, Food Science and Technology, Virginia Tech.

9. All food items should be clearly labeled and include:

- Net weight
- List of allergens
- Ingredients
- Name and address of manufacturer
- Storage instructions
- Best-by dates
- Any additional commodity-specific regulations

For more labeling information refer to the Virginia Cooperative Extension publication:

“Required Labeling Information,” found at:

[http://pubs.ext.vt.edu/content/dam/pubs\\_ext\\_vt\\_edu/FST/FST-55/FST-55NP-PDF.pdf](http://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/FST/FST-55/FST-55NP-PDF.pdf)

How should I store/sell my fermented vegetables at the market?

1. Canned fermented vegetables must be sold and stored in approved canning jars with sealed lids and must meet labeling requirement mentioned above.
2. The recommended storage time properly canned products 12 months. Canned fermented vegetables should be stored in a cool, dark and dry environment. Storing cans in unsuitable conditions can shorten the products shelf life and can increase chances of spoilage.

\*\*\*For a more in depth vegetable fermentation resource please refer to *Vegetable Fermentation* by Joell A. Eifert, Food Safety Extension Agent, Virginia Cooperative Extension, Renee R. Boyer, Associate Professor, Food Science and Technology, Virginia Tech, Robert C. Williams, Associate Professor, Food Science and Technology, Susan S. Sumner, Associate Dean Academic Programs, College of Agriculture and Life Science.

## References

1. Marco, M. L., Heeney, D., Binda, S., Cifelli, C. J., Cotter, P. D., Foligné, B., . . . Hutkins, R. (2016;2017;). Health benefits of fermented foods: Microbiota and beyond. *Current Opinion in Biotechnology*, 44, 94-102. doi:10.1016/j.copbio.2016.11.010
2. Eifert, J. A., Boyer, R. R., Williams, R. C., & Sumner, S. S. (n.d.). *Vegetable Fermentation*
3. Nwadike, L. (2015, September). *Safely Fermenting Food at Home; Extension Food Safety Fact*

## Appendix B

### What do I need to know to sell jams and jellies at the farmers market?

#### What are jams and jellies?

There are different ways to preserve foods so they can be enjoyed any time of the year. Canning is one food preservation method. Jam and jellies made from canning mostly fruits is a popular food preservation method. Even though, both jam and jelly contain the same ingredients (fruit, pectin, sugar and acid), there are variations in the preparation and finished product<sup>1</sup>.

Jam - is made from crushed or ground fruit and can contain seeds or pulp<sup>4</sup>.

Jelly - is made from the juice of the fruit. It is often transparent and contains no seeds or pulp<sup>4</sup>.

Some examples of these include:

- Strawberry jam
- Grape jelly
- Blueberry jam
- Apple jelly

\*\*\* Jams and jellies that do not contain low acid ingredients can be sold at the farmers market without a VDACS kitchen inspection. However, if sold from an uninspected home kitchen, product must indicate this on the label (more labeling information below). If the jam/jelly contains low acid ingredients (ex. Pepper jelly), then it must be inspected by VDACS.

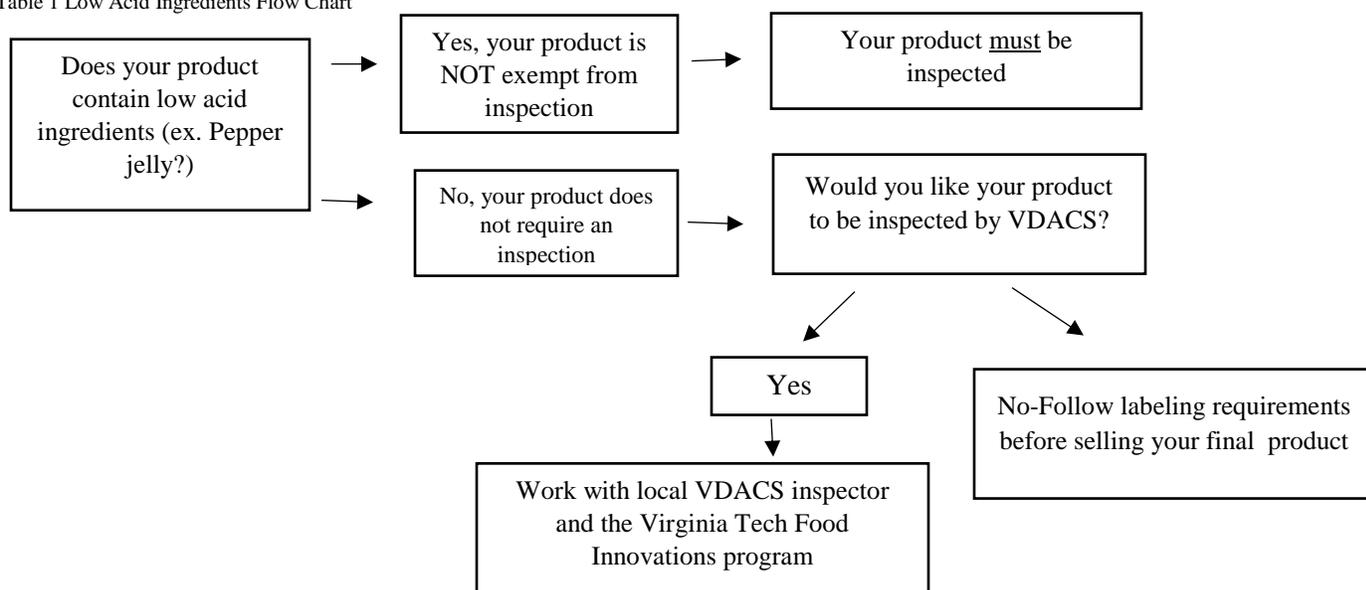
#### Why prepare jams and jellies?

Jams and jellies are value added product for farmers and vendors. Producing and selling jams and jellies are a great way to use excess or second graded produce.

#### What are the steps if I want to produce jams and jellies for sale?

1. Confirm that the recipe for the jam/jelly that you wish to make contains only high acid ingredients (ex. fruits)<sup>1</sup>.

Table 1 Low Acid Ingredients Flow Chart



\*For more information regarding the Virginia Tech Food Innovations Program refer to:

<https://ext.vt.edu/food-health/food-innovations.html>

2. Become familiar with safe canning procedures and use a tested canning recipe from a credible source<sup>2</sup>.

For additional information of canning refer to Virginia Cooperative Extension Publications, *Can it Safely*, *Boiling Water Bath Canning* authored by Renee Boyer and Julie McKinney and *Pressure Canning* authored by Renee Boyer and Melissa Chase.

3. Be aware that jams/jellies produced in a home kitchen cannot be sold across state lines, on the internet or in specialty stores.

3. All jams and jellies must have the proper label containing:

- Product name
- Net weight
- Ingredient statement
- Name & physical address of manufacturer/distributor/packer
- Nutritional labeling (exemptions apply)
- List of allergens
- NOT FOR RESALE – PROCESSED AND PREPARED WITHOUT STATE INSPECTION (if the home kitchen was not inspected, if the kitchen was inspected, then this does not need to be on the label).

What are the most important food safety steps I need to consider when preparing my product?

1. Fruits can be used as long as fruit is not rotten or moldy.
2. Follow recipes from an approved or tested source such as the National Center for Home Food Preservation <http://nchfp.uga.edu/> or the Cooperative Extension
3. Adjust for altitude, typically you will need to add one minute of processing time for each 1000 feet of altitude over 1000 feet..
4. Keep finished product upright and do not move for at least 12 hours.

The same food safety considerations should be taken when preparing canned foods:

1. Proper temperature control
2. Cooking foods to recommended temperatures
3. Avoiding cross contamination
4. Good personal hygiene and hand washing
5. Purchasing products from approved, reputable suppliers.

What are some guideline for preparation of jams and jellies?

1. To gel properly all jams and jellies must contain pectin, sugar, acid and fruit flavor. All fruits contain pectin but the amount varies depending on the fruit.

Fruits with high pectin concentration:<sup>5</sup>

- Apples

- Crabapples
- Gooseberries
- Some plums

Fruits with lower pectin concentration:<sup>5</sup>

- Cherries
- Blueberries
- Strawberries

\*\*\*Fruits with lower pectin concentration will require additional pectin to ensure a properly jellied product<sup>5</sup>.

2. The food safety concerns with high acid canned foods such as jams and jellies are yeast and mold. The heating or canning process will eliminate any vegetative microorganisms in the product and make it shelf-stable<sup>1</sup>.

3. Yeast and molds are a sign of spoilage and jams and jellies containing either are not safe to consume. Check seals on jams and jellies before storing. After opening jams and jellies should be stored in the refrigerator<sup>1</sup>.

How should I store/sell my jams and jellies at the farmers market?

1. Homemade jams and jellies must be sold and stored in approved canning jars with sealed lids and must meet labeling requirement mentioned above.

2. The recommended storage time for jams and jellies is 12 months. Jams and jellies should be stored in a cool, dark and dry environment. Storing cans in unsuitable conditions can shorten the products shelf life and can increase chances of spoilage<sup>3</sup>.



*Photo: Preparing strawberry jam*

References:

1. Boyer, R., & McKinney, J. (2013). Boiling Water Bath Canning. Retrieved from [https://pubs.ext.vt.edu/content/dam/pubs\\_ext\\_vt\\_edu/348/348-594/348-594\\_pdf.pdf](https://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/348/348-594/348-594_pdf.pdf)
2. Can it Safely. (n.d.). Retrieved from [https://pubs.ext.vt.edu/content/dam/pubs\\_ext\\_vt\\_edu/FST/FST-114/FST-275NPv1.pdf](https://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/FST/FST-114/FST-275NPv1.pdf)
3. Harrison, J. A., & Andress, E. L. (Eds.). (2013, March). Preserving Foods: Jams and Jellies. Retrieved from [https://nchfp.uga.edu/publications/uga/uga\\_jams\\_jellies.pdf](https://nchfp.uga.edu/publications/uga/uga_jams_jellies.pdf)

4. Rodgers Dinstel, R. (2017, August). Jams and Jellies. Retrieved from

<https://www.uaf.edu/files/ces/publications-db/catalog/hec/FNH-00562E.pdf>

5. Making and Preserving Fruit: Butters, Jellies, Preserves, and Jams. (n.d.). Retrieved from

<http://ucanr.edu/sites/cottagefoods/files/201264.pdf>

## Appendix C

### What do I need to know to sell high moisture refrigerated foods at the farmers market?

#### What are high moisture refrigerated foods?

High moisture refrigerated foods are foods that have a high level of available water for foodborne pathogens to survive and thrive. These are considered **TCS foods**, or foods that require time/temperature control to ensure their safety. High moisture refrigerated foods must be kept out of the temperature danger zone to prevent bacterial growth of unwanted pathogens. Some examples of these foods include:

- Hummus
- Guacamole
- Salsa
- Mayonnaise based salads

\*\*\*ALL high moisture refrigerated foods will require inspection of the facility by the Virginia Department of Agriculture and Consumer Services (VDACS)

#### Why prepare high moisture refrigerated foods?

High moisture refrigerated foods can be tasty, nutritious and can complement meals and snacks.

#### What are the steps if I want to produce high moisture refrigerated foods?

1. Complete a food safety course- For examples ServSafe™ for Managers, which is provided by many Extension offices throughout the state of Virginia. This fact sheet will give a brief overview of what to do, but a good food safety course will provide a thorough background in safe food handling practices.

2. Decide where you are going to produce your product:

- In the inspected home kitchen
- In an inspected community or commercial kitchen

3. Understand the regulatory process of starting a food business.

Refer to: <http://www.vdacs.virginia.gov/dairy-kitchen-food-services-businesses.shtml>

4. Complete and submit the correct application that pertains to where you will be producing your refrigerated or frozen food (Application for Home Processing Operation or Application for a Commercial Kitchen Food Processing Operation)

5. After you submit your application, VDACS will contact you with further questions or schedule an inspection when your application is considered complete.

#### What are the most important food safety steps I need to consider when preparing my product?

1. Practice proper personal hygiene, including hand washing
2. Use proper cleaning and sanitation practices

3. Use proper temperature control
4. Purchase ingredients from approved, reputable sources
  - Many high moisture refrigerated foods are ready to eat foods; the food handler's bare hands should never come in contact directly with the food product. Gloves approved for food handling should be used during preparation and any other time the handler could come into contact with the food product. Hands should be washed before putting on gloves and gloves should not be reused.

What are some guideline for preparation of high moisture refrigerated foods?

1. Many high moisture refrigerated foods are not cooked before serving which means pathogens transferred to foods during preparation are likely to remain in the product even during refrigeration. Refrigeration slows the growth of most pathogens but does not kill unwanted pathogens present on a food product.

2. TCS foods need to be kept at safe temperatures throughout the life of the food product. High moisture refrigerated foods need to be kept at a temperature of 41° F (5° C) or lower. Always keep a thermometer in your refrigerator and cooler at the farmers market to ensure that products stay at safe temperatures.

4. All food items should be clearly labeled and include:

- Net weight
- List of allergens
- Ingredients
- Name and address of manufacturer
- Storage instructions
- Best-by dates
- Any additional commodity-specific regulations

For more labeling information refer to the Virginia Cooperative Extension publication:

“Required Labeling Information,” found at:

[http://pubs.ext.vt.edu/content/dam/pubs\\_ext\\_vt\\_edu/FST/FST-55/FST-55NP-PDF.pdf](http://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/FST/FST-55/FST-55NP-PDF.pdf)

The label should also include, “**Keep Refrigerated.**” This statement should be easy to read and on prominently displayed on the label.

5. *Listeria monocytogenes* is a pathogen of concern among high moisture refrigerated foods and if consumed can cause Listeriosis, a serious and sometimes fatal illness. Pregnant women, individuals over the age of 65 and those with compromised immune systems are at the highest risk. Unlike other pathogens, *Listeria monocytogenes* can continue to grow during refrigeration. Follow the food safety steps previously mentioned to decrease the risk of contamination<sup>1</sup>.

How should I store/sell my high moisture refrigerated foods at the market?

1. Refrigerated foods that cannot be stored in the refrigerator should still be stored at 41°F or lower. If using a cooler and ice for storage, the following requirements should be met:

- Packaged foods that are subject to the entry of water because of the nature of packaging, wrapping, or container, cannot be stored in contact with ice or water<sup>2</sup>.
- If ice is used, it must be done in such a way that the water from melting is constantly draining away from the product and into a properly designated area or in a container<sup>2</sup>.
- Vendors who sell refrigerated foods are required to have a thermometer to verify food maintained at or below 41°F.

2. All food items should be stored at least 6 inches off the floor or ground.

3. Vehicles and equipment used for transportation should be kept clean at all times.

References:

1. Handbook for Small Food Manufactures. (n.d.). Retrieved from

<http://www.vdacs.virginia.gov/pdf/va-food-handbook.pdf>

2. Listeria (Listeriosis). (2018, March 01). Retrieved from <https://www.cdc.gov/listeria/faq.html>

## Appendix D

### What do I need to know to sell maple syrup at the farmers' market?

#### What is maple syrup?

Maple syrup is a sweet treat made from processed maple sap. Maple syrup is used as a topping on pancakes, waffles and other foods as well as a natural sweetener in other prepared foods.

\*\*\* Maple syrup can be sold at the farmers market without a VDACS kitchen inspection. Product must be properly labeled (more labeling information below).

#### Why maple syrup?

Maple syrup can be a value added product for farmers and vendors. Maple syrup is produced in the winter months when other farm products are not being produced and smaller operations can prepare maple syrup without substantial overhead cost.

#### What are the steps if I want to produce maple syrup?

1. Become familiar with safe cooking and bottling procedures.
2. Be aware that maple syrup produced in a home kitchen cannot be sold across state lines, on the internet or specialty stores.
3. All maple syrup must have the proper label containing:
  - Product name
  - Net weight
  - Ingredient statement
  - Name & physical address of manufacturer/distributor/packer
  - Nutritional labeling (exemptions apply)
  - List of allergens
  - NOT FOR RESALE – PROCESSED AND PREPARED WITHOUT STATE INSPECTION (if the home kitchen was not inspected, if the kitchen was inspected, then this does not need to be on the label).

#### What are the most important food safety steps I need to consider when preparing my product?

The same food safety considerations should be taken when preparing maple syrup:

1. Proper temperature control
2. Cooking foods to recommended temperatures
3. Avoiding cross contamination
4. Good personal hygiene and hand washing
5. Purchasing products from approved, reputable suppliers.

#### What are some guidelines for preparation of maple syrup?

1. Maple syrup is graded and classified according to United States Department of Agriculture (USDA) standards into 3 classes, A, B or substandard<sup>1</sup>.

2. Sugar maples produce sap with the highest sugar concentration but red and silver maple trees also produce sap that can be used to create syrup<sup>1</sup>.
3. Sap can be boiled down using an evaporator or smaller operations can use large food grade kitchen pots<sup>2</sup>.
4. The sap turns to sugar once the sugar content has reached 66% and the sap temperature is 7.1 degrees above the boiling point. Boiling point at sea level is 212°F but will vary according to elevation<sup>2</sup>.
5. Syrup must be drained and filtered before putting into jars. Syrup should be filtered while the syrup is hot using approved filtering material, that can be purchased through maple syrup equipment retailers<sup>3</sup>.
6. Syrup should be canned hot while it is hot, recommended temperature is 185°F. Pour the hot syrup into sterilized canning jars and seal.

#### How should I store/sell my maple syrup at the farmers market?

1. Maple syrup must be sold and stored in appropriate food grade containers with sealed lids and must meet labeling requirement mentioned above.
2. Maple syrup should be stored in a cool dry place until opened. After opening, maple syrup should be stored in the refrigerator<sup>3</sup>.



*Bottling maple syrup: Photo released with permission of Phillip Meeks Agriculture and Natural Resources Agent*

References:

1. Hansen, R. S., Childs, S. L., Kime, L. F., & Harper, J. K. (2010). Maple Syrup Production. Retrieved from <https://extension.psu.edu/maple-syrup-production>
2. Maple Syrup Production. (2018, February 14). Retrieved from <http://warren.cce.cornell.edu/natural-resources/maple-syrup-production>
3. Blumenstock, M. (n.d.). How to Tap Maple Trees and Make Maple Syrup. Retrieved from <https://extension.umaine.edu/publications/7036e/>