Mobile Poultry Processing on Nantucket

Authors:
Katie Bowles
Trevor Drane
Adam LaBombard
Charles Ritchie

Sponsor:
Posie Constable
Managing Director of
Sustainable Nantucket

13 December 2022

Mobile Poultry Processing on Nantucket

An Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
degree of Bachelor of Science

Authors:
Katie Bowles
Trevor Drane
Adam LaBombard
Charles Ritchie

Date:
13 December 2022

Submitted to:

Posie Constable
Sustainable Nantucket

Professor Bruce Bursten
Professor Dominic Golding
Worcester Polytechnic Institute

WPI

Abstract

Sustainable Nantucket has funds for a mobile poultry processing unit (MPPU) to encourage chicken farming on Nantucket. The goal of our project was to create a plan and set of materials Sustainable Nantucket can use to negotiate with the Nantucket Board of Health and other entities for the approval and implementation of a MPPU. We observed an MPPU in operation on Martha's Vineyard and evaluated regulations, farmer interest, operational logistics, and estimated costs on Nantucket. We concluded there is sufficient farmer interest to proceed and recommended the type of MPPU Sustainable Nantucket should consider purchasing. We developed a financial plan, operating manual, and other materials to help Sustainable Nantucket achieve regulatory approval at the state and local levels.

ACKnowledgments

We would like to thank all of the individuals and organizations who made this project possible and assisted us in our research:

Especially our sponsor at Sustainable Nantucket, **Posie Constable**, Managing Director of Sustainable Nantucket. We would like to express our gratitude for all her hands-on support, guidance, and transportation throughout our time on island.

Bruce Bursten and Dominic Golding, our advisors.

All of the Nantucket based farmers we interviewed: **Aidan Feeney, Tom Larrabee, Abby Slosek, Dylan Wallace, Chris Getoor, Dan Southey,** and **Nicole Dupont**.

Lauren Lynch, with Martha's Vineyard Agricultural Society.

Julie Scott, with the Island Grown Initiative.

Jennifer Hashley, with New Entry Sustainable Farming Project.

Richard Andre, previously with the Island Grown Initiative.

J.P. Caron, with Nantucket Waste Options.

David Gray, with the Nantucket Sewer Department.

Roberto Santamaria, with the Nantucket Board of Health.

Nantucket Ice House

Young's Bicycle Shop, for providing us with bikes during our stay on Nantucket.

ReMain Nantucket, for holding a scavenger hunt to welcome us to Nantucket.

The Nantucket Yacht Club, for providing us with housing during our stay.

Executive Summary

Being on an island, the people and businesses of Nantucket must import everything from fuel to food. Most food for the roughly fourteen thousand year-round residents and more than 50,000 summer visitors is shipped to the island by ferry. For several years, the nonprofit organization Sustainable Nantucket (SN) has endeavored to help reduce that load by promoting sustainable small-scale farming and other food production on the island. Like the rest of the country, Nantucket has seen an increasing interest in raising and consuming chickens, especially organic and free-range or pasture-fed chickens. Sustainable Nantucket has recently been provided grant funds for the purchase of a mobile poultry processing unit (MPPU), that they hope to use to aid the chicken farmers of the island in the processing of their livestock.

The goal of our project was to create a plan and set of materials Sustainable Nantucket can use to implement their chicken farming project and negotiate with the Nantucket Board of Health and other stakeholders for the development and approval of their mobile poultry processing unit.

1. Identify applicable federal, state, and local regulations and documentation necessary to create and operate a Mobile Poultry Processing Unit.
2. Evaluate the lessons learned by other communities in Massachusetts and elsewhere to try to meet the regulations and requirements necessary to implement MPPUs.
3. Identify and assess the perspectives of the pertinent stakeholders on Nantucket regarding the promotion of small-scale chicken farming and poultry processing on island.
4. Evaluate and determine the most appropriate MPPU technology and operational options for a Nantucket MPPU based on demand and regulations.
5. Develop a business model and other deliverables.

To accomplish these goals, we did extensive research on relevant regulations and guidelines, assessed relevant literature, met with farmers on Nantucket to gauge levels of interest and concerns, observed an MPPU in action on MV, conducted site visits to scope out possible locations and operational logistics, and estimated likely capital and operating costs for an MPPU on Nantucket.

Recommendations

Through our research, we have determined that while there is not enough current chicken production on Nantucket to warrant the purchase of an MPPU, there is sufficient interest from farmers to increase chicken production if an MPPU were available. Based on these results, we believe that there will be sufficient demand for an on-island MPPU to justify investment by Sustainable Nantucket. Below are our specific recommendations for Sustainable Nantucket (SN) to consider when implementing an MPPU:

1. **We recommend an open-air MPPU stored in a closed trailer.**

   We recommend Sustainable Nantucket purchase an enclosed trailer similar to the one currently used by Martha's Vineyard Agricultural Society (MVAS) that will protect the MPPU from the elements during storage and transportation. The trailer will store all materials except for "day of slaughter" purchases–such as ice, propane, bags, etc.–that are necessary for slaughtering small poultry, chickens, and turkeys. This configuration can be towed by a small truck, which means the MPPU will be more accessible to farmers should Sustainable Nantucket choose to use the unit at more than one location or change the storage location.

2. **We recommend that Sustainable Nantucket purchase an MPPU with flexible capabilities.**

   Based on our comparisons of pre-made MPPU kits vs. building an MPPU from its various components, we recommend that Sustainable Nantucket opt for the latter approach. In particular, purchasing the components individually will allow Sustainable Nantucket to be more flexible in the design of their unit and to customize it to fit the demand of farmers and upgrade equipment as they expand.

3. **We recommend Sustainable Nantucket provide EPA approved chemicals to clean and sanitize the equipment per USDA guidelines.**

   The MPPU should have the cleaning equipment following USDA and Massachusetts guidelines for the safe handling of poultry. The chemicals Sustainable Nantucket should provide should be from the EPA list of environmentally friendly degreasers and sanitizers to protect wetlands in case of any runoff and to protect the cultures in the digester. Along with following proper procedures, using the recommended

EPA endorsed chemicals will allow farmers to legally sell the poultry they raise for on-island consumption.

4. **We recommend that the MPPU be located at the Nantucket Wastewater Treatment Plant for processing and general storage.**

This recommended location has easy access to water, electricity, and bathrooms, and has the facilities to dispose of wastewater from processing and cleaning the unit. In addition, there is plenty of space for the unit to be stored when not in use.

5. **We recommend that Sustainable Nantucket work with local officials to allow safe disposal of the wastewater and of solid waste in current municipal facilities.**

We recommend that Sustainable Nantucket collect as much water as possible for disposal. We met with David Gray at the Nantucket Sewer Department and learned that that wastewater can likely be disposed of at the Sewage Department facilities. Sustainable Nantucket might consider having the farmers or operators of the unit transport the wastewater collected to the Sewer Department at a cost of $5 per l00 gallons.

We recommend that Sustainable Nantucket arrange for all solid waste to be collected and disposed of in the digester at the Nantucket Transfer Station. J.P. Caron from Waste Options told us they would gladly take any solid waste in the digester including feathers, offal, and wood chips that are used as absorbent on the ground.

6. **We recommend that farmers that use the MPPU have a ServSafe certification.**

Having a ServSafe certification, while not required, is recommended to farmers for the safe handling of raw poultry. This is a program recommended by OSHA and the USDA for proper food safety handling. We recommend that Sustainable Nantucket require that one or more of the workers running the MPPU at any given time have the ServSafe certification.

7. **We recommend that the process of slaughter follows the guidelines in appendix H.**

   The guidelines in Appendix H of this report provide detailed procedures that should be followed before, during, and after slaughter. These protocols are based on regulations and recommendations from the state, Massachusetts Department of Public Health (MassDPH), and USDA that are relevant to the MPPU and other recommendations we made surrounding the type of MPPU and processing location.

8. **We recommend that Sustainable Nantucket follow the model HACCP (Appendix E) as a guideline when creating their own to apply for a license from MassDPH.**

   We recommend that Sustainable Nantucket follow Tuft's HACCP as it is one of the only examples of an HACCP for an MPPU currently in operation; it is what we based our model HACCP on. It will provide Sustainable Nantucket with safety guidelines required by the state and federal regulatory agencies.

Authorship Table

Section	Primary Author(s)	Editors
Abstract	Katie,Charles	
Authorship table	Katie,Trevor, Charles	
ACKnowledgements	Katie	
Executive Summary	Katie, Trevor, Charles	
1.0 Introduction	Trevor, Charles	Katie
2.0 Background	Trevor	Katie, Charles
2.1 Conventional Chicken Farming	Trevor	Katie, Charles
2.2 Changing Practices	Trevor	Katie
2.3 Case Studies	Adam	Katie, Charles
2.4 MPPU Types and Processing	Trevor	Katie
2.4.1 Types of MPPUs	Katie	Charles, Trevor
2.4.2 Steps in the Process	Charles, Katie	Trevor
3.0 Methods	Katie	Trevor, Charles
3.1	Katie	Trevor, Charles
3.2	Trevor	Katie, Charles
3.3	Adam	Katie, Trevor, Charles
3.4	Trevor	Katie, Charles
3.5	Charles, Katie	Trevor
4.0 Preliminary Findings	Katie	Trevor, Charles
4.1 Gauging the Market...	Trevor	Katie, Charles
4.2 Observations from MV	Katie	Trevor, Charles
4.3 Sanitization and Waste Disposal	Charles, Trevor, Katie	Katie, Trevor, Charles
4.4 Processing Location	Trevor, Charles	Katie, Charles, Trevor
4.5 Processing Expenses	Charles,Trevor, Katie	Katie, Trevor, Charles
4.6 MPPU Selection	Katie, Trevor	Charles
5.0 Conclusions + Recommendations	Trevor	Katie
5.1	Katie, Charles	Trevor
5.2	Katie	Trevor, Charles
5.3	Charles	Katie, Trevor
5.4	Katie, Trevor	Charles
5.5	Katie	Trevor, Charles

Section	Primary Author(s)	Editors
5.6	Charles	Katie, Trevor
5.7	Trevor	Charles
5.8	Katie	Charles, Trevor
References	Trevor	Katie, Charles
Appendix A -Interviews w/ BOH	Charles,Trevor, Katie	
Appendix B- Interviews w/MV and IGI	Charles,Trevor, Katie	Adam
Appendix C-Interviews w/ farmers	Charles, Trevor, Katie	Adam
Appendix D-Sewer and waste options	Charles,Trevor, Katie	
Appendix E -Sample HACCP	Charles	Katie, Trevor
Appendix F-Price per Chicken	Trevor	Charles, Katie
Appendix G -Operators expenses	Charles	Katie, Trevor
Appendix H-Operating Manual	Charles	Katie, Trevor
Appendix I-All in one MPPU prices	Katie	Charles
Formatting	Trevor	Trevor

Table of Contents

List of Figures

List of Tables

1.0 Introduction

Being on an island, the people and businesses of Nantucket must import everything from fuel to food. Most food for the 14,000 year-round residents and up to 60,000 summer visitors is shipped to the island by ferry (Town and County of Nantucket Massachusetts, 2020). For several years, the nonprofit organization Sustainable Nantucket (SN) has endeavored to help reduce that load by promoting sustainable small-scale farming and other food production on the island. Like the rest of the country, Nantucket has seen an increasing interest in raising and consuming chickens, especially organic and free-range or pasture-fed chickens. Sustainable Nantucket was recently awarded grant funds for the purchase of a mobile poultry processing unit (MPPU), which they hope to use to aid the chicken farmers of the island in the processing of their livestock.

The goal of our project was to create a plan and set of materials that Sustainable Nantucket could use to negotiate with the Nantucket Board of Health and other stakeholders for the development and approval of a Mobile Poultry Processing Unit on island. To achieve this goal, we identified five objectives, which were as follows:

1. Identify applicable federal, state, and local regulations as well as documentation necessary to create and operate a Mobile Poultry Processing Unit (MPPU).
2. Evaluate the lessons learned by other communities in Massachusetts and elsewhere to try to meet the regulations and requirements necessary to implement MPPUs.
3. Identify and assess the perspectives of the pertinent stakeholders on Nantucket regarding the promotion of small-scale chicken farming and poultry processing on island.
4. Evaluate and determine the most appropriate MPPU technology and operational options for a Nantucket MPPU based on demand and regulations.
5. Develop a business model and other deliverables.

Our team collected data from a variety of sources, such as applicable legislation, case studies, field observations, and interviews with relevant stakeholders to determine the steps required in fulfilling our main objectives, and the exact details of how our project would be most useful to Sustainable Nantucket. We have determined that while there is not enough current chicken production on Nantucket to warrant the purchase of an MPPU, there is sufficient interest

from farmers to increase chicken production if an MPPU were available. We determined that SN should consider an open-air MPPU that is stored in an enclosed trailer because it provides the best balance between cost and function, has been successfully implemented in similar locations, and it is small making it easier to store and transport. We developed a financial plan and step-by-step MPPU operations manual, we recommend Sustainable Nantucket use these resources to seek approval from state and local officials and guide their operations in the future.

2.0 Background

In this section, we will discuss the development of poultry production in the US and the recent trends toward organic and small-scale production. We will delve into case studies of communities with similar operations and examine poultry processing on a small scale.

2.1 Conventional Chicken Farming

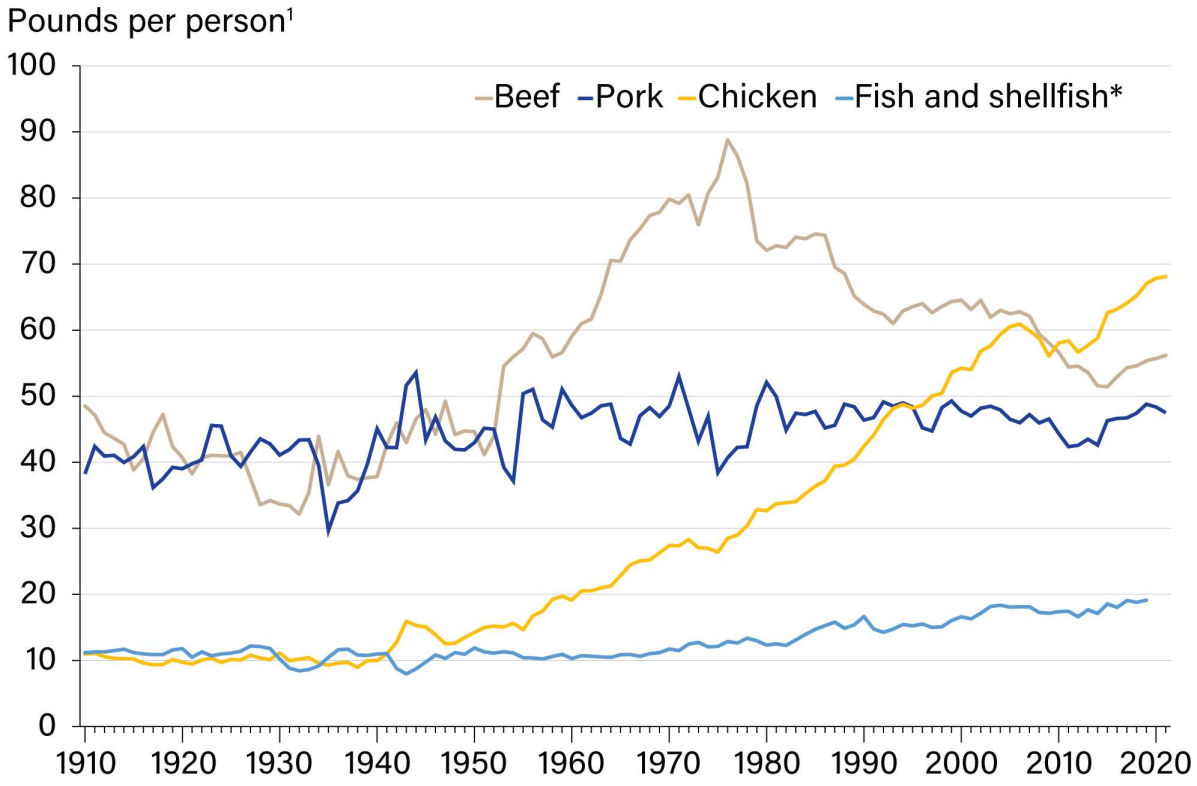
The popularity of chicken in the American diet has increased steadily since the 1930s and has led to the development of increasingly larger farms to meet the increasing demand. Selective breeding has been used to promote faster growth and weight gain, or increased egg production (Akinyemi, 2005). On an early American family farm, chickens were raised largely as an afterthought: they "roamed the farmyard and were fed excess grain and table scraps" (Striffler, 2007, p. 33). They were rarely sold and were typically raised only to add a little extra protein to the family's diet.

In the early 20th century, commercial chickens were raised for eggs. Any meat production from males and unproductive birds was a convenient byproduct (National Agricultural Statistics Service, 2018). However, economic hardships in the early 20th century caused some farmers to try their luck at farming these birds that were frequently considered a nuisance. Finding success, a few farmers quickly scaled their operations and improved their shipping methods and were soon transporting birds long distances to bigger markets in the cities. A collection of farmers located on the Delmarva Peninsula[1] were some of the first to transition to growing broilers, the breeds of chickens specialized for meat production. The farmers' proximity to Philadelphia and New York City gave them a nearly unlimited market. John Tyson, Jesse Jewell, and Charles Lovette also started companies for growing chickens in southern and midwestern states. They soon grew by vertically integrating their operations by growing, processing, and transporting their own birds (Striffler, 2007).

Through the first half of the 20th century, small-scale chicken farmers existed alongside the larger producers. However, these smaller operations were more susceptible to fluctuating costs of feed and variations in the market prices of chickens. Over time most of the small

[1] The Delmarva Peninsula is a large peninsula located on the eastern coast of the United States. It is mostly occupied by the entire State of Delaware and portions of the States of Maryland and Virginia (WorldAtlas, 2021).

operations failed or were bought out by larger corporations. By the 1960s, nearly every part of the supply chain was vertically integrated, from feed to chicks to processing, and the entire process was owned by just a few companies (Striffler, 2007). A modern poultry farming operation looks nothing like the classic media depiction of a chicken farm. A modern chicken house is typically a long metal shed where thousands of chickens will live their entire lives crowded together eating grain until they weigh enough to be shipped off for processing. These changes in the poultry industry were caused by steadily increasing demand for chicken over the past 50 years. Figure 1 shows the increasing availability of chicken in recent years and how the chicken industry has outgrown the other major meat industries.



[1]Calculated on the basis of raw and edible meat in boneless, trimmed (edible) weight. Excludes edible offals, bones, viscera, and game from red meat. Includes skin, neck, and giblets from chicken. Excludes use of chicken for commercially prepared pet food.

*Fish and shellfish data are only available through 2019.

Source: USDA, Economic Research Service, Food Availability Data.

Figure 1: Trendlines for the availability of beef, pork, chicken, & fish/shelfish from 1910-2021 (Economic Research Service, 2022).

Another reason for a shift to locally produced poultry is the public awareness of the negative environmental effects of factory farming. Agricultural activities are the dominant source of ammonia emissions in the environment, and a major portion of emitted ammonia is due to livestock waste (Jiang et al., 2021). The high populations of animals in a small area in factory farms concentrate waste and increase demand for feed crops. Both problems cause pollution in the form of greenhouse gasses, and the release of high concentrations of nitrogen and phosphorus, bacteria, and antibiotics into soils, groundwater, and surface waters (Kraham, 2017). Higher ammonia concentrations are detrimental to many aspects of the environment. For example, the excess ammonia in salt and freshwater causes fish to be stressed due to ammonia toxicity, and on land ammonia pollution "impacts species composition through soil acidification, direct toxic damage to leaves and by altering the susceptibility of plants to frost, drought and pathogens" (Guthrie et al., 2018).

Public revelations about animal abuse in food industries has driven a desire for more locally and ethically sourced meat. For example, in 2016, Compassion Over Killing, an animal rights group based in Washington State, released video footage showing the abuse of chickens in four slaughter facilities in Virginia owned by Tyson (Moyer, 2017). Seven individuals were convicted and Tyson's public reputation was damaged. Other similar exposés have encouraged public demand for the more humane treatment of animals raised for food, including chickens.

The quality of food and farming practices are becoming more of a concern for the ordinary consumer. Modern farming involves producing food in a centralized location on a large scale to decrease the overall cost of production leading to compromises in the overall quality of the food the consumer receives. Consumers are willing to pay more for freshness, quality, and ethical peace of mind (Ruth-McSwain, 2012). The ethical and quality issues encountered with factory-farmed meat can be countered by increasing the local production of poultry with smaller-scale farms and more sustainable practices.

2.2 Changing Practices

As the global population grows, competition for resources is only expected to increase; specifically, as population increases, demand for food increases and the amount of land dedicated to farming decreases (Thornton, 2010). With these expectations, several international organizations have recommended investment in sustainable food production programs. The

United Nations published a list of seventeen Sustainable Development Goals, the second of which is zero hunger. This goal urges nations to fight for food security, improved nutrition, and sustainable agriculture (UN Department of Economic and Social Affairs, 2015). In his book on agricultural production, Akinyemi (2007, p. 34) says that the goals of sustainable agriculture should be to "increase food production in a sustainable manner with the intention of enhancing food security and environmental protection." In order to preserve the remaining resources of the Earth and meet the growing demand for food, the productivity of the land currently in use must be increased using sustainable farming practices.

The logistics involved in getting the product from the farm where it is grown to the customer takes time, which limits the freshness of the chicken. The number of chickens produced in such a small space usually means that the chickens must be transported to the company's central processing plant. Once processed, the meat must then be distributed to consumers sometimes thousands of miles away. On a local farm, a mobile poultry processing unit (MPPU) can be brought to the farm where the chickens were grown, reducing the transportation times for live birds to almost zero. Overall, it would be better for the environment for the birds to be transported as little as possible to reduce transportation emissions.

In recent years there has been increasing demand for local and sustainable food production, and some people have taken matters into their own hands, growing food for themselves. In most cases, the goal is to increase the quality of the product and decrease the environmental impact in the process. Rademaker, Glas, and Jochemsen (2017) describe how people want to have more control over what goes into their food and producing food locally can help them do that.

There are several methods that people are turning to in an effort to achieve some of these goals. One group considers themselves locavores, which means they will only consume products grown locally (usually defined by a range of less than a hundred miles). People cite a few motives for following this rule; in particular, they desire fresher food with more nutrients and less packaging, and they hope to become more self-sufficient as a community and friendlier to the environment by cutting transportation and investing in local businesses (Ruth-McSwain, 2012). Places like Hobby Farms have worked with communities to develop a program that works for individuals to raise and slaughter their own chickens. Hobby Farms is using a grant from the USDA's "Know Your Food" program to create new economic opportunities by "forging

connections between consumers and local producers" to help them meet their goals (Mumaw, 2010).

Homestead farmers are a more extreme movement than locavores. The homesteaders try to avoid as much large-scale infrastructure as possible but they have the goal of growing all of their food for themselves and living off their land. In recent years, especially following the outbreak of the COVID-19 pandemic, there has been an uptick in the number of people interested in homesteading. Roberts (2020) describes a sharp uptick in the sales of chicks, eggs, and seeds after the start of the pandemic, and describes how people are quick to search for food security that growing your own food can provide when the economy and large meat processing facilities are failing.

Elkohoraibi et al. (2014) surveyed a group of farmers raising chickens in their backyards. They found that 70% of the respondents had raised chickens for less than five years and a similar fraction had fewer than 10 birds, evidence of a growing movement. Most of them said they raise their own chickens because they believe their own chickens have better health and welfare, and the meat or eggs taste better, are more nutritious, or are safer to eat than commercial options.

In 2017, Elkohoraibi et al. conducted another survey where it was found that processing was an issue for approximately 40% of small pasture chicken farmers. The increasing popularity of pasture-raised chicken farming created increased demand for chicken processing (Elkohoraibi et al., 2017). MPPUs provide a small-scale solution to this problem that allows the entire process to remain local. The goal of Sustainable Nantucket is to provide this service for the farmers on Nantucket. Sustainable Nantucket also hopes that by creating a safe way for chickens to be processed other farmers will be encouraged to raise more poultry.

2.3 Case Studies in the Use of MPPUs

To implement an MPPU on Nantucket, the experiences of other locations need to be thoroughly examined. In addition, we researched the different types of MPPUs and how their processes work to apply the appropriate regulations. This section reviews sustainable animal farming cases in Lopez Island (Washington State), and Martha's Vineyard, Belchertown, and Beverly, Massachusetts.

Two of the first United States Department of Agriculture (USDA) approved MPPUs came to fruition in 2001 (Kentucky State University, 2017). The unit in Kentucky, constructed for operation by Heifer International and now owned by Kentucky State University Research Farm, was a 20' x 8' gooseneck trailer that was converted into an MPPU (Kentucky State University, 2017). The other unit was produced by the Lopez Community Land Trust and was sold to the Island Grown Farmers Cooperative on Lopez Island, Washington. These units are transported from farm to farm and allow small scale farmers to process their poultry at a USDA approved level. Adding these units to communities increases sustainable food production, creates a local source for fertilizer, and leads to a source of income for farmers.

2.3.1 Island Grown Farmers Cooperative (Lopez Island, Washington State)

In 2002, the Lopez Island Community Land Trust determined there was sufficient support among Lopez Island farmers to establish the Island Grown Farmers Cooperative (IGFC). The cooperative implemented a Mobile Processing Unit (MPU), which would become the first USDA licensed MPU in the US. The IGFC emerged as a service for the small-scale farmers of the San Juan islands to process their livestock and enable competition with large farming corporations while reducing the costs of island farming. The IGFC MPU is USDA certified and processes different kinds of livestock besides poultry. Over the years, demand for the IGFC MPU grew, and the IGFC expanded their service to various other neighboring islands and counties; even those on mainland Washington State (NW Local Meats, 2022), as illustrated in Figure 3.

Figure 2: A map of the islands and counties which IGFC provides processing sources to, shown in yellow (Image from (NW Local Meats, 2022)). Note that while the images show San Juan as one big island, it is in reality multiple smaller islands in close proximity to each other. The islands labeled "Island" are Whidbey Island (left) and Camano Island (right) and are connected to the mainland via a bridge per island (Google, n.d.b).

2.3.2 New Entry Sustainable Farming Project (Tufts)

The New Entry Sustainable Farming Project, an initiative of the Tufts University Friedman School of Nutrition, collaborates with people, communities, and organizations across the nation to "foster resilience in local, regional, and national food systems" (New Entry Sustainable Farming Project, n.d.). The NESFP has written several guides on poultry processing with MPPUs that incorporate research on other organizations that own MPPUs, government legislation regarding the operation of MPPUs, as well as their own experience operating an MPPU in eastern Massachusetts. In their guidebook *Building an On-farm Poultry Processing Facility*, NESFP admits that they erroneously assumed a higher demand for their MPPU based on pre-existing trends and offhand remarks of interest from local farmers, but many prospective

users were turned away by the cost of licenses and other obstacles. After the roll-out of the MPPU, NESFP found many farmers who had previously expressed interest in using the MPPU never actually utilized the service as the licensing fee and process were apparently too daunting. As a result of this misestimation of interest, NESFP recommends creating a list of farmers that are more committed to the MPPU even with the required licensing, as well as a list of their desires and requirements for the MPPU. NESFP also warns of the propensity of farmers to process and sell their birds illegally themselves, so it is important that an MPPU is presented as a convenient and attractive alternative to illegal processing, which is aided if the state regulatory cycle is fueling concern over shutting down illegal sales. NEFSP acquired two MPPUs; a custom-built open-air MPPU and a premade enclosed MPPU. In building their open-air MPPU, NESFP used the services of local fabricators, which they credit for making future repairs to the MPPU easier, as the same fabricators could be relied on to fix the unit, but they also note that the pre-built MPPU required far fewer repairs overall. Initially, the custom-built open-air MPPU did not meet health guidelines. NESFP had to replace the trailer floor and plumbing to achieve regulatory compliance. On the other hand, the heavy pre-built trailer requires a powerful truck for towing. To avoid such additional costs, delays, and inconvenience NESFP recommends actively involving regulators in the planning for the development and implementation of any MPPU is to be used. (New Entry Sustainable Farming Project, 2012).

2.3.3 New England Small Farm Institute (Massachusetts State Pilot Program)

The Massachusetts Department of Agricultural Resources chose the New England Small Farm Institute (NESFI) to conduct a pilot program regarding MPPUs. The organization had previously received grants for an MPPU and had started service for the first farms. The initial pilot MPPU program serviced three farms over the course of two years and expected to enroll more farms in a third year (although these are not yet documented). The pilot study identified several problems that the New England Small Farm Institute encountered. Cooling of the chickens was a major problem, as less ice was available than needed, more time was required for birds in the cooling baths than anticipated, and cooling was more difficult on warm days. To address these issues, the New England Small Farm Institute covered chill tanks in thermal material, reduced refrigeration temperatures, procured more ice, and used cryovac bags in place of loose plastic bags. The pilot study revealed that on the hottest days so much ice was required

that the amount of wastewater produced exceeded that allowed under state regulations (Massachusetts Department of Public Health, 2009).

2.3.4 Island Grown Initiative (Martha's Vineyard)

Martha's Vineyard suffers many of the same problems with food sourcing, processing, and sustainability as Nantucket. In 2006, the Island Grown Initiative (IGI) was created as part of an effort to address these issues. In 2008, the IGI recognized that many small-scale chicken farmers on Martha's Vineyard could not maintain a profitable business given the costs of processing and transporting chickens to a large mainland processing facility. IGI also discovered that providing education in the raising of poultry to local prospective farmers as well as building relations between local businesses that could be persuaded to buy locally grown birds were important tasks in achieving their goal of increasing poultry farming and processing on Martha's Vineyard. IGI established a workshop to teach local farmers about important matters of bird care, such as diseases, coop building, and predators. IGI also trains farmers in the operation and use of the MPPU (Island Grown Initiative 2009).

The Island Grown Initiative of Martha's Vineyard has previously worked to garner support for chicken farming and mobile processing on the island. A lesson that they noted was that many new chicken farmers were not adequately provided with the knowledge of how to protect and care for chickens, and thus lost many when they first attempted to raise chickens. IGI recommended additional training and channels of inquiry to be made available for new chicken farmers. IGI also noted that demand for mobile processing went up after the mobile processing trailer was introduced, and they then needed to gain more processing equipment to meet the new demand (Island Grown Initiative, 2009).

Each case study faced challenges that needed to be addressed to implement a successful slaughter facility. They tailored their processing according to what exemption, style of service, and MPPU type best fit the circumstances of the community they were serving.

2.4 Styles and Operations of Mobile Poultry Processing Units

This section will discuss the main different styles of MPPU that are available for SN to consider for operation on Nantucket and provide a description of the slaughtering process.

2.4.1 Types of MPPUs

Two of the first mobile poultry processing units (MPPUs) approved by United States Department of Agriculture (USDA) came to fruition in 2001 (Kentucky State University, 2017). One, a unit in Kentucky by Heifer International and is now owned by Kentucky State University Research Farm, was a 20'x8' gooseneck trailer that was converted into an MPPU (Kentucky State University, 2017). The other unit was produced by the Lopez Community Land Trust and was sold to the Island Grown Farmers Cooperative on Lopez Island, Washington. These units are used to go from farm to farm and allow small scale farmers to process their poultry at a USDA approved level. Adding these units to communities increases sustainable food production and leads to a source of income for farmers.

The New England Small Farm Institute (NESFI)[2] compares two types of MPPUs in their report *Massachusetts Mobile Poultry Processing Units.* The first is an open-air structure that allows airflow through the entire unit (Figure 4). The open air MPPU can be attached to a trailer and moved to different locations as needed.

Figure 3: An open-air prototype MPPU. This is the NESFI's unit in MA. (Image from (MPPU Project, 2022)).

[2] The NESFI is a land-based non-profit organization created by Women in Agriculture, Food Policy and Land Use Reform in Belchertown, Massachusetts (MA)

In the second type of MPPU, all the processing equipment is enclosed in a trailer with full walls and a ceiling (Figure 5). Some enclosed MPPUs can come directly from the manufacturer built to the specifications of the pertinent regulatory organizations.

Figure 4: An enclosed prototype MPPU (Eastern Massachusetts MPPU, 2022).

According to NESFI estimates the open-air prototype would cost between $25,000 to $35,000 compared with $90,000 for the enclosed unit. The NESFI's open-air MPPU was the first in MA and has been operating for around five years.

2.4.2 Steps in the Slaughtering Process

The slaughter process is a straightforward process of killing, scalding, plucking on the "dirty" side and cooling, eviscerating, and chilling on the "clean" side. A basic layout of an MPPU set up is pictured in the diagram below.

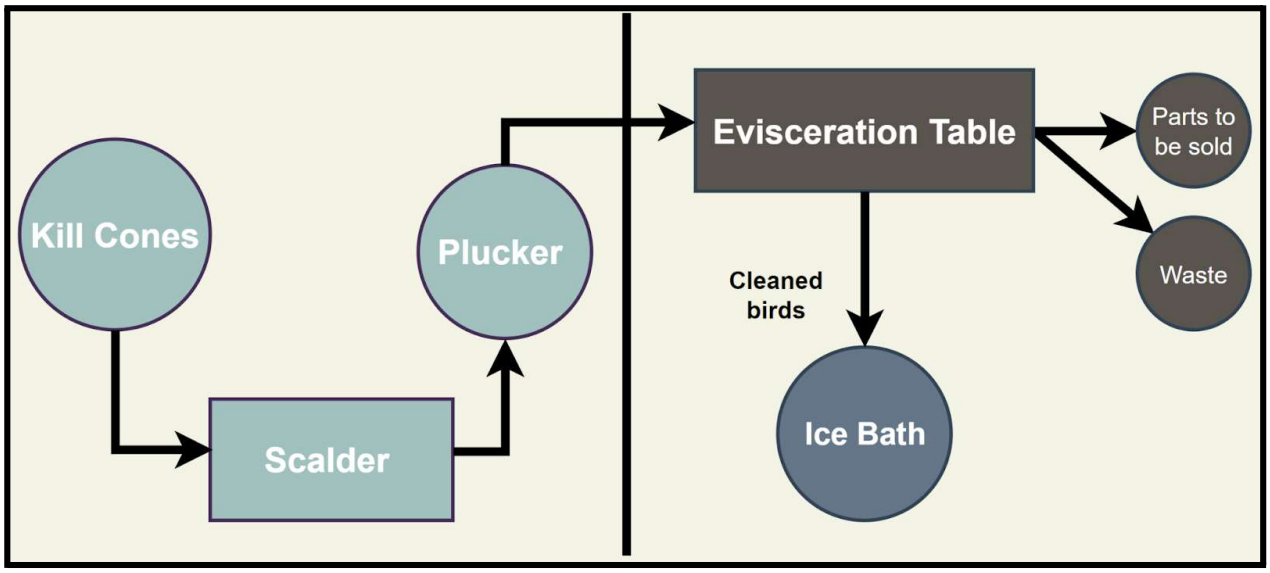


Figure 5: A visual representation of poultry processing

One day before the slaughter the chickens are withheld food to clear their digestive tract. While at the slaughtering site the chicken storage area must remain clean and free of pests. The chicken is then placed upside down into the kill cone (Figure 6). The chicken's head should be sticking out of the cone above the blood collection trough. Using either an electric stun knife or a regular knife the chicken is dispatched and left to drain.

Figure 6: Open-air MPPU with the kill cones on the left, and scalder and plucker centered (Anderson and Hashley, 2012)

Once the stream of blood stops, the chicken is placed into the scalder. The scalder dunks the chickens in hot soapy water a few times to remove some of the oils on the feathers and help the feathers release from the bird. After removal from the scalder the bird is placed into the plucker. The plucker (figure 6) uses a rotating drum and rubber fingers to pluck the chicken. Then the featherless carcass moves to the evisceration table. The organs are then removed and parts that can be sold like the heart, feet, lungs, and liver are separated and the inedible parts put into the trash receptacle. Once cleaned, the carcass is put into an ice bath to be brought to an internal temperature of below 40° Fahrenheit. The chicken can then be packaged for long term refrigeration or freezing. If all of the procedures are followed properly and approval is given by the state and local governments, an MPPU will allow local farmers to process poultry for sale to restaurants and the general public.

3.0 Methods

The goal of this project was to create a plan and set of materials Sustainable Nantucket could use to negotiate with the Nantucket Board of Health and other stakeholders for the development and approval of a Mobile Poultry Processing Unit on island. To achieve this goal, we identified five objectives, which were as follows:

1. Identify applicable federal, state, and local regulations and documentation necessary to create and operate a Mobile Poultry Processing Unit (MPPU).
2. Evaluate the lessons learned by other communities in Massachusetts and elsewhere to try to meet the regulations and requirements necessary to implement MPPUs.
3. Identify and assess the perspectives of the pertinent stakeholders on Nantucket regarding the promotion of small-scale chicken farming and poultry processing on island.
4. Evaluate and determine the most appropriate MPPU technology and operational options for a Nantucket MPPU based on demand and regulations.
5. Develop a business model and other deliverables.

Our team collected data from a variety of sources such as applicable legislation, case studies, field observations, and interviews with relevant stakeholders to determine the steps required in fulfilling our main objectives, and the exact details of how our project would be best implemented for Sustainable Nantucket. Figure 9 is a schematic showing the methods associated with each objective.

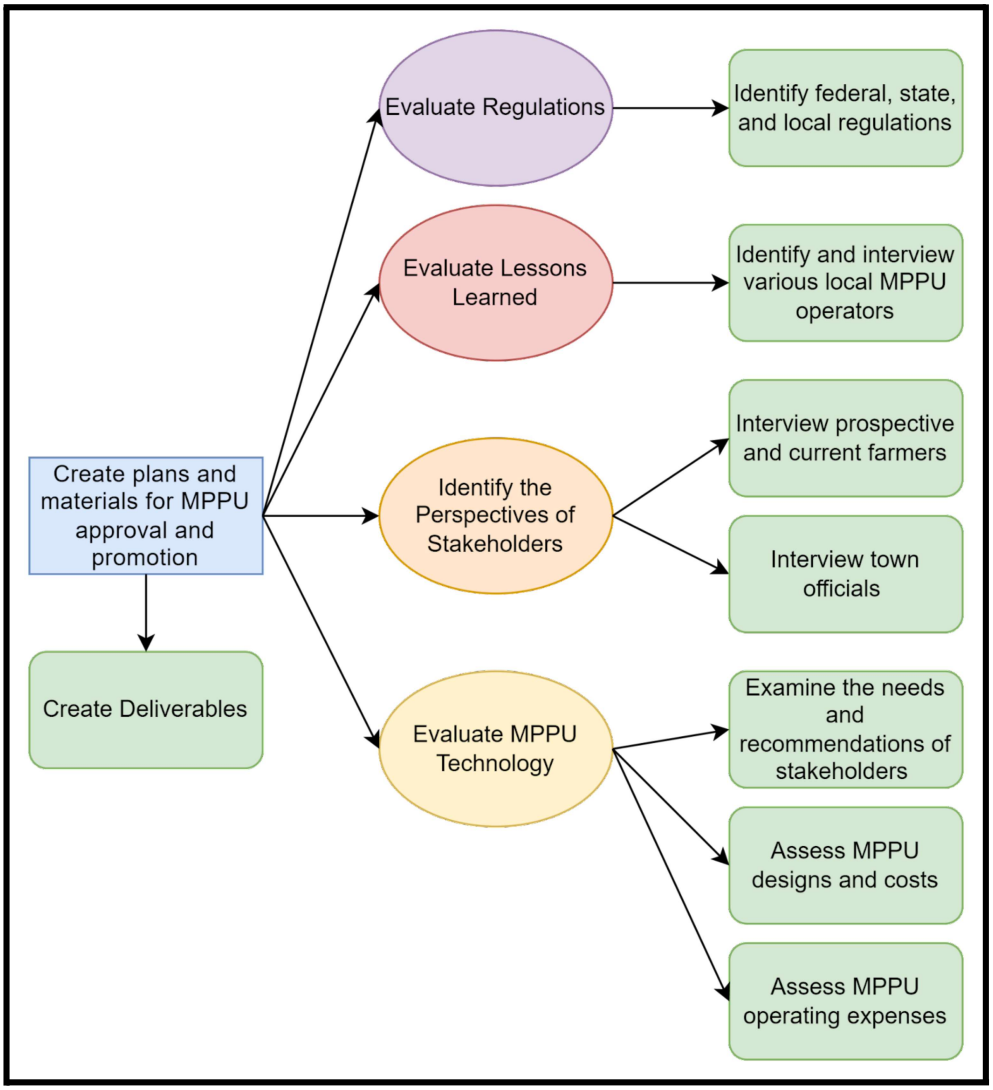


Figure 7: A flow chart of project objectives and tasks

3.1 Objective 1: Identify Applicable Regulations

To identify any barriers to creating and operating an MPPU program on Nantucket, our team conducted background research on the existing applicable regulations at the federal, state, and local levels. We consulted with our sponsor contact, Posie Constable, about the different options for implementing an MPPU on Nantucket to determine which regulations might apply. We interviewed representatives of the Nantucket Board of Health to gauge interest and ensure we addressed any concerns they may have.

We developed the interview outline in consultation with our sponsor. A script with the questions asked presented in Appendix A. We adapted the questions according to the knowledge and experience of the interviewee, and added questions 'on the fly' as warranted by the circumstances. We began each interview with a preamble that explains the nature of the research and solicits interviewee consent. We planned on audio recording interviews but had to take notes instead due to weather conditions, given that most interviews took place outdoors.

3.2 Objective 2: Evaluate Lessons Learned Elsewhere

Our second objective was to evaluate the lessons learned by communities, in Massachusetts and elsewhere, in trying to promote poultry production through the implementation of MPPUs. We found examples of similar programs implemented in other communities, identified the lessons learned, and determined how they have achieved compliance with state and local regulations. The following is a list of locations and groups that have previously implemented MPPUs:

- Martha's Vineyard Agricultural Society (MVAS)/Island Grown Initiative;
- New Entry Sustainable Farming Project (Tufts University, Massachusetts);
- Lopez Island (Washington State);
- New England Small Farm Institute (Massachusetts); and,
- Heifer International (Kentucky).

We attempted to supplement our background research on these efforts to implement MPPUs through interviews with representatives from these groups only some of whom responded to our efforts to set up meetings. We met with representatives from the MVAS and Island Grown Initiative in person while they were operating and learned valuable information about actual

MPPU use. We developed the interview script in consultation with our sponsor and advisors. The script is outlined in Appendix B; topics include waste, sanitation, permit application, and business practices. The questions asked varied by interviewee depending on their relevance to that organization. We followed the protocols discussed in Objective 1 to ensure consent and confidentiality.

3.3 Objective 3: Identify the Perspectives of Stakeholders

We assessed the perspectives of pertinent stakeholders on Nantucket regarding the implementation of small-scale chicken farming and poultry processing on the island. We interviewed stakeholders, including:

- Sustainable Nantucket in order to clarify the organization's vision for MPPUs as well as to get a better sense of the situation on the island regarding the MPPU and small-scale chicken farming;
- Current chicken farmers regarding their interest and all aspects of an MPPU (see Appendix C for the list of questions);
- Prospective chicken farmers to determine potential future interests in raising chickens and an MPPU (see Appendix C for the list of questions); and,
- Officials from Nantucket Waste Options and Sewer Department regarding the disposal of processing waste and water (see Appendix D for the list of questions);

We identified appropriate representatives from these groups in consultation with Sustainable Nantucket and through referrals. The interviews followed the protocols outlined above. Again, we consulted with our sponsor and advisors to develop the interview scripts outlined in Appendix C and Appendix D. We followed the protocols discussed in Objective 1 to ensure consent and confidentiality.

3.4 Objective 4: Evaluate and Determine the Most Appropriate MPPU Technologies and Operational Options for Sustainable Nantucket

Using the data we gathered under the three objectives above, we evaluated the different options and tradeoffs facing Sustainable Nantucket in its choice of MPPU. As indicated in the background chapter, MPPUs vary significantly in cost, capacity, and sophistication, based largely on the different configurations that can be used. The optimal choice of MPPU for Sustainable Nantucket will depend on numerous factors, including:

- The number of chicken farms to be serviced;
- The size of the farms;
- How often the MPPU will need to be moved;
- Processing location;
- Disposal of the waste.

We used data from our interviews and research to fill in some of the questions to the above points, considered and compared these operational options for each type of MPPU to determine to best options. The size of the MPPU depends on the number and types of birds SN and farmers expect to process at a time. The regulations governing the operation of the MPPU depend on the operating location(s) of the MPPU, and what we learned from the Nantucket Department of Public Works (DPW) and Sewer Department about waste disposal. The type of MPPU will be determined by the required capability but should also be optimized to balance our sponsor's needs and budget as well as the farmers' ease of use.

Based on the preferred MPPU, we developed a list of capital expenses and materials required to get the unit operational. First identified were the major expenses mainly consisting of the initial costs of an MPPU, comparing the costs of open-air vs. enclosed units, which will allow our sponsor to compare various options and make an informed final decision. Second, we focused on the recurring expenses from the wages of the operators to the cost of major consumables, principally ice and propane. The expense of proper disposal of waste products also factors into recurring expenses.

3.5 Objective 5: Develop a Hazard Analysis and Critical Control Points Plan and Financial Plan

We assessed the various aspects of an MPPU and found that SN would need a Hazard Analysis and Critical Control Points plan (HACCP) (Appendix E). During our research we also identified the need for a financial plan for SN to properly assess the expenses of implementing an MPPU. The price to slaughter per chicken and the operational costs with the capital expenses can be found in Appendices F and H.

Hazard Analysis and Critical Control Points (HACCP)

A HACCP plan, required by the USDA for any food safety or biological, chemical, and physical hazards, is essential to ensuring that any poultry products sold by small-scale poultry farmers remain untainted and sanitary (Validation, Verification, Reassessment, 2012). The HACCP plan consists of three main parts; the Good Manufacturing Practices (GMP), the Standard Operating Procedures (SOP), and the Sanitation Standard Operating Procedures (SSOP). The GMP describes general safe practices for handling food, and includes topics such as handwashing practices, training, and pest control. The SOP and SSOP explain how often and through what process daily, weekly, and monthly cleaning should be done. SOP and SSOP plans are much more standard throughout the restaurant industry than the GMP. The HACCP is a management system for food safety to identify the various hazards in meat and poultry product production. To ensure safe poultry handling practices the HACCP outlines each potential hazard and how to avoid it. An example of a HACCP diagram is included in Appendix E.

Financial Plan

A financial plan is a plan that identifies the projected income and expenses of a business with the intent of establishing the level at which it will profit (or, in the case of a non-profit organization, financially break even) (Kopp, 2022). In our research, we identified the need for a cost analysis-focused business model for SN to properly implement an MPPU. Most of the expenses were identified through our interviews with the current operators of an MPPU on Martha's Vineyard and current farmers on Nantucket, and through case studies of other operations. These financially quantified options will aid in advising SN on the most

cost-effective options for their vision of a Nantucket MPPU, as well as give a general idea of the cost to operate per bird processed. This objective will involve collecting our recommendations into a separate deliverable with resources for our sponsor.

4.0 Findings

This section discusses our findings both from our interviews on the island and from our research regarding laws and regulations surrounding the licensing and operation of a Mobile Poultry Processing Unit (MPPU). We will provide recommendations for the type of MPPU that SN should procure and operate based on these interviews, and discuss how the applicable regulations should be addressed.

4.1 Gauging the Market for an MPPU: Perspectives of Nantucket Farmers

Nantucket farmers only have only two options for nearly every aspect of business that happens there: it has to happen on island or it must be sourced from the mainland. Nantucket has a healthy farming population interested in raising birds for eggs and meat; however, there is currently no processing service regularly available to Nantucket farmers. Nantucket does not have the advantage of easy access to a slaughterhouse or an MPPU in a neighboring town like several municipalities on the mainland or Martha's Vineyard. To gauge the market for an MPPU we interviewed a majority of the farmers on the island with any stake in growing livestock.

We asked about the farmers' level of interest in an MPPU, their farming practices for any current and former livestock, growth plans, and other livestock processing. They also brought up many aspects we might not have considered about farming on an island that were important factors in their daily operations.

On Nantucket, most farmers and individuals who currently raise chickens only have interest in growing chickens for eggs. About 250 laying birds are currently grown by the farmers we interviewed. Growing chickens for eggs rather than meat requires less labor and less expensive infrastructure to be compliant with regulations. The production timeline for a broiler is much shorter than a laying chicken. Typically, broilers will be slaughtered seven to eight weeks after hatching when they weigh roughly eight pounds, depending on the breed. This timeline allows farmers on Nantucket to raise three to four batches of broilers in one season from April to October. For example, a farmer could raise 200 birds per season without ever having to manage and care for more than 50 at one time. Typically, a laying chicken produces no eggs for the first

18 to 22 weeks of their life and will lay for three years thereafter. When the birds stop laying, they are typically culled to keep feed costs down, and can be processed for meat.

A couple of farmers explained how they handle old layers. One farmer disposes of their layers on their own and is not interested in selling or giving away culled birds for meat at all. A second farmer described how they offer their culled layers to the local community. The chickens are picked up alive and the farmers do not involve themselves in the processing. Several farmers described the meat from laying breeds as tougher and gamier than broilers; however, there is clearly still demand from local communities for any additional protein the farmers can provide.

The only farmers currently growing meat birds regularly are Chris Getoor and Dylan Wallace, who work together to raise and slaughter about 50 broilers each year for their own consumption. Even including the number of laying birds currently eaten on the island, Nantucket does not have any farmers raising birds for meat on a scale that would require an MPPU. However, our interviews have shown that if there were a processing service or equipment available, there would be increased interest from farmers to start growing higher volumes of broilers and other poultry for meat.

Table 1: Farmer Interview Summary

Interviewee	**Organization**	**Current Poultry**	**Goal Poultry**	**Would use the MPPU**
Nicole DuPont	Individual	0 poultry	Broilers and turkeys	Yes
Abby Slosek	Moors End Farm	50 layers	150 layers	Yes
Dan Southey	Washashore Farm	50 ducks	50 ducks + would consider turkeys	Maybe
Tom Larrabee	My Grandfather's Farm	150 layers	450 layers	No
Chris Getoor	Strong Wings Adventure School	50 shared broilers	50 x several batches of broilers	Yes
Dylan Wallace	Eat Fire Farm		1000 broilers	Yes
Aidan Feeney	FogTown Farm	0 poultry	Personal use	Unknown

We asked the farmers to share their interest in growing meat birds should a processing facility become available on the island, and Table 1 summarizes their responses. Chris Getoor and Dylan Wallace indicated a strong interest to expand their production significantly. As a result, it is likely that these two farmers would make up the majority of the processing demand on the island at first. There would be some additional processing demand from farmers returning to the business, such as Nicole Dupont who is interested in raising chickens and turkeys. Because farmers are interested in raising birds other than chickens, SN might strongly consider purchasing equipment capable of processing birds of larger sizes, such as ducks and turkeys. Some processing demand could also come from the end-of-life slaughter of laying birds, however this demand would be much less than that from meat birds. The Moors End Farm indicated an interest in buying 50 laying birds at the start of the season each year and processing them at the end of their productive life. Assuming the chickens lay for approximately three years, Moors End would expect to have approximately 50 chickens to cull each year. The 50 chickens culled, would be replaced by 50 new layers each spring to maintain a flock of approximately 150 birds.

We also discussed the potential of processing four-legged livestock in the mobile processing unit (MPU). The farmers we interviewed were excited about the convenience of having local processing capability on island. Several farmers from both Nantucket and Martha's Vineyard shared their frustration about the logistical challenges of taking livestock off island by ferry for processing, including costs, limited ferry schedules, and the problems that ferry cancellations could cause, particularly that livestock might be stuck in a trailer for long periods or the meat might be spoiled. These challenges have meant that few farmers on Nantucket raise animals for meat. Nicole Dupont has a few sheep that graze the fields under the solar panels at Bartlett's Farm, Moors End Farm raises a few pigs, and some other animals are kept as pets. Nantucket would benefit from four-legged animal processing capability to eliminate the need to return to the mainland for processing. However, the current demand and interest from farmers would not make the development and operation of a more broad-based MPU feasible at this time. For these reasons, we focused on regulations and recommendations surrounding poultry processing for this project.

4.2 Observations from the Martha's Vineyard MPPU Operation Site

We were given the opportunity to visit Morning Glory Farm by Lauren Lynch with Martha's Vineyard Agricultural Society (MVAS). MVAS has an MPPU that has been in operation since 2012; it operates on a weekly schedule at various locations on Martha's Vineyard and processes roughly 2,000 birds a year. We visited on November 1, 2022 and were able to observe how their MPPU operates. The MVAS MPPU is stored and transported in a small, enclosed trailer that can be easily towed by a pick-up truck. Staff unloaded the various pieces of equipment from the trailer and set them up on a bed of wood chips. The wood chips are placed on the ground to absorb any liquids that fall and keep them out of the ground table. As shown in Figure 10, the kill cones, scalder, and plucker comprise the "dirty side" of the operation. The "clean side" includes the evisceration table, prechill, ice baths, and waste disposal containers. Staff used a pop-up tent over the "clean side" equipment to prevent contamination from rain and other airborne debris (e.g., leaves).

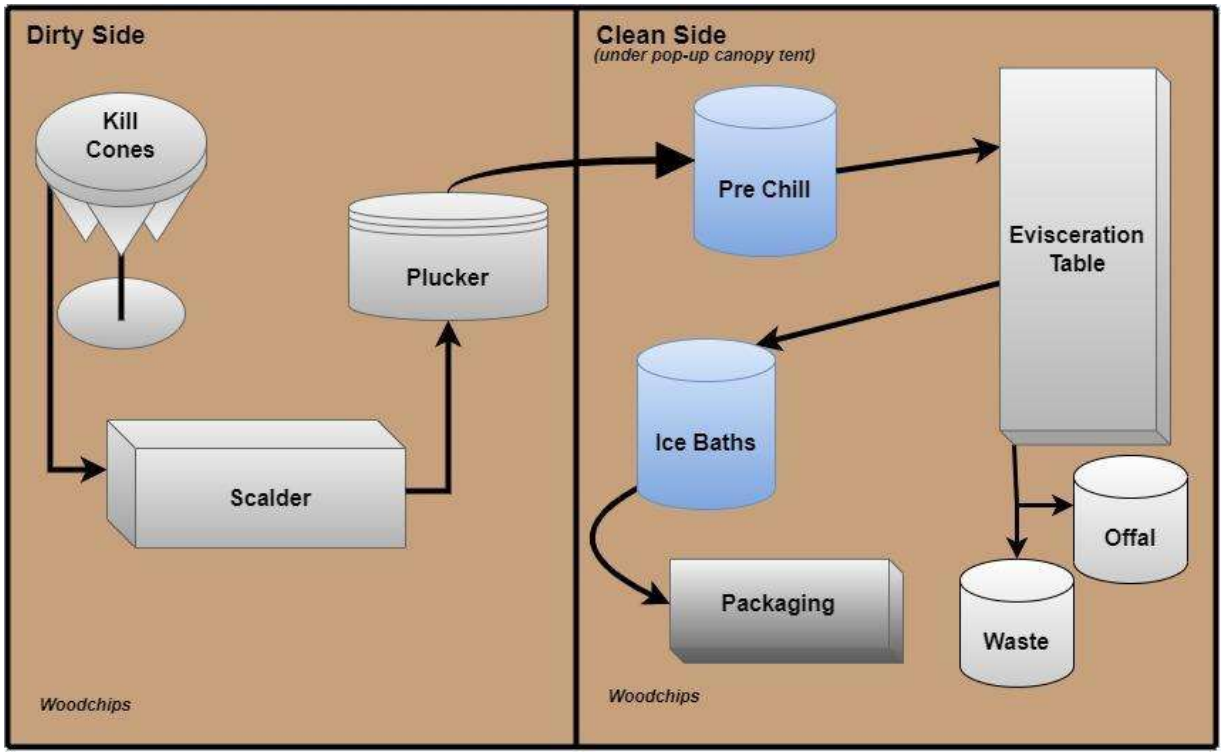


Figure 8: Diagram of the MPPU setup used by MVAS

Figure 9: Image of the trailer used to store and transport MVAS MPPU equipment

From observing the MVAS unit in action and speaking with its operators, we were able to learn valuable information about the logistics of operating a MPPU in the field. Matthew Dix and his colleague planned to process 70 chickens using the MPPU on the day we observed. Mr. Dix indicated this is typically the number of birds they can process at one time, although they have processed up to 150 chickens or 50 turkeys in a day. They estimated it would take around six hours to kill, scald, pluck, and clean the 70 birds, including set up time and an hour for lunch. The operators typically take their lunch break after the slaughtering is complete to ensure the birds cool adequately in the ice baths. Mr. Dix estimated that they typically use around 25 pounds of propane[3] for 75 birds. The propane is used to heat the water for the scalder and provide warm water for workers to wash their hands and equipment. Mr. Dix said they typically use around eight pounds of ice per chicken, which is more than the five pounds of ice per bird recommended by the Massachusetts Board of Health issue FP-08 (Massachusetts Department of Public Health, 2015). In addition, MVAS and the Island Grown Initiative provided us with sample copies of the MPPU documentation, including the Hazard Analysis Critical Control Point plan, logs, and records. We used the information gleaned from the visit to Morning Glory Farm to help develop our financial plan and a step-by-step MPPU operations manual for SN.

4.3 Sanitization and Waste Disposal

Due to strict environmental laws and Nantucket's widespread wetlands, it is essential for SN to use an MPPU system that will protect the environment. During the slaughter process, wastewater needs to be collected and properly processed. How exactly wastewater is collected will depend on the direction SN chooses to go with processing location and MPPU selection. Categories of waste produced by the slaughtering process include blood from the kill cones, water from the scalder, plucker, and ice baths, feathers from the plucker, guts and other offal from the evisceration process, and potentially wood chips to absorb any contaminated water and cleaning chemicals that are washed onto the ground. Table 2 breaks down the types of waste by their sources and provides an estimated volume produced by each processing operation or by each chicken processed. These estimates are based on observations from the operation of the MPPU in Martha's Vineyard and from our interview with Mathew Dix about the operation of the unit.

[3] A typical propane tank for home gas grill uses a 20lb tank

Table 2: Summary of Waste Production by an MPPU

Waste Type	Sources	Quantity
Water	Scalder	20-30 gallons/operation
	Plucker	<1 gallon/chicken
	Ice Baths	2 gallons/chicken
	Sanitization	5-10 gallons/clean
Cleaning Chemicals	Sanitization	<1 gallon/clean
Feathers	Plucker	1-3 lbs of wet feathers/chicken
Blood	Kill Cones	<5 gallons/operation
Guts/Offal	Evisceration	5-10 gallons/operation
Wood chips	Wastewater Absorption	~2 cubic yards/operation

J.P. Caron, a manager working for the Nantucket Department of Public Works (DPW) through the company Waste Options, suggested that we use wood chips to soak up the wastewater as does MVAS. The wood chips could be provided by the DPW with the understanding that after they are used they would be collected and disposed of in the digester. The digester is run by the DPW to break down yard waste, road kill, and deer carcasses. The compost is then sold for use on the island. From the perspective of the DPW, accepting the wood chips from the processed poultry is beneficial because the nutrients from the water absorbed by the wood chips will be added to the compost that comes from the digester. Solid waste from chicken processing could also be sent to the digester to avoid the complicated composting process and land needed to compost it properly on a farm.

Sustainable Nantucket has two options for disposing of waste water. The DPW is able to take the water and mix it with wood chips so it can be put into the waste digester. The water could also be pumped into the sewage treatment plant. The water would be collected at the rate used for food trucks at $5 per 100 gallons of waste. Regardless of the destination of the water, the type of sanitization chemicals that are used are very important. If the wrong chemicals are used it could harm bacteria in the processing facilities. If SN were found to be using harmful

chemicals, they could be fined. SN should continue discussing the details with the DPW and Sewer Department.

Another safety requirement SN could have is staff trained with the USDA ServSafe program. The ServSafe program is an easy online class that teaches people proper food temperature safety.

4.4 Processing Location

The location of the MPPU when slaughtering is another issue that SN needs to address. We explored multiple options for processing locations, from various farms to town land like the Sewer Department. Choosing a location where any water runoff will not harm wildlife or water supplies is very important. J.P. Caron also recommends keeping MPPU operation out of the public eye as much as possible, as the blood and viscera is likely to draw negative reactions from passersby. The processing location must have access to clean water, either from a well that has been tested in the last six months or from town water. The location must also have access to electricity to run the motors in the processing equipment. If electricity is not available a generator could be used.

Processing on a farm where the chickens are located would be ideal, however, this might not work in some situations. For example, the farm may not have appropriate space that meets the guidelines regarding the protection of wetlands, preventing the contamination of food crops, and collecting wastewater while meeting BoH standards. If processing is done on a field, it is important to make sure all these guidelines are met. The ground under the processing area must be covered in wood chips to absorb fluids and keep them from contaminating the soil and entering the groundwater.

We spoke with David Gray, the Director of the Nantucket Sewer Department, and Roberto Santamaria, the Director of the Nantucket Board of Health (BoH), about operating the MPPU on the grounds of the wastewater treatment plant at South Shore Road to simplify the disposal of wastewater. Both parties were open to the idea as the area already serves as a deer tagging station during hunting season. David Gray noted this would require negotiation with the town to determine the details of an agreement. To facilitate collection of wastewater, a sealed concrete pad with drainage around it could be used as a location for processing. The drainage would be plumbed into the Sewer Department’s on site collection to be treated.

4.5 MPPU Selection

In Table 3, we describe the costs, advantages, and disadvantages of the three types of MPPUs that might be most appropriate for Nantucket.

The mounted open-air trailer is the easiest to clean, as it is accessible from the outside, but is open to the elements even when not in use. At $25,000-30,000, it is cheaper than the camper style ($90,000) but more expensive than the landscape style trailer ($25,000) but would require a larger truck to tow. The enclosed camper style unit is the most expensive to purchase and maintain but makes collecting wastewater and any cleaning products easier as it is all contained inside in a dedicated area. In the last option we examined, the equipment is stored and transported in a landscape style trailer but must be removed and set up for processing. The equipment should be set up under a canopy tent to avoid contamination by rain, leaves, and other debris. This unit is the cheapest option of the three, but requires more labor time for setting up, breaking down, and disposal of waste and water. It is more difficult to collect the waste and water from this unit, these operations can be easily achieved through the use of buckets and wood chips, or processing in a location where everything is washed down and drained appropriately.

We recommend that SN consider an open-air MPPU that is stored in an enclosed trailer when not in use. The trailer can be used to store all reusable materials necessary for slaughtering small poultry, chickens, and turkeys. A list of recommended materials is included in Appendix I. The scalder, plucker, and kill cones come in various sizes for different types of poultry. SN should also provide the cleaning equipment to follow USDA and Massachusetts guidelines for the safe handling of poultry.

The model of MPPU we recommend for SN to use is very similar to Martha's Vineyard's MPPU. It includes an enclosed trailer similar to the one shown in Table 3. The enclosed trailer will protect the MPPU from the elements during storage and transportation. It is also able to be towed by a small truck, which means it can be more operationally flexible if conditions on island change. This style of MPPU will also be helpful to the farmer for moving ice and waste products. For example, while the equipment is being set up, the farmer can use the trailer to pick up the ice.

Table 3: Breakdown of the Different Types of MPPUs

 **MPPU Type:** ***Open Air Trailer Mounted Unit*** **Description:** Mounted and operated on an open trailer bed under a pop-up canopy tent	**Estimated Cost:** $25,000-$35,000 **Pros:** Short set-up and clean up times. Easily towed and maintained. **Cons:** Open to the elements. Wastewater is difficult to contain and collect as the open style of the trailer allows water and waste to fall to the ground. Cramped work area. Need to hire company to build.
 **MPPU Type:** ***Enclosed Camper Style Unit*** **Description:** The processing machinery is operated from within the fully enclosed trailer.	**Estimated Cost:** $90,000 **Pros:** Components are protected from the elements. Unit contains all wastewater including spillages, and limits contamination of ground. Air-conditioned workspace. Can be certified for larger production numbers **Cons:** Most expensive option. Requires a large truck for towing. Cramped workspace for processing. Need to hire company to build.
 **MPPU Type:** ***Enclosed Storage Open-Air*** **Description:** Stored inside an enclosed trailer but set up outside of the trailer under a pop-up canopy tent.	**Estimated Cost:** $25,000 **Pros:** Components are stored away from the elements. Cheaper than the other units. Similar setup has worked for multiple years for MVAS. Expandable work area. Easily towable. No need to hire external company for assembly **Cons:** Long setup time. Wastewater is difficult to contain and collect. Requires more drying time before storage.

We priced out the cost of buying each individual component of the MPPU and buying a pre-made kit from a manufacturer consisting of a complete MPPU including the trailer and all the equipment (kill cones, scalder, etc.). Table 4 summarizes the costs of just the major components in a pre-made kit versus separate components. Although buying the separate components is more expensive, purchasing the components separately will allow SN to customize the unit to fit the needs of the local farmers. For example, SN specifically wants a scalder with a rotary rack because it will allow for quick "hands off" scalding.

Table 4: Price Comparison between Pre-Made and Custom Kits

	Plucker	*Scalder*	*Kill Cones*	*Total*
Pre-Made Kit	28"x23"x33"	w/ roto dunker, 30"x27"x32"	8 cones For broilers	$5,716.00
Purchased Individually	28"x23"x33"	w/ rotary rack, 28"x30"x22"	5 larger cones Large and small poultry	$8,428.00

4.6 Processing Expenses

In addition, part of the processing fee to use the MPPU will go towards purchasing new cleaning supplies and the approved chemicals and towards the maintenance of the unit.
Labor on Nantucket is very expensive. Most jobs pay more than $25 per hour. A part-time job that only offers six-hour days on an irregular schedule will be hard to staff, especially as the workers will need to undergo training in the operation of an MPPU. We assessed the price per bird, the irregular schedule of an individual working the MPPU, a living wage of $21 per hour for a single adult with no children on Nantucket, and what our sponsor is willing to pay in order to estimate the wages necessary (MIT, n.d.). Housing is extremely limited and because the cost of living is so high, the effective minimum wage has increased. When calculating the cost of slaughter per chicken we used a conservative estimate of $30 per hour. As a result, calculating for two workers for a six hour day processing 75 birds, labor makes up a majority of the processing cost at $4.80 per bird.

The second largest cost for processing will be ice. We contacted the Nantucket Ice House to get pricing for large periodic orders of ice. They would be capable of meeting the demand and

offered the price of $15 per 40lbs of ice. This price is much better than we could find anywhere else but the cost still comes out to $3 per chicken at 8lbs of ice per chicken. Labor and Ice make up a majority of the per-chicken cost for processing and the rest would come from consumables like gloves, propane, and cleaning supplies.

SN can provide the consumables to the farmer for the slaughter at a slightly increased processing fee but the farmer may elect to bring their own and in some cases may need to provide their own if SN does not have them to provide, such as different sized poultry bags. Another option for the farmer to reduce the cost of processing, is for them to provide an individual properly trained to substitute for SN provided labor.

Going forward there are various paths that SN can take to reduce the cost to the farmers. As a nonprofit, one of the best options for SN to explore would be the purchase of an industrial ice machine. SN could request another grant to allow them to acquire the machine and produce their own ice thus allowing them to charge the farmers a decreased price per pound of ice as well as not pay for the delivery fee from Nantucket Ice. Sustainable Nantucket has a large grant that it is able to use to cover many expenses. We have included some items that Sustainable Nantucket could purchase to help them lower processing costs in Appendix G, the list of capital expenses.

5.0 Conclusions and Recommendations

Through our research, we have determined that while there is not enough current chicken production on Nantucket to warrant the purchase of an MPPU, there is sufficient interest from farmers to increase chicken production if an MPPU were available. Based on these results, we believe that there will be sufficient demand for an on-island MPPU to justify investment by Sustainable Nantucket. Below are our specific recommendations for Sustainable Nantucket (SN) to consider when implementing an MPPU:

5.1 We recommend Sustainable Nantucket consider an open-air MPPU stored in a closed trailer.

Throughout our research process, we have been narrowing down what style of MPPU would be most appropriate for Nantucket based on the projected demand from farmers and their interest in raising different types of poultry. Our recommendation is that Sustainable Nantucket should establish an open-air MPPU that is stored in an enclosed trailer when not in use. The trailer will store all materials except for “day of slaughter” purchases–such as ice, propane, bags, etc.–that are necessary for slaughtering small poultry, chickens, and turkeys.

We recommend Sustainable Nantucket purchase an enclosed trailer similar to the one currently used by Martha's Vineyard Agricultural Society (MVAS) that will protect the MPPU from the elements during storage and transportation. The trailer can be towed by a small truck, which means the MPPU will be more accessible to farmers should Sustainable Nantucket choose to use the unit at more than one location or change the storage location. The closed-trailer configuration of this MPPU will also be helpful to farmers and operators for transporting ice and waste products. For example, while the equipment is being set up in the open air, the farmer can use the trailer to pick up the ice if Sustainable Nantucket or the farmer does not elect to have the ice delivered to the site by the supplier.

5.2 We recommend that Sustainable Nantucket consider purchasing an MPPU with flexible capabilities.

We compared the cost of buying each individual component of the MPPU to the cost of a pre-made kit from a manufacturer and determined that purchasing the components individually allows Sustainable Nantucket to be more flexible in the design of their unit. To see a breakdown of costs see Appendix G. Assembling the MPPU from scratch allows Sustainable Nantucket to customize it to fit the demand of farmers and upgrade equipment as they expand. All components should be capable of processing poultry up to the size of a turkey, easy to clean, and small enough to fit in an enclosed trailer. We recommend the purchase of a rotary scalder instead of other styles for a more hands-off process to save on time. We recommend that Sustainable Nantucket references Appendix G of this report when they make their purchases.

5.3 We recommend Sustainable Nantucket provide EPA approved chemicals to clean and sanitize the equipment per USDA guidelines.

The MPPU should use cleaning equipment that meets the USDA and Massachusetts guidelines for the safe handling of poultry. We recommend that each farmer use the cleaning supplies to clean before and after slaughter in the manner outlined in the operations manual in Appendix H. The chemicals Sustainable Nantucket should provide should be from the EPA list of environmentally friendly degreasers and sanitizers to protect wetlands in case of any runoff and to protect the cultures in the digester. Sustainable Nantucket should use the money from the fees collected from each slaughter to replenish the cleaning supplies as needed. For a detailed list of cleaning supplies that have also been approved by J.P. Caron with Nantucket Waste Options for disposal in the digester, see Appendix G. Along with following proper procedures, using the chemicals recommended by EPA will allow farmers to legally sell the poultry they raise for on-island consumption.

5.4 We recommend that the MPPU processing be done at, and the unit be stored at, the Nantucket Wastewater Treatment Plant.

The Director of the Nantucket Sewage Department, David Gray, expressed willingness to allow SN to store the trailer and conduct the processing at the Wastewater

Treatment Plant given appropriate approval by state and local officials. The location has easy access to water, electricity, and bathrooms, and has the facilities to dispose of wastewater from processing and cleaning the unit. In addition, there is plenty of space for the unit to be stored when not in use. Roberto Santamaria, director of the Nantucket Board of Health, also expressed his preliminary support for the idea of processing the poultry at the Wastewater Treatment Plant as the location already has a deer tag station and definitely has the space and facilities that the operators of the unit will need.

5.5 We recommend that SN work with local officials to allow safe disposal of the wastewater and of solid waste in current municipal facilities.

Director David Gray indicated that wastewater can likely be disposed of directly at the Sewage Department facilities. We recommend that Sustainable Nantucket collect as much water as possible before it lands on either the non-porous surface with drainage or the wood chips that the processing is being done on. Sustainable Nantucket might consider having the farmers or operators of the unit transport the wastewater collected to the Sewer Department at a cost of $5 per l00 gallons if the processing is not being done at the Sewer Department location.

We recommend that Sustainable Nantucket arrange for all solid waste to be collected and disposed of in the digester at the Nantucket Transfer Station. J.P. Caron from Waste Options told us they would gladly take any solid waste in the digester including feathers, offal, and wood chips that are used as absorbent on the ground.

5.6 We recommend that farmers that use the MPPU have a ServSafe certification.

Having a ServSafe certification, while not required, is recommended to farmers for the safe handling of raw poultry. This is a program recommended by OSHA and the USDA for proper food safety handling. We recommend that Sustainable Nantucket require that one or more of the workers running the MPPU at any given time have the ServSafe certification.

5.7 We recommend that the process of slaughter follows the guidelines in Appendix H.

The guidelines in Appendix H provide detailed procedures that should be followed before, during, and after slaughter. These protocols are based on regulations and recommendations from the state, Massachusetts Department of Public Health (MassDPH), and USDA that are relevant to the MPPU and other recommendations we made surrounding the type of MPPU and processing location.

5.8 We recommend that Sustainable Nantucket follow the model HACCP (Appendix E) as a guideline when creating their own to apply for a license from MassDPH.

We recommend that Sustainable Nantucket follow Tuft's HACCP as it is one of the only examples of an HACCP for an MPPU currently in operation; it is what we based our model HACCP on. It will provide Sustainable Nantucket with safety guidelines required by the state and federal regulatory agencies.

References

Akinyemi, O. M. (2007). *Agricultural production: Organic and conventional systems*. Science Publishers. https://ebookcentral.proquest.com/lib/wpi/detail.action?docID=3404304

Building an On-farm Poultry Processing Facility. (2012). New Entry Sustainable Farming Project. Retrieved October 5, 2022, from https://www.sare.org/wp-content/uploads/MPPU-Replication-Guide.pdf

Bureau of Environmental Health. (2015, June 30) *The use of mobile poultry processing equipment under USDA exemptions as outlined in the poultry products inspection act.* Massachusetts Department of Public Health. https://www.mass.gov/doc/the-use-of-mobile-poultry-processing-equipment-under-usda-exemptions-as-outlined-in-the-poultry/download

Corné J., R., Glas, G., & Jochemsen, H. (2017). Sustainable Livestock Farming as Normative Practice. *Philosophia Reformata*, 82(2), 216–240. https://www.jstor.org/stable/26548047

Delmarva Peninsula. (2021, April 27). WorldAtlas. https://www.worldatlas.com/peninsulas/delmarva-peninsula.html

Economic Research Service. (2022, December 1). *Per capita availability of chicken higher than that of beef*. USDA. https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58312

Elkhoraibi, C., Blatchford, R. A., Pitesky, M. E., & Mench, J. A. (2014). Backyard chickens in the United States: A survey of flock owners. *Poultry Science*, 93(11), 2920–2931. https://doi.org/10.3382/ps.2014-04154

Elkhoraibi, C., Pitesky, M., Dailey, N., & Niemeier, D. (2017). Operational challenges and opportunities in pastured poultry operations in the United States. *Poultry Science*, 96(6), 1648–1650. https://doi.org/10.3382/ps/pew448

Fiber-Ostrow, P., & Lovell, J. S. (2016). Behind a veil of secrecy: animal abuse, factory farms, and Ag-Gag legislation. *Contemporary Justice Review*, 19(2), 230–249. https://doi.org/10.1080/10282580.2016.1168257

Food Protection Program Policies, Procedures and Guidelines. (2015). Massachusetts Department of Public Health.

https://www.mass.gov/doc/the-use-of-mobile-poultry-processing-equipment-under-usda-exemptions-as-outlined-in-the-poultry/download

Google. (n.d. a). [Nantucket Island and Martha's Vineyard]. Retrieved September 14, 2022 from https://www.google.com/maps/@41.3748494,-70.5346285,10.72z

Google. (n.d. b). [Lopez Island]. Retrieved September 14, 2022 from https://www.google.com/maps/place/Lopez+Island/

Good Manufacturing Practices For Food, 105 CMR 500.000, Massachusetts Department of Public Health (n.d.). https://www.mass.gov/doc/105-cmr-500000-good-manufacturing-practices-for-food-0/download

Guidance for determining whether a poultry slaughter or processing ... Guidance for Determining Whether a Poultry Slaughter or Processing Operation is Exempt from Inspection Requirements of the Poultry Products Inspection Act . (2006). Retrieved September 14, 2022, from https://www.fsis.usda.gov/guidelines/2006-0001

Susan Guthrie, Sarah Giles, Fay Dunkerley, Hadeel Tabaqchali, Harshfield, A., Ioppolo, B., & Manville, C. (2018). *The impact of ammonia emissions from agriculture on biodiversity*. RAND Corporation. https://royalsociety.org/~/media/policy/projects/evidence-synthesis/Ammonia/Ammonia-report.pdf

Hashley, J., & Gillan, J. (2022, August 3). *Mobile poultry processing unit farm and food safety man*. SARE Northeast. Retrieved September 28, 2022, from https://northeast.sare.org/wp-content/uploads/MPPU-Safety-Guide.pdf

Home. (n.d.). New England Small Farm Institute. Retrieved September 26, 2022, from https://www.smallfarm.org/

Island Grown Initiative Poultry Program on Martha's Vineyard. (n.d.). Sustainable Agriculture Research and Education Projects. Retrieved October 5, 2022, from https://projects.sare.org/sare_project/cne08-039/

Jiang, J., Stevenson, D. S., Uwizeye, A., Tempio, G., & Sutton, M. A. (2021). A climate-dependent global model of ammonia emissions from chicken farming. Biogeosciences, 18(1), 135–158. https://doi.org/10.5194/bg-18-135-2021

Kentucky State University: Kentucky State University Mobile Chicken Processing unit one of few in the country. Kentucky State University. (n.d.). https://www.kysu.edu/news/2017/11/kentucky-state-university-mobile-chicken-processing-unit-one-of-few-in-the-country.php

Kraham, S. J. (2017). Environmental Impacts of Industrial Livestock Production. In G. Steier & K. K. Patel (Eds.), *International Farm Animal, Wildlife and Food Safety Law* (pp. 3–40). Springer International Publishing. https://doi.org/10.1007/978-3-319-18002-1_1

Living Wage Calculation for Nantucket County, Massachusetts. (n.d.). MIT. Retrieved December 5, 2022, from https://livingwage.mit.edu/counties/25019

Lopez Community Land Trust. (n.d.). *Sustainable Agriculture*. Sustainable Agriculture & Rural Development. https://www.lopezclt.org/sustainable-agriculture/

Mass. Gen. Laws, Ch 111 §151 (n.d.). https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section151r

Massachusetts Dept. Of Public Health Bureau of Environmental Health. (2009). MDPH Participation in a Pilot Program on Mobile Poultry Processing. Retrieved from https://www.mass.gov/doc/mppu-reviewpdf/download

Massachusetts Statutes, codes, and regulations for Meat and Poultry Slaughter and Processing. Legal research tools from Casetext. (2022). From https://www.mass.gov/how-to/apply-for-a-license-to-process-meat-and-poultry

Massachusetts MPPU Project New Entry Sustainable Farming Project | New Entry Sustainable Farming Project. Retrieved October 5, 2022, from https://www.nichemeatprocessing.org/wp-content/uploads/2019/07/Massachusetts-MPPU-Project_JHashley.pdf

MDPH Participation in a Pilot Program on Mobile Chicken Processing Final Report. (2009). Massachusetts Department of Public Health. Retrieved October 5, 2022, from https://www.mass.gov/doc/mppu-reviewpdf/download

MEAT+POULTRY. (2021, August 4). *Slaughter on the move*. MEAT+POULTRY RSS. Retrieved September 26, 2022, from https://www.meatpoultry.com/articles/25313-slaughter-on-the-move

Moyer, J. W. (2017, August 31). Seven sentenced after animal rights activists film abuse at chicken farms. Washington Post.

https://www.washingtonpost.com/local/public-safety/seven-sentenced-after-animal-rights-activists-film-abuse-at-chicken-farms/2017/08/31/9c3656f4-8e6a-11e7-8111-e841db675815_story.html

Mumaw, R. (2020). *Mobile processing for Backyard Chickens*. Hobby Farms. https://www.hobbyfarms.com/mobile-processing-for-backyard-chickens/

NW Local Meats. (n.d.). NW Local Meats. Retrieved October 5, 2022, from https://www.nwlocalmeats.com

Roberts, B. (2020, August 18). *Homesteading Gains Popularity During Pandemic*. Spectrum News 1. Retrieved November 8, 2022, from https://spectrumnews1.com/ky/louisville/news/2020/08/18/homesteading-gaining-popularity

Rothrock, M. J., Gibson, K. E., Micciche, A. C., & Ricke, S. C. (2018). Pastured Poultry Production in the United States: Strategies to Balance System Sustainability and Environmental Impact. *Frontiers in Sustainable Food Systems*. https://doi.org/10.3389/fsufs.2019.00074

Ruth-McSwain, A. (2012). Eating green: Coverage of the locavore movement. *Journal of Extension,* 50(5). https://archives.joe.org/joe/2012october/pdf/JOE_v50_5a7.pdf

Striffler, S. (2005). *Chicken: The dangerous transformation of America's favorite food*. Yale University Press. https://ebookcentral.proquest.com/lib/wpi/detail.action?docID=3420197

Supplemental Regulations for Meat and Poultry Slaughter and Processing. 105 CMR 500.030, Retrieved October 5, 2022, from https://casetext.com/regulation/code-of-massachusetts-regulations/department-105-cmr-department-of-public-health/title-105-cmr-500000-good-manufacturing-practices-for-food/supplemental-regulations-for-meat-and-poultry-slaughter-and-processing/section-500030-general-requirements-and-exemptions

Thornton, P. K. (2010). Livestock production: Recent trends, future prospects. *Philosophical Transactions: Biological Sciences*, *365*(1554), 2853–2867. http://www.jstor.org/stable/20752983

Tonsor, G., Lusk, J., & Schroeder, T. (2021). *Impacts of New Plant-Based Protein Alternatives on U.S. Beef Demand*.

https://agmanager.info/sites/default/files/pdf/PlantBasedProteinAlternatives_FullReport.pdf

Town and County of Nantucket Massachusetts (2020). *How many people live on Nantucket? FAQs,* Retrieved from https://www.nantucket-ma.gov/Faq.aspx?QID=289

Trends in U.S. Agriculture - Broiler Industry. (2018, May 4). USDA National Agricultural Statistics Service. https://www.nass.usda.gov/Publications/Trends_in_U.S._Agriculture/Broiler_Industry/index.php

Tufts University. (n.d.). *New Entry Sustainable Farming Project*. Eastern Massachusetts Mobile Poultry Processing Unit (MPPU) | New Entry Sustainable Farming Project. Retrieved October 5, 2022, from https://nesfp.nutrition.tufts.edu/farmer-training/livestock-poultry/poultry-resources/eastern-massachusetts-mobile-poultry-processing

Tufts University. (n.d.). *New Entry Sustainable Farming Project*. New Entry Sustainable Farming Project. Retrieved October 08, 2022, from https://nesfp.nutrition.tufts.edu/about

UN Department of Economic and Social Affairs. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations. https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Validation, Verification, Reassessment, 9, 417 C.F.R. 563 (2012). https://www.ecfr.gov/current/title-9/chapter-III/subchapter-E/part-417/section-417.4

Appendix A: Board of Health Interview Script

Questions for Roberto Santamaria, Director of the Nantucket Board of Health
Preamble:

During this interview, we will ask you questions about the regulations surrounding implementing an MPPU in Nantucket. We will use the information we gather to help guide our team while researching how to implement an MPPU with the non-profit Sustainable Nantucket effectively.

Your name and other information such as job title and place of employment may also be included in the publication. If you would like for these to be omitted and remain anonymous you may say so. If you would like to abstain from answering any questions you may. You will also have a chance to review notes taken from this interview and correct or omit any statements you wish.

1. Aside from what we have already prepared, is there anything else we need to address?
2. What are your opinions on conducting processing at the Sewer Department property?
3. Are the EPA approved chemicals we would like to recommend sufficient?
4. What would you look for in a processing location?
5. How often does the water in the chill buckets and scalder need to be changed?
6. What sort of facilities does the MPPU need on site?
7. What are requirements for transportation of the finished product?

Appendix B: MVAS and IGI Interview Script

Questions for MV personnel
Preamble:

During this interview, we will ask you questions about the challenges experienced with implementing an MPPU in your community. We will use the information we gather to help guide our team while researching how to implement an MPPU with the non-profit Sustainable Nantucket effectively.

Your name and other information such as job title and place of employment may also be included in the publication. If you would like for these to be omitted and remain anonymous you may say so. If you would like to abstain from answering any questions you may. You will also have a chance to review notes taken from this interview and correct or omit any statements you wish.

Some questions might be skipped depending on their relevance to the interviewee.

1. Were you part of the process of starting the MPPU?
    a. If yes
        i. What was your role?
        ii. Would you be willing to share your contact with us so we can hold a follow-up interview and discuss the process that you went through?
        iii. When did you start the program?
        iv. What was your process for getting approval from Mass DPH/licenses?
        v. How has your business plan changed from the initial proposal?
    b. If no
        i. Could you provide us with the contact of anyone majorly involved in getting through the process?
2. What do you do with waste (with and without sanitizing chemicals) (compost or trash)?
3. What is your sanitization procedure? Do you do the three-step bleach, wipe, and water spray or do you go further?
4. Do you believe the estimates that the USDA and Massachusetts DPH provided for ice use are accurate? (1lb of ice/lb of meat)
5. Do you have farmers bring you the chickens or do you bring the MPPU to each farm?
6. How has the public reaction been (mainly for Martha's Vineyard)?
7. How did MPPU or chicken farming demand change after the first year or so of operation?
8. Roughly how many farms do you service per year (best estimate)?
9. Roughly how many chickens do you process per year (best estimate)?
10. Does Martha's Vineyard have any programs in place to help non-farmers raise chickens (similar to what Posie is doing)?
11. Have you had any demand or requests for a non-poultry MPU?
12. Are there any pieces of advice that you think would benefit a new MPPU operator?

To help determine the appropriate MPPU

13. What type of MPPU do you use?
14. Where did you purchase it?
15. How much solid waste do you end up with?
16. What led you to choose this type? Specifically, in regard to:
    a. operational regulations and guidelines
    b. Sanitization practices

    c. Waste disposal practices
    d. Freezing times
    e. Transportation
17. About Statistics
18. How many chickens or other birds are processed per day?
19. What are you charging farmers?
20. The number of people involved in the processing?
21. How much ice do you use per 100 birds?
22. How much propane do you go through?
23. How long does the MPPU take to set up? To clean up?

Posie's Questions for MV

24. Do you have a permit for each serviced town? Did the permit process differ between towns?
25. How often does MA DPH come for inspections?
26. Do farmers need a certificate of where their chicks were purchased? What if they hatch them themselves?
27. How are other livestock slaughtered on the island? (deer, pigs, cows, etc)
28. Can you share:
    a. Blank logs
    b. HACCP Plan
    c. Recall plan
29. Do you have annual training for operators?
30. How does the deer donation program work?

Appendix C: Farmer Interview Script

Questions for farmers on Nantucket
Preamble:

During this interview, we will ask you questions about raising chickens on Nantucket. We will use the information we gather to help guide our team while researching how to implement an MPPU with the non-profit Sustainable Nantucket effectively.

Your name and other information such as job title and place of employment may also be included in the publication. If you would like for these to be omitted and remain anonymous you may say so. If you would like to abstain from answering any questions you may. You will also have a chance to review notes taken from this interview and correct or omit any statements you wish.

Some questions might be skipped depending on their relevance to the interviewee.
Questions for farmers currently raising chickens on Nantucket:

1. How many chickens do you currently have?
2. What is the primary purpose of your chickens (meat, eggs, or both)?
3. How many do you slaughter per year?
4. Assuming processing and sale are not an issue, what is the maximum number of chickens your farm could grow/would be interested in growing?
5. How many staff members do you have on your farm?
6. What is your current method of processing chickens? (anonymously collect this question, as illegal slaughtering is prevalent)
7. Who do you sell your chickens to (restaurants, grocers, farmers market, private sale, etc)? (anonymously collect this question as well, as unlicensed slaughter makes sale illegal)
    a. What do you price them at or trade them for?
8. How do you freeze or refrigerate your chickens?
9. Do you have any other livestock?
10. Would access to an MPU increase your interest in owning other livestock?
11. Do you know of anyone we might be interested in talking to? Either people who own chickens or are interested in owning chickens.
12. What resources are preventing you from growing more chickens

Questions for persons on Nantucket who are interested in raising chickens:

1. Do you have or can you easily acquire the resources and space to farm chickens?
2. Why do you not currently farm chickens?
3. Are you associated with or know about Sustainable Nantucket?
4. Do you have acquaintances who farm chickens?
5. After a brief explanation of what an MPPU is, ask; Would having a mobile poultry processing unit available make you more likely to farm chickens, or aid you in doing so?
6. How many chickens do you imagine you would have?
7. Do you feel you have ready access to resources regarding how to farm chickens?
    a. Would you use SN classes and resources to get started raising livestock?
8. Do you currently farm or hunt livestock other than chickens?
    a. If not, would you want to farm other livestock besides birds?
    b. If yes, what livestock?

Appendix D: Sewer Department and DPW Interview Script

Questions for J.P. Caron and David Gray
Preamble:

During this interview, we will ask you questions about waste disposal on Nantucket and how existing infrastructure may be used in conjunction with the implementation of an MPPU. We will use the information we gather to help guide our team while researching how to implement an MPPU with the non-profit Sustainable Nantucket effectively.

Your name and other information such as job title and place of employment may also be included in publication. If you would like for these to be omitted and remain anonymous you may say so. If you would like to abstain from answering any questions you may. You will also have a chance to review notes taken from this interview and correct or omit any statements you wish.

Some questions might be skipped depending on their relevance to the interviewee.

1. Is there anything that might come from the processing of a chicken or other livestock that could not be processed by the digester?
2. Is there anything we could do to the waste that would make it better for the digester?
3. How often are people allowed to drop stuff off?
4. What animals have been brought to the digester?
5. How do people currently send deer to the digester?
6. When would be the best time to use the digester for livestock?
7. Are there any limitations to the amount of waste from poultry processing that can be brought to the digester?
8. Would the MPPU be able to be stored or used for processing on the property?
9. Are there costs for disposal?
10. If we bring water here what would that process look like?
11. How would you like it transported to you?
12. Any recommendations?
13. Will there be any fees?
14. How much can we dump at once? We would expect about 150 gallons for 75 birds processed
15. Are there any chemicals that we would not be able to dump?
16. Would you be able to process any potential solids?

Appendix E: Sample HACCP

Intentionally left blank; see next page.

Hazard Analysis & Identification of Critical Control Points

Process step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?
Receive and hold	Biological: fecal contamination (Salmonella spp.) from birds or infected personnel. Physical: fecal Chemical: none	Withhold feed, provide acidified water prior day. Clean any foreign matter from birds. Prevent X-C. Proper personnel hygiene (GMP 2; SSOP 2). See above.	Yes. Steps to control contamination occur throughout processing process. (see above)
Kill and bleed	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of cones, equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Scald	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Monitor water temperature; change water if / as required.	No
Pluck	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of equipment, including rubber picker fingers (SSOP 3).	No
Pre-chill	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Monitor water temperature; change frequently (SSOP 5).	No
Transfer	Biological: none Physical: none Chemical: none	Not applicable	No
Remove head and feet	Biological: accidental X-C Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Remove oil gland	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No

Process step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?
Make J-cut around vent	Biological: accidental fecal contamination (Salmonella spp.) Physical: none Chemical: none	Proper personnel training (GMP 1); proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Eviscerate	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Inspect viscera	Biological: none Physical: none Chemical: none	Not applicable	No
Harvest liver and heart	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Harvest neck	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Remove crop and lungs	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Trim carcass/final rinse (inside and out)	Biological: pathogen introduction Physical: none Chemical: none	Trim to remove any foreign matter that may cause contamination. Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No

Process Step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?	CCP #
Final inspection: carcass, giblets and neck	Biological: pathogen introduction (X-C from other birds and ice) Physical: none Chemical: none	Trim to remove contamination from foreign matter. Proper cleaning of equipment & utensils (SSOP 3).	Yes	1
Chill carcass, gilbets and neck	Biological: pathogen introduction (X-C from other birds and ice) Physical: none Chemical: none		Yes	2
Drain carcass, giblets and neck	Biological: pathogen introduction Physical: contamination from foreign matter Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2). Proper cleaning of equipment and food contact surfaces (SSOP 3).	No	
Package, weigh and label	Biological: pathogen introduction (salmonella ssp.) from birds or infected personnel. Physical: contamination from foreign matter Chemical: none	Include proper cooking instructions on every food label (see MPPU Food Product Description). Wash or trim to remove contamination from foreign matter (Final Inspection/CL 1).	No	

HACCP Record Keeping & Verification Procedures

Process/step CCP	Records	Responsibility	CCP verification
Final Inspection CCP #1	HACCP Final Inspection Logs (carcass and giblets)	HACCP-trained grower-processor or designee	HACCP final inspection logs will be verified each day of use by grower-processor or designee.
Final Inspection CCP #2	HACCP Temperature Log	HACCP-trained grower-processor or designee	HACCP temperature logs will be verified each day of use by grower-processor or designee. Personnel will be retrained each year by grower-processor or designee.

Identifying Critical Limits, Monitoring & Corrective Actions

PROCESS/STEP CCP	CRITICAL LIMIT(CL)	MONITORING PROCEDURE	CORRECTIVE ACTION (CA)
Final inspection CCP #1	No visible foreign matter, zero tolerance for fecal matter and ingesta.	What will be measured? At least 2% of birds (5 minimum) will be monitored for presence of foreign matter and/or ingesta after final rinse and prior to chilling. Where will the CL be measured? Final inspection in the evisceration area. Who will monitor the CL? HACCP trained grower-processor or designee Frequency? For 200 birds or less: 5-bird sample per day.	How will the process be corrected? Trim away any foreign matter. Product disposition? Discard trimmings into container for inedibles. Who is responsible for implementing the CA? HACCP trained grower-processor or designee. Measure to prevent any recurrence? Retrain personnel and adjust process as needed.
Final inspection CCP #2	Internal bird temperature <41 degrees F.	What will be measured? Internal temperature Where will CL be measured? In the carcass cavity. How will CL be measured? Thermal probe. Who will monitor CL? HACCP-trained grower-processor or designee. Frequency? For 200 birds or less: 5-bird sample per day.	How will the process be corrected? Keep chilling until temperature is reached. Product disposition? Reject/discard, chill or freeze. Who is responsible for implementing the CA? HACCP-trained grower-processor or designee. Measures to prevent recurrence? Retrain personnel. Adjust process.

Appendix F: Breakdown of Per-Chicken Pricing

Operating Cost Breakdown				
Categories		**Usage**	**Process Your Own**	**Processing as a Service**
Labor	**2x$30/hr**	6 hrs	**N/A**	**$360**
Propane	**$30/20lbs**	25lbs per 75 chickens	**$37.50**	**$37.50**
Ice	**$15/40lbs**	8lbs per chicken	**$225**	**$225**
Waste Disposal	**Wood chips $0**		**$0**	**$0**
	Water $5/100 gallons	2.5 gallons per bird at 75 birds	**$10**	**$10**
Cleaning Supplies and Maintenance	**Sanitizer, Detergent, Test strips, Soap**	Total number of birds*5%= $ cleaning supplies cost	**$3.75**	**$3.75**
Electricity	**Negligible**		***TBD**	***TBD**
Water	**Negligible**		***TBD**	***TBD**
Bags	$32.99 for 100 bags	1 bag per bird	**$25**	**$25**
Insurance			**$3.50**	**$8.30**
Total	All prices asume a farmer is processing 75 broilers		**$305**	**$665**

**Pending conversations and agreements between Sustainable Nantucket and the town*

Appendix G: Capital Expenses

Item	Links	Quantity	Initial Cost
Landscape style trailer	7x14	1	$6,500
Plucker	Featherman gamebird plucker large $2410	1	$2,410
Scalder	Featherman with manual dunker $2377	1	$4,468
Kill cones	Featherman w/small broiler cones	1	$800
Food-grade hose150 ft min	amazon 50ft $22	2-4	$64
Steel table	table with lip $555	1-3	$3,000
Five Gallon Bucket	Leaktite 5 gal. 70mil Food Safe Bucket	6	$600
Inedible waste AND cooling tanks		8	$1,200
1 user hand sink	1 person sink with heater	2	$2,846
Electric knives	v cone wall mounted	8	$1,500
Spray bottles	2 32oz 5.64	2	$30
Backflow preventer	$21.88		$21.88
Rubbrmaid tubs for waste disposal		2	$173.90
Heat resistant gloves	18 inch $31.99/12		$31.99
Fire extinguisher	10lb abc $79.99		$79.99
First aid kit	$116.49		$116.99
Propane burner	$65.99		$65.99
Stock pot	$166.99		$166.99
Backflow preventor	$21.99		$21.99
Knives: two of each x3	$188.00	2	$235.89
Water splitter	$19.99		
Spray nozzle	$6.98	3	
Metal shovels	$14.98	2	$29.92
Metal rake	$17.98	1	$17.98
Extension cables	$131 per 100ft	2	$262.00
Slaughtering hoses			

Item	Links	Quantity	Initial Cost
Epoxy paint	43.98 per gallon	5	$219.90
Fan	$179.00	1	$179.00
Propane monitoring device	$175.75	1	$175.75
Expoxy roller	$10.48		$10.48
Cut gloves	$210.44		$210.44
Pop up canopy tent	10x15		
Instant read thermometer	$23.99	2	$47.98
Total			$25,439.08

Appendix H: Operating Manual

Intentionally left blank; see next page.

Mobile Poultry Processing Unit Operations Manual

For Sustainable Nantucket
by Katie Bowles, Trevor Drane,
Adam LaBombard, Charles Ritchie

Table of Contents

1. Trainings, licensing, and Documentation

1.1 Massachusetts MPPU License

- MPPU state license should be verified as up to date

1.2 Massachusetts Licensing Requirement

- One person at the slaughter should be trained in a state approved program in proper slaughtering practices

1.3 ServSafe Certification

- At least one person on site should have a ServSafe Certification.

1.4 Water Test

Well Water

- A water quality test must be performed every 6 months for the well providing water at the processing facility and kept on record.

City Water

- Water quality certification must be obtained from the water company providing water at the slaughter location and kept on record and up to date.

2. Pre-slaughter Preparation

- Fill out slaughter safety waiver.
- Fill out slaughter day health form
- Chickens should be kept from food for 15-24 hours before slaughter.
- Site of slaughter should be mowed (if applicable).
- Farmer should have proper refrigeration space.
- 1 week prior to slaughter, the farmer or SN should call Nantucket Ice to confirm delivery.
- Farmer should have a digital or paper copy of FSIS recall plan booklet.
- Ensure the availability of wood chips at the slaughter location. If not, arrange for pick up from the DPW.
- Farmer should review proper temperature logging procedures

3. Day of Slaughter Preparation

3.1 Set up

General Set Up

- Sanitizer and detergent should be mixed in accordance with manufacturers instructions in the appropriate spray bottles.
- Sanitizer should be run through the water hoses then rinsed into gray water collection tanks.
- Water connection should be hooked up with a backflow preventer. Tap->backflow preventer-> splitter-> hoses-> spray nozzle/plucker.
- Aprons should be donned and checked for holes and excessive wear.

Dirty Side

- Ensure chickens are in the shade and not stressed, while still being close to the slaughter area.
- Wood chips should be spread out in an even layer over the ground. A thicker layer should be around the plucker and in between the path the chickens take from the plucker to the clean side and anywhere else where there is a high chance of water being spilled.
- Scalder should be placed in a wood chip free area and surrounded by wood chips to prevent runoff.
- Fill up the secondary pot with water and light the burner.
- If power is not available at the processing location, hook up the provided generator.
- Run extension cords from the power source to the scalder and plucker. Light pilot light on the scalder.
- Test all equipment to ensure it has water flow and power.
- Connect to propane, fill with water then light. Regularly check the propane lines and tank to ensure there is no ice build up.
- Check plucker fingers to ensure a tight fit.
- Check plucker for water flow and power.
- Set up rubbermaid tub below plucker to catch waste water and feathers.
- Set up dirty side handwashing station and turn on the heater.
- Set up kill cones on stable ground. Make sure all drainage can be collected for disposal.
- Knives should be sharpened and recleaned.
- Thermometers should start measuring water temperature.

- When water temperature in the scalder reaches *140°F* and all other steps are completed, slaughter can begin.

Clean Side

- Pop-up canopy tents should be erected over all equipment and materials on the clean side.
- The evisceration table set up and cleaned/sanitized.
- Knives should be sharpened and recleaned.
- Chilling barrels cleaned/sanitized and filled ⅓ with fresh water and ⅓ ice.
- Clean side sink set up and connected to heater.
- Set up one ice bucket in between the clean and dirty side in case the clean side is not able to process chickens fast enough. This should not be the same ice bucket that is used to chill eviscerated chickens.

3.2 Arrival of chickens

- Chickens should arrive at the farm before slaughter setup begins.
    - The chickens should be stored in chicken boxes out of the sun above the ground.
- Farmers should ensure they have the proper paperwork for the chickens from the hatchery.

3.3 Picking up consumables

- Farmer should have heat shrink bags, and bag wraps with extras.
- Retrieve wood chips from DPW if applicable.

4. Slaughter

4.1 Tagging

- During the slaughter 5 chickens need to be checked and tagged to monitor temperature throughout the slaughter process.
- Use the provided colored markers to tag every 15 chickens.
- Chicken temperature should be noted when the chicken enters the clean side, after evisceration, and every hour for 4 hours.
- Chicken temperature must be reduced to below 40°F.
- Follow the below temperature logging chart for the proper format.

4.1 Bleeding

- Calmly pick up chickens.
- Primary hand should be on bottom of chickens and secondary hand on top.
- Secondary hand grabs the back of the neck of the chicken.
- Primary hand rolls chicken over onto the secondary hand and arm. Bring chicken close to chest to keep it still.
- Chicken should now be upside down being held by its back against the operator.
- Secondary hand should stretch out the chickens neck gently, primary hand should use the slaughtering knife and make a cut perpendicular to the chickens neck; one on each side.
- Place chicken in the kill cone and tie legs with the leg ties.
- Wait about five minutes till the blood stops draining.

4.3 Scalding

- Every 10 birds scalded add a drop of dawn dish soap to the scalder water.
- Remove chickens from kill cones. Keep feet bound.
- Place chickens into scalder and turn on rotator.
- Chickens should be scalded for roughly 2 minutes, until the skin on the feet starts to fall off.

4.4 Plucking

- Place 2 or 3 chickens into the plucker and turn on. Ensure water is flowing.
- Wait 30-120 seconds for feathers to be removed.
- Turn off and remove chickens. Pass to clean side for evisceration.
- While plucking, the rubbermaid bucket will fill with water and feathers. Make sure the bucket does not overfill.

4.5 Going to the clean side

- While moving to the clean side transferring blood and feathers should be avoided as much as possible.
- The operator on the dirty side should not enter the clean side and the clean side operator should not enter the dirty side throughout the slaughter process.
- If clean side does not have enough room to hold non eviscerated chickens, they can be placed in a holding ice bucket to begin the chilling process

4.6 Evisceration

- Refer to a more experienced slaughterer or a website with step by step instructions similar to this: https://www.backyardchickens.com/threads/killing-plucking-eviscerating-cutting-up-your-chicken-graphic.109583/

- All inedible products should be disposed of in the bins labeled “inedible”
- All edible products besides the whole chicken itself should be placed in a food grade bin labeled edible. That bin should be kept on ice during the slaughter process.
- The whole chicken should be put into ice immediately after evisceration

5. Chilling

- Poultry temperature should be measured in the thickest part of the bird.
- Chilling bins and any bin that is to hold edible meat should be labeled “edible” and replaced when damaged.
- All poultry shall be chilled immediately after processing so that the internal temperature of poultry carcasses and major portions weighing under 4 pounds shall be reduced to 40 °F or below within 4 hours of processing; carcasses weighing 4 to 8 pounds, within 6 hours of processing; and those weighing over 8 pounds, within 8 hours of processing unless such poultry is to be frozen or cooked immediately at the official establishment. Once chilled, poultry should be packaged and shipped to be stored at 40 °F or less.
- Giblets should be chilled to 40° F or lower within two hours of the time that they are removed from the inedible viscera, except that when the giblets are cooled with the carcass from which they were drawn, the giblets should be subject to the same time and temperatures for carcasses above in paragraphs A and B.
- In air chilled, ready-to-cook poultry, the internal temperature of the carcasses shall be reduced to 40° F or less within 16 hours.

- For further information see: https://www.fsis.usda.gov/sites/default/files/import/Chilling-Requirements-1014.pdf

6. Packaging and Transport

- All package chicken must be labeled with the producer's name,the producer's address, and the statement, Exempt P.L. 90-492
- Farmers are responsible for keeping poultry products chilled after packaging
- SN will have coolers available for farmers to use for transport

7. Clean up

7.1 Sanitization

- Mix sanitizer and detergent in spray bottles according to manufacturer's directions.
- Dirty side
    - All scalder and plucker should be drained and any large waste chunks should be properly disposed of either by running water or by hand.
    - Spray all surfaces with detergent and scrub with brushes. Then rinse.
    - Spray all surfaces with sanitizer according to manufacturer's directions.
- Clean side
    - Tables and chill bins should be scrubbed with degreaser and detergent then sanitized.
    - All disposal containers should also be cleaned after being emptied at the DPW.

    - All tools should be cleaned.
- General Cleaning
    - Nothing should be wet when it goes into the trailer
    - All materials should go back in place where they were initially found
    - Everything that was used during slaughter should be scrubbed with detergent then sanitizer according to manufacturer's instructions

7.2 Waste Disposal

- Solid waste should go in receptacles labeled “inedible” and should be kept away from edible food.
- Solid waste buckets should not have any holes in them and should be replaced when broken
- Water should be prevented from going into the ground by putting wood chips in the areas where spills can occur.
- During clean up all wood chips should be picked up and brought to the Nantucket Waste Digester for disposal.
- Chemical safety sheets are to be brought with all waste transported to the Waste Digester.
- Chill buckets should be drained into Nantucket Sewage Department dumping area
- Once emptied all containers should be cleaned according to the cleaning chemical manufacturers instructions.

8. Recall plan

- Make sure each processing farmer has the appropriate recall plan on record or fill out the one below
- Ensure all edible products are labeled before they leave the slaughter area

Hazard Analysis & Identification of Critical Control Points

Process step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?
Receive and hold	Biological: fecal contamination (Salmonella spp.) from birds or infected personnel. Physical: fecal Chemical: none	Withhold feed, provide acidified water prior day. Clean any foreign matter from birds. Prevent X-C. Proper personnel hygiene (GMP 2; SSOP 2). See above.	Yes. Steps to control contamination occur throughout processing process. (see above)
Kill and bleed	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of cones, equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Scald	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Monitor water temperature; change water if / as required.	No
Pluck	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of equipment, including rubber picker fingers (SSOP 3).	No
Pre-chill	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Monitor water temperature; change frequently (SSOP 5).	No
Transfer	Biological: none Physical: none Chemical: none	Not applicable	No
Remove head and feet	Biological: accidental X-C Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Remove oil gland	Biological: pathogen introduction (X-C) Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No

Process step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?
Make J-cut around vent	Biological: accidental fecal contamination (Salmonella spp.) Physical: none Chemical: none	Proper personnel training (GMP 1); proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Eviscerate	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Inspect viscera	Biological: none Physical: none Chemical: none	Not applicable	No
Harvest liver and heart	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Harvest neck	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Remove crop and lungs	Biological: pathogen introduction Physical: none Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No
Trim carcass/final rinse (inside and out)	Biological: pathogen introduction Physical: none Chemical: none	Trim to remove any foreign matter that may cause contamination. Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2).	No

Process Step	Potential hazard (X-C = cross-contamination)	What control measures can be applied to prevent the hazard?	Is the potential safety hazard significant and reasonably likely to occur?	CCP #
Final inspection: carcass, giblets and neck	Biological: pathogen introduction (X-C from other birds and ice) Physical: none Chemical: none	Trim to remove contamination from foreign matter. Proper cleaning of equipment & utensils (SSOP 3).	Yes	1
Chill carcass, gilbets and neck	Biological: pathogen introduction (X-C from other birds and ice) Physical: none Chemical: none		Yes	2
Drain carcass, giblets and neck	Biological: pathogen introduction Physical: contamination from foreign matter Chemical: none	Proper cleaning of equipment & utensils (SSOP 3). Proper personnel hygiene (GMP 2; SSOP 2). Proper cleaning of equipment and food contact surfaces (SSOP 3).	No	
Package, weigh and label	Biological: pathogen introduction (salmonella ssp.) from birds or infected personnel. Physical: contamination from foreign matter Chemical: none	Include proper cooking instructions on every food label (see MPPU Food Product Description). Wash or trim to remove contamination from foreign matter (Final Inspection/CL 1).	No	

HACCP Record Keeping & Verification Procedures

Process/step CCP	Records	Responsibility	CCP verification
Final Inspection CCP #1	HACCP Final Inspection Logs (carcass and giblets)	HACCP-trained grower-processor or designee	HACCP final inspection logs will be verified each day of use by grower-processor or designee.
Final Inspection CCP #2	HACCP Temperature Log	HACCP-trained grower-processor or designee	HACCP temperature logs will be verified each day of use by grower-processor or designee. Personnel will be retrained each year by grower-processor or designee.

Identifying Critical Limits, Monitoring & Corrective Actions

PROCESS/STEP CCP	CRITICAL LIMIT(CL)	MONITORING PROCEDURE	CORRECTIVE ACTION (CA)
Final inspection CCP #1	No visible foreign matter, zero tolerance for fecal matter and ingesta.	What will be measured? At least 2% of birds (5 minimum) will be monitored for presence of foreign matter and/or ingesta after final rinse and prior to chilling. Where will the CL be measured? Final inspection in the evisceration area. Who will monitor the CL? HACCP trained grower-processor or designee Frequency? For 200 birds or less: 5-bird sample per day.	How will the process be corrected? Trim away any foreign matter. Product disposition? Discard trimmings into container for inedibles. Who is responsible for implementing the CA? HACCP trained grower-processor or designee. Measure to prevent any recurrence? Retrain personnel and adjust process as needed.
Final inspection CCP #2	Internal bird temperature <41 degrees F.	What will be measured? Internal temperature Where will CL be measured? In the carcass cavity. How will CL be measured? Thermal probe. Who will monitor CL? HACCP-trained grower-processor or designee. Frequency? For 200 birds or less: 5-bird sample per day.	How will the process be corrected? Keep chilling until temperature is reached. Product disposition? Reject/discard, chill or freeze. Who is responsible for implementing the CA? HACCP-trained grower-processor or designee. Measures to prevent recurrence? Retrain personnel. Adjust process.

POULTRY PROCESSING LOG

Farm:

Address:

Person in Charge:

Date:
Total birds processed:
Start time:
End time:

CCP 1 Cavity Inspections performed on 5 birds: Y / N Corrective Actions:**

CCP 2** INTERNAL BIRD TEMPERATURES (<40*F in less than 4 hours)

Tag Color	Kill Time	Time hour 1	Temp hour 1	Time hour 2	Temp hour 2	Time hour 3	Temp hour 3	Time hour 4	Temp hour 4	Corrective actions	initial
#1											
#2											
#3											
#4											
#5											

PARTS TEMPERATURES (<40*F)

Container	Time hour 1	Temp hour 1	Time hour 2	Temp hour 2	Time hour 3	Temp hour 3	Time hour 4	Temp hour 4	Corrective actions	initial
hearts										
livers										
gizzards										
necks										

CHILL TANK TEMPERATURES (<40*F)

Tank	Temp at start	Time hour 1	Temp hour 1	Time hour 2	Temp hour 2	Time hour 3	Temp hour 3	Time hour 4	Temp hour 4	Corrective actions	initial
#1											
#2											
#3											
#4											
#5											

REFRIGERATED STORAGE (<40*F)

Date	Time (AM)	Temp	Time (PM)	Temp	initial

Verification Signature: **Date:**

Sample Monthly Log: Farm Site Inspection & Pest Control

(Use to document SOP 1)

DATE (Month/ Year)	AREA INSPECTED/ CORRECTIVE ACTIONS NEEDED (IF ANY):	Initial/ Date:	NOTES/ CORRECTIVE ACTIONS TAKEN:	Initial/ Date:
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			

Once each month of permit duration:

1. Producer-processor visually inspects processing environment (grounds & buildings, including storage areas & sanitary facilities) for cleanliness and presence of pests and trash, **once each month** during period covered by the State Slaughter License. Lists needed corrective action and documents (initials log).
2. Producer-processor performs corrective actions and documents (initials log).
3. Producer-processor verifies, signs and dates each monthly log. Most recent copy to be filed with MPPU Use Report.

Signed/Date_____

Sample Daily Log: Personnel Health & Hygiene Assessment

(Use to document SSOP 2)

Farm:
Date:
Time:

NAME:	ASSESSSED BY:	PASS / FAIL, COMMENTS	INITIAL / DATE (Both parties)
1			
2			
3			
4			
5			
6			
7			
8			

Use additional sheets if required.

Once each day of operation, personnel checks for following and initials log:

- Presence of food borne illness; symptoms of a stomach or intestinal illness
- Sore throat or temperature
- Infected wounds or cuts
- Household member with person who is ill
- Personal cleanliness (hair, work clothes, shoes)
- Presence of jewelry; need for hair or beard restraint
- Working knowledge of proper hygienic hand practices

Producer-processor verifies, signs and dates.

Signed/Date_____

Sample Daily Log: **Pre- & Post-Operational Inspection & Sanitation**

(Use to document SSOPs 3 & 6)

Farm:
Date:

	PRE-OP INSPECTION / CLEAN-UP: (Initial)	CLEAN / RINSE / SANITIZE: (Initial)	POST OP INSPECTION / CLEAN-UP / STORAGE: (Initial)	NOTES / CORRECTIVE ACTIONS REQUIRED and COMPLETED
		Pre-Op Post-Op		
Killing cones		/		
Scalder & plucker		/		
Knives, implements & utensils		/		
Evisceration & work tables		/		
Chilling & holding tanks, tubs, etc.		/		
Cleaning & sanitizing equipment		/		
Pipes; hoses; water, propane & electric systems, backflow devices; floor, etc.		/		
Sanitary facilities		/		

For each day of use, both before (pre-operation) and after (post-operation) use:

1. Personnel visually inspect all water, electric and propane systems, and all processing equipment utensils, for cleanliness and operability, and documents (initial log). Post-operation: picks up feathers and other matter; removes receptacles for inedible material and trash. Document.
2. Personnel clean, rinse and sanitize all product contact surfaces, equipment and utensils. Repeats if necessary. Post-operation: applies edible oil to all surfaces subject to corrosion. Stores supplies. Document.
3. Producer-processor verifies, signs and dates. Signed/Date:_____

Sample Daily Log: Operational Sanitation Maintenance

(Use to document SSOP 4)

Farm:
Date:
Time:

POTENTIAL HAZARD / EVENT* (IF ANY)	CORRECTIVE ACTION** REQUIRED & COMPLETED	SIGN and DATE

Examples:

1. Hazard: carcass falls to the floor.
   Corrective action: immediately pick up carcass and wash / rinse thoroughly before further processing. Document in Log.
2. Hazard: poultry intestines are nicked during evisceration, contaminating evisceration table and utensils with fecal matter.
   Corrective action: wash, rinse and sanitize processing area and utensils. Document in Log.
3. Hazard: area of unit or piece of equipment becomes contaminated.
4. **Corrective Action: Clean, rinse and sanitize, as per Pre-Operational Sanitation Procedures. Maintain clean and sanitary conditions throughout the daily operation. Document corrective action in Log.

Producer-processor verifies, signs and dates.

Signed/Date_____

Sample Daily Log: Chill Tank & Refrigeration Temperature Monitoring

(Use to document SSOP 5)

Farm:
Date:
Time:

CHILL TANKS	TIME	TEMP.	CORRECTIVE ACTIONS	SIGNED

REFRIG.	DATE	TEMP.	CORRECTIVE ACTIONS	SIGNED

COOLER	DATE	TEMP. START / END	
1			
2			
3			

1. Personnel use digital thermometer to test temperature of chill tanks once each hour of operation. Maintain temperature between 33° and 40° F.
2. Personnel use min-max thermometer to test temperature of refrigerator used to hold fresh poultry once each day in use. Maintain temperature at <40° F.
3. Personnel monitor Farmers' Market cooler temperatures at 33° - 40° F. Add ice as required. Document temperatures at start and end of day.
4. Producer-processor verifies, signs and dates.

Signed/Date_____

Sample Daily HACCP Log: Poultry Carcass & Giblets Final Inspection

(Use to document CCP #1, Inspection)

Farm:
Date:
Time:

Sample	Inspected by:	Pass	Fail	Corrective Action *	Re-inspected by:	Pass	Fail**	Signature
1								
2								
3								
4								
5								

NOTE: 2% of product must be tested and documented. For 200 or fewer birds, a sample of at least five is required. Use additional forms if required.
Critical Control is necessary to reduce a biological hazard – the rapid growth of pathogens introduced by physical presence of fecal matter or ingesta.
* Corrective Action: Trim to remove contamination from foreign matter.
**Critical Limit: Zero tolerance for fecal matter and ingesta. No visible contamination.

1. Personnel manage final inspection of 2% (minimum of 5) product samples and document.
2. Producer-processor verifies, signs and dates.

Signed/Date_____

Sample Daily HACCP Log: Poultry Carcass & Giblets Internal Temperature Monitoring

(Use to document CCP #2, Chilling)

Farm:
Date:
Time:

Sample	Test #1	Tested by:	Pass	Fail	Corrective Action *	Test #2	Tested by:	Pass	Fail**	Signature
1										
2										
3										
4										
5										

NOTE: 2% of birds must be tested. For 200 or fewer birds, a sample of at least five is required. Use additional forms if required.

Critical Control is necessary to reduce a biological hazard – the rapid growth of pathogens introduced by X-C from other birds or from contaminated water or ice.

*Corrective Action: Keep chilling until critical limit is reached. Monitor chill tank temperature (at least once / hour) and document. The target temperature for chill tank slurry is between 33° and 40° F. Add ice as necessary. See SSOP 5 for Chill Tank and Refrigeration Temperature Monitoring.

**Critical Limit: Internal carcass temperature <40° F within four hours. If critical limit is not reached, product may not enter commerce. Cook or freeze immediately for personal use or discard.

1. Personnel monitor and document product internal temperature and chill tank temperature.
2. Producer-processor verifies, signs and dates.

Signed/Date_____

MPPU Farm-to-Farm Bio-Security Protocol & Practices

(Use log to document Good Manufacturing Practices 3,4 & 5

Introduction

"Bio-security means doing everything you can to protect your birds from disease. As a [producer-processor], keeping your birds healthy is a top priority. Your birds can become sick or die from exposure to just a few unseen bacteria, viruses, or parasites. In a single day, these germs can multiply and infect all your birds…."

This quote, and most of the following information, is taken from the USDA Animal and Plant Health Inspection Service (APFIS) brochure: *Backyard Bio-security Practices to Keep Your Birds Healthy*.
Visit *www.aphis.usda.gov/animal_health/* and *www.ma.gov/agr* to learn more.

APHIS offers several "Bio-security Tips" to prevent poultry disease. They are as effective for keeping your processing environment clean and sanitary as for use in your poultry rearing areas. They include:

1. Keep Your Distance. Restrict access to your birds. Allow only people who care for them to come in contact with them. Keep a clean buffer zone around the area where they are housed or grazed.
2. Keep it Clean. Set aside work clothes and shoes that you and others will wear only around your birds. You can scrub shoes with a long-handled scrub brush dipped in a solution of household bleach (sodium hypochlorite 6 percent. Mix ¾ cup per gallon of water.) Consider installing a pail and brush near both entrances of the MPPU.
3. Don't Haul Disease Home. "Car and truck tires, poultry cages and equipment can harbor "germs." Be sure to disinfect these items – including tires of the MPPU and the truck that transports it -- before allowing them on your property. Scrub them with disinfectant and rinse at the entrance of your farm.
4. Don't Borrow Disease from a Neighbor. Do not share birds, equipment, tools or poultry supplies with other bird owners. If you must, clean and disinfect them before bringing them onto your property – and clean and disinfect them before returning them. Never share items such as wooden pallets [or other items that are porous] and cannot be adequately cleaned and sanitized.

Cleaning and disinfecting is one of the most important bio-security practices. You must thoroughly clean and scrub objects before applying disinfectants or sanitizers. They cannot work on top of caked-on dirt. Rinse well before applying a sanitizer with a brush, sponge or spray and allow adequate contact time.

Sample MPPU Farm-to-Farm Bio-Security Practices Log

FARM:
DATE:

1. Processing personnel who raise poultry have changed into clean work clothing and shoes (or disinfected shoes) before entering this farm.
2. Car, truck and MPPU trailer tires have been properly disinfected before being allowed onto this farm.
3. Equipment, tools and/or supplies borrowed from or shared with other poultry producers, if any, have been carefully cleaned and sanitized before being brought onto this farm.

The MPPU Farm-to-Farm Bio-Security procedures described above were implemented on the above farm on this date.

Signed: _____
Producer-processor MPPU Use Date

Sample MPPU Processing Water & Solid Waste Management Protocol & Practices Log

Good Manufacturing Practice 9 (see also, Appendix A to this document)

A. Processing Location:

The unit was parked on (check one):
_____ biologically active grass, farm hayfields or pasture.
_____an agricultural compost pad provided with a biologically active buffer strip, located at least 100' from active cropland.

B. Water:

_____ Water from pre- and post-process cleaning/rinsing and hand sinks not contained (i.e., was allowed to flow directly to an actively growing grassed area), was discharged in a manner that would not cause erosion or impact surface water, groundwater or other resource areas. No harsh cleaning and disinfectant chemicals were introduced into such rinse water; prior to commencement of post-process rinse, all solid waste (e.g., viscera, offal, feathers) was physically removed from equipment and food contact surfaces.

_____ Water generated during processing (i.e., from scalder, plucker and evisceration tables, or from initial cleaning of contact surfaces that contain solids) was incorporated into a compost pile (see B, below).

Water contained in chill tanks was (check one):
_____ applied to actively growing agricultural land verified by MDAR during site inspection as adequate to accept this application; or
_____ discharged directly into a compost pile (see B, below). Such discharge shall not cause the water to migrate beyond the compost pile boundary.

Completed by: _____
Signed: _____
Producer-processor MPPU Use Date

C. Solid Waste: Solid waste, e.g., feathers, blood, viscera and inedible processing byproducts have been properly collected and disposed of as follows (check one):
_____Placed in an on-site dumpster with regularly scheduled pick-up for transport to a licensed solid waste facility.
_____Incorporated into an approved active or newly constructed agricultural compost pile (minimum 4'wide x 5' high, and 6'long per 100 birds). Also see Appendix A to this document.

Completed by: _____
Signed: _____
Producer-processor MPPU Use Date

Sample MPPU Processing Water & Solid Waste Management Protocol & Practices Log

Good Manufacturing Practice 9, page 2

D. Trash: All trash generated by poultry processing activity on this date, e.g., paper towels, discarded containers or packaging materials, and disposable gloves, has been properly collected, contained and removed from the processing environment.

Completed by: _____

Signed: _____

Producer-processor MPPU Use Date

RECALL WORKSHEET

(Include attachments, additional pages, label copies and flowcharts as necessary)

TODAY'S DATE:_____

ESTABLISHMENT NUMBERS: EST._____P-_____

ESTABLISHMENT NAME:_____

ADDRESS:_____

COMPANY RECALL COORDINATOR (name, title, telephone)_____

_____

COMPANY MEDIA CONTACT (name, title, telephone)_____

_____

COMPANY CONSUMER CONTACT (name, title, telephone)_____

_____

REASON FOR RECALL:_____

IDENTIFY RECALLED PRODUCTS SEPARATELY BY:

BRAND NAME			
PRODUCT NAME			
PACKAGE (Type & Size)			
PACKAGE CODE (Use By/Sell By)			
PACKAGING DATE			
CASE CODE (Identifying)			
COUNT/CASE			
PRODUCTION DATE			
AMOUNT (lbs./cases) PRODUCED			
AMOUNT HELD AT ESTABLISHMENT			
AMOUNT (lbs./cases) DISTRIBUTED			
DISTRIBUTION LEVEL (institutional/retail/etc.)			
DISTRIBUTION AREA			
EXPORTED TO (country)			
SCHOOL LUNCH (CN, AMS Contract)	(YES) (NO)	(YES) (NO)	(YES) (NO)
DEPT. OF DEFENSE (DSCP, Commissary, etc.)	(YES) (NO)	(YES) (NO)	(YES) (NO)
INTERNET OR CATALOG SALES	(YES) (NO)	(YES) (NO)	(YES) (NO)

RECALL WORKSHEET

DESCRIBE THE PRODUCTION/PROCESSING OPERATION AND/OR ATTACH A PROCESS FLOW DIAGRAM:_____

_____

_____

_____

WHAT WERE THE "CLEAN-UP TO CLEAN-UP" TIMES (where applicable)?_____

HAS THE SOURCE OF THE CONTAMINATION BEEN IDENTIFIED? EXPLAIN: _____

_____

_____

ARE THERE DATA THAT COULD LIMIT THE AMOUNT OF PRODUCT AFFECTED? (YES) (NO)
EXPLAIN:_____

_____

WERE THERE ANY DEVIATIONS REPORTED IN THE MEASURING AND/OR MIXING OF INGREDIENTS? (YES) (NO)
EXPLAIN:_____

_____

_____

DOES THE ESTABLISHMENT ROUTINELY USE METAL DETECTORS OR OTHER VISUAL IMAGING DEVICES? (YES) (NO)
EXPLAIN:_____

_____

_____

WERE OTHER PRODUCTS PRODUCED ON THE SAME LINE OR USING SOME OF THE SAME EQUIPMENT DURING THE "CLEAN-UP TO CLEAN-UP" PERIOD? (YES) (NO) EXPLAIN:_____

_____

RECALL WORKSHEET

(Listeria monocytogenes ATTACHMENT)

(READY-TO-EAT PRODUCT)

DESCRIBE THE PRODUCTION/PROCESSING OPERATION AND/OR ATTACH A PROCESS FLOW DIAGRAM:_____

_____

_____

_____

_____

WHAT WERE THE "CLEAN-UP TO CLEAN-UP" TIMES?_____

WAS CARRYOVER PRODUCT FROM PREVIOUS PRODUCTION PACKED WITH THIS PACKAGING CODE? (YES) (NO)

WAS THERE A COMPLETE LINE CLEAN-UP AFTER THE CARRYOVER WAS RUN? (YES) (NO)

WHAT DATE WAS THE CARRYOVER PRODUCT CARRIED OVER FROM?_____

WERE THERE ANY PROCESS DEVIATIONS DURING THE PRODUCTION OF THE CARRYOVER PRODUCT? (YES) (NO)

EXPLAIN:_____

WHAT WAS/WERE THE CORRECTIVE ACTION(S)?_____

_____

WERE OTHER PRODUCTS PRODUCED ON THE SAME LINE OR USING SOME OF THE SAME EQUIPMENT DURING THE "CLEAN-UP TO CLEAN-UP" PERIOD? (YES) (NO) EXPLAIN: _____

_____

WHAT INTERNAL COOK TEMPERATURE WAS REACHED? _____

DID THE PRODUCT REACH ANY SPECIFIED Aw OR pH REQUIREMENT? (YES) (NO) SPECIFY:_____

DOES THE FIRM HAVE AN IN-PLANT ENVIRONMENTAL MONITORING PROGRAM FOR *Listeria monocytogenes?* (YES) (NO)

WAS THE SOURCE OF THE CONTAMINATION IDENTIFIED? (YES) (NO)

EXPLAIN:_____

_____

IS THERE DATA THAT COULD LIMIT THE AMOUNT OF PRODUCT AFFECTED? (YES) (NO) EXPLAIN:_____

_____

RECALL WORKSHEET

(*E. coli* 0157:H7 ATTACHMENT)

DESCRIBE THE PRODUCTION/PROCESSING OPERATION AND/OR ATTACH A PROCESS FLOW DIAGRAM:_____

_____

_____

_____

DOES THE ESTABLISHMENT CONDUCT *E. coli* 0157:H7 TESTING? (YES) (NO) WHAT FREQUENCY?

WHAT WAS/WERE THE SOURCE(S) OF THE MATERIALS PROCESSED?_____

_____

WERE OTHER PRODUCTS PRODUCED FROM THE SOURCE MATERIALS? (YES) (NO)

EXPLAIN:_____

_____

WAS REWORK OR CARRYOVER FROM THIS PRODUCT USED IN FUTURE PRODUCTION? (YES) (NO)

IF YES, ON WHAT DATES WERE THE REWORK OR CARRYOVER USED AND WAS THERE ANY REWORK OR CARRYOVER FROM THAT DAY'S PRODUCTION USED IN FUTURE PRODUCTION?

_____

WHAT WERE THE "CLEAN-UP TO CLEAN-UP" TIMES?_____

WERE OTHER PRODUCTS PRODUCED ON THE SAME LINE OR USING SOME OF THE SAME EQUIPMENT DURING THE "CLEAN-UP TO CLEAN-UP" PERIOD? (YES) (NO) EXPLAIN: _____

_____

WAS ANY MICROBIOLOGICAL TESTING PERFORMED BY THE COMPANY? (YES) (NO) EXPLAIN, INCLUDE RESULTS:_____

_____

ARE THERE DATA THAT COULD LIMIT THE AMOUNT OF PRODUCT AFFECTED? (YES) (NO) _____

_____

_____

_____

WERE THERE ANY PROCESS DEVIATIONS DURING THE PRODUCTION OF THE AFFECTED PRODUCT? (YES) (NO)

WHAT WAS/WERE THE CORRECTIVE ACTION(S)?_____

_____

_____

RECALL WORKSHEET

(Salmonella sp. ATTACHMENT)

(READY-TO-EAT PRODUCT)

DESCRIBE THE PRODUCTION/PROCESSING OPERATION AND/OR ATTACH A PROCESS FLOW DIAGRAM:_____

_____

_____

_____

WHAT WERE THE "CLEAN-UP TO CLEAN-UP" TIMES? _____

WAS CARRYOVER PRODUCT FROM PREVIOUS PRODUCTION PACKED WITH THIS CODE? (YES) (NO)

WAS THERE A LINE CLEAN-UP AFTER THE CARRYOVER WAS RUN? (YES) (NO)

WHAT DATE WAS THE CARRYOVER PRODUCT CARRIED OVER FROM? _____

WERE THERE ANY PROCESS DEVIATIONS DURING THE PRODUCTION OF THE CARRYOVER PRODUCT? (YES) (NO)

EXPLAIN:_____

_____

WHAT WAS/WERE THE CORRECTIVE ACTION(S)?_____

_____

WERE OTHER PRODUCTS PRODUCED ON THE SAME LINE OR USING SOME OF THE SAME EQUIPMENT DURING THE "CLEAN-UP TO CLEAN-UP" PERIOD? (YES) (NO) EXPLAIN:_____

_____

WHAT INTERNAL COOK TEMPERATURE WAS REACHED? _____

DID THE PRODUCT REACH ANY SPECIFIED Aw OR pH REQUIREMENT? (YES) (NO) SPECIFY:_____

_____

DOES THE ESTABLISHMENT HAVE POST-PROCESSING CONTROLS? (YES) (NO) SPECIFY (include records):_____

_____

WAS ANY MICROBIOLOGICAL TESTING PERFORMED BY THE COMPANY? (YES) (NO) EXPLAIN, INCLUDE RESULTS:_____

_____

IS THERE DATA THAT COULD LIMIT THE AMOUNT OF PRODUCT AFFECTED? (YES) (NO) EXPLAIN:_____

_____

Appendix I: All-In-One MPPU Kit Prices

	Price	Features	Link	Notes
Bird Nerd	$15,100	A typical Bird Nerd MPU features a 30″ rotary scalder, 27″ plucker, evisceration table, chill tank, and 5 kill cones. 14' open landscape trailer	https://thebirdnerd.biz/shop/mobile-processing-unit-mpu/	Includes a trailer. Is in the format of the first type of MPPU from table 3.
Featherman	$5,188	PRO Plucker, Scalder, Roto-Dunker, Kill Stand 8 with Cones	https://www.featherman equipment.com/shop/featherman-set-up-special-bundled-kits/featherman-pro-set-up-special-w-roto-dunker/	Would need a larger plucker for turkeys, **does not include trailer. This style of roto dunker would not work well for our purposes**