

Industrial Juicing to Advance Food Security

Pre-feasibility study for utilizing legacy industrial fruit
processing equipment in the Hawaiian Islands



Swette Center for Sustainable Food Systems, Arizona State University

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Executive Summary

The Hawaiian Islands are highly reliant on imported foods for feeding residents and visitors alike. This is in part due to a shortage in food processing infrastructure locally that contributes to Hawai'i's inability to process much of its own food products. This study examines the feasibility of increasing food self-sufficiency in the islands through utilizing legacy industrial fruit processing equipment recently acquired by Olohana Foundation, a small 501(c)3 non-profit in Hawai'i. This study asks: How can the Olohana Foundation develop their aseptic juicing line to best support increased food self-sufficiency in the islands? Additionally, how can the juicing line be re-deployed in a manner to provide sustainable economic opportunity to producers and other community members? Through interviews with Hawai'i food system experts, fruit grower and fruit product buyer surveys, and a review of selected United States Department of Agriculture National Agricultural Statistics Survey (USDA NASS) crop data for Hawai'i, our team evaluated the feasibility for re-establishing the juicing line. Our results found that due to the lack of available locally-produced fruits and high start-up and operational costs, it is unlikely that the juicing line can be re-established as it was previously operating, producing papaya and guava juices and purees. However, there is no shortage in demand for locally grown fruit products in Hawai'i and there is high interest from producers in joining a grower-owned cooperative. We conclude with several recommendations for the near, medium and long-term. In the near to medium-term, we recommend that the Foundation pursue alternative configurations of the equipment to produce niche Hawai'i products for which there is adequate supply, including fermented fruit products. In the long-term, the Foundation should research the potential for sourcing produce from other Pacific-region islands, as well as work at the policy and community levels to increase production of fruits locally, lower costs of production, and lower barriers to organic certification.

Introduction

In February 2021, Olohana Foundation, a non-profit organization located on Hawai'i Island, acquired a legacy industrial-scale aseptic fruit juicing system. Recognizing the need for increased food processing infrastructure on Hawai'i Island and across the archipelago, the Foundation took the opportunity to secure the juicer to put to use in adding value to local fruit crops and contributing to local food security. With the fruit processing equipment secured, Olohana Foundation partnered with the Swette Center for Sustainable Food Systems for support in understanding the feasibility of establishing a local fruit-juicing business. As a community-focused organization, Olohana was interested in developing the juicer operation in both an economically viable and community-values based manner. Specifically, there was interest in establishing a cooperatively-owned and managed organization that would support Hawai'i's small-scale fruit growers while filling a gap in needed food processing infrastructure.

The goal of this study, therefore, was to take the first step outlining the feasibility of setting up such a system. Through in-depth interviews, and both primary and secondary data collection over the summer of 2021, our ASU research team endeavored to answer these questions:

Research Questions

How can the Olohana Foundation develop their aseptic juicing line to best support increased food self-sufficiency in the islands? How can the juicing line be re-deployed in a manner to provide sustainable economic opportunity to producers and other community members?

Through careful consideration, our team focused on four main aspects of feasibility of establishing such an operation:

- a) Equipment, start-up, and operational costs,
- b) Supply: availability and accessibility of local fruit supply,
- c) Demand: important markets for fruit products including juices and purees, and
- d) Potential business structures including non profit corporation, member-owned cooperatives, Limited Liability Company (LLC) and Sustainable Business Corporation.

The findings of this study provide valuable insight not just for understanding the viability of this fruit juicing cooperative initiative, but also for understanding the hurdles that Hawai'i faces in establishing similar community-based food security efforts.

Our results found that due to low production levels of locally-grown fruits and high start-up costs, it is unlikely that the juicing line can be re-established as it was previously operating, producing large quantities of local fruit juices and purees. However, there is no shortage in demand for locally grown fruit products in Hawai'i and there is high interest from small-scale producers in joining a grower-owned cooperative. Additionally, other potential uses for the equipment may be viable, including reconfiguring the various machinery for alternative fruit, food, or agricultural input processing.

Olohana Foundation “[works] with communities to co-develop strategies for resilience” (Olohana, 2016).

Background

Olohana Foundation is a small nonprofit organization (501(c)3) located on Hawai'i Island. Their mission is "to work with communities to co-develop strategies for resilience and adaptation to climate change. Olohana's projects and programs intersect food, energy, water, and knowledge systems and facilitate and support strengthened relationships between the generations, between cultures, and with the natural environment" (Olohana, 2016). Founded in 2008, they have worked to develop backyard food resiliency in Hawai'i in the context of an island food system that is extremely vulnerable to disasters, including through their VICTree food garden project involving the installation of agroforestry demonstration sites to promote food security through breadfruit and other edible tree crops (Olohana, 2016b). Their programming is rooted in Indigenous Hawaiian and Polynesian ways of relating to the land and recognizes the importance of restoring native foodways for climate and community resiliency.

Food Sovereignty, Security, Self-Sufficiency & Community-Based Food Systems

Central to Olohana's mission and the juicing project are the intersecting concepts of food sovereignty, food security, and food self-sufficiency.

Food Sovereignty

Food sovereignty can be defined as "the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems. It develops a model of small-scale sustainable production benefiting communities and their environment" (Nyéléni, 2007). At its core is the belief in community-based and localized food systems in which communities have self-determination in their food systems.

The US Food Sovereignty Alliance outlines the following principles of Food Sovereignty:

Principles of Food Sovereignty

(Source: U.S. Food Sovereignty Alliance (n.d.))

- *Focuses on Food for People*

Food sovereignty puts the right to sufficient, healthy, and culturally appropriate food for all at the center of food, agriculture, livestock, and fisheries policies.

- *Values Food Providers*

Food sovereignty values all those who grow, harvest and process food, including women, family farmers, herders, fisherpeople, forest dwellers, indigenous peoples, and agricultural, migrant, and fisheries workers.

- *Localizes Food Systems*

Food sovereignty brings food providers and consumers closer together so they can make joint decisions on food issues that benefit and protect all.

- *Puts Control Locally*

Food sovereignty respects the right of food providers to have control over their land, seeds, and water and rejects the privatization of natural resources.

- *Builds Knowledge and Skills*

Food sovereignty values the sharing of local knowledge and skills that have been passed down over generations for sustainable food production free from technologies that undermine health and well-being.

- *Works With Nature*

Food sovereignty focuses on production and harvesting methods that maximize the contribution of ecosystems, avoid costly and toxic inputs, and improve the resiliency of local food systems in the face of climate change.

Kilolani and Correa (2020) outline the necessity for access to land in any pursuit of food sovereignty. They argue that until native Hawaiians can gain some measure of self-determination over their lands, food sovereignty will not be achievable. However, despite native Hawaiians' lack of control over their lands today, in striving toward a more food-sovereign Hawai'i, Olohana Foundation's juicer project will take these food sovereignty principles as core to its mission.

Food Security

“Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 1996). Globally, food security has been decreasing since 2014, however it was greatly exacerbated by the COVID-19 pandemic in 2020 (FAO et al., 2021). Hawai‘i did not escape this trend, as evidenced by a 30% increase of Supplemental Nutrition Assistance Program (SNAP) enrollees from February 2020 to February 2021, resulting in the highest number of SNAP users ever in the state (Kawano, 2021).

A May 2021 Hawai‘i News Now documentary “Ketchup and M&M’s,” (a title referring to the forced reliance on processed, shelf-stable foods that would result were the food shipments from the continental United States to be interrupted) featured revelations of how close Hawai‘i’s food distributors came to losing access to channels of food shipped in from the continental United States (Aalto, 2021). The documentary featured Hawai‘i Food Service Alliance (HFA), the “largest supplier of highly perishable food products” in Hawai‘i (Aalto, 2021). It revealed that HFA relied on relationships with California distributors to ensure that food supply was not interrupted to the islands as Hawai‘i consumers stocked up at grocery stores to meet at-home food requirements during the lockdowns of the spring and summer of 2020. Residents of the islands saw empty shelves and long lines at grocery stores. Though HFA ensured the continued supply of perishable foods from the west coast, the scramble to do so was a stark reminder of the over-reliance on outside shipping that leaves Hawai‘i’s food system extremely vulnerable to interruptions, with studies showing the state imports between 85-90% of its food for consumption (Loke and Leung, 2013, Page et. al. 2007, Leung and Loke 2008, Meter 2003).

While Olohana Foundation has been addressing this issue through its work, the industrial scale fruit processing equipment presents an opportunity to fill another piece of the puzzle for increasing local import substitution for local food security.

Food Self-Sufficiency

The related concept of food self-sufficiency is defined by the FAO as the “extent to which a country [or region] can satisfy its food needs from its own domestic production” (FAO, 1999). Hawai‘i’s leaders and residents agree that increasing local production of food staples is an important goal for increasing overall food security, particularly if shipments of such staples were to be cut off by a hurricane or other interruption.

Though the islands were once food self-sufficient, and increased self-sufficiency has been a growing focus in the public sphere, George Kent (2014) and others (Leung & Loke, 2008) have cautioned against an over-emphasis on food self-sufficiency alone, including the change in diet that may be required for 100% self-sufficiency. The variety of food products that could be grown and processed in the islands may be limited as compared to what is available on the global marketplace. However, achieving self-sufficiency in certain food categories including fresh fruits and vegetables is not far out of reach. As of 2012, Hawai'i was close to self-sufficient in production of certain vegetables including watercress, Chinese cabbage, tomatoes, sweet potatoes, and sweet corn to name a few (Office of Planning, 2012). In terms of fruit, the majority of demand for watermelon, papaya, pineapple and banana was also produced locally at the time (Office of Planning, 2012).

With an industrial-scale capacity, the juicing system will require a large and steady supply of fruit. With a goal to rely on local production of such inputs, it will be important to ensure adequate supply of locally-grown fruits.

Decreasing Food Security Over Time

Despite food self-sufficiency in some sectors as noted above, Hawai'i still imports the vast majority of its consumable food (Loke and Leung, 2013). It is important to note that this level of food insecurity and lack of self-sufficiency is relatively new to Hawai'i. Before Western contact, Hawai'i was 100% food self-sufficient and food sovereign. Native Hawaiians intensely cultivated their land, described in 1782 as *'āina momona*, fertile lands fat with food (Kame'eleihiwa, 2016). *Lo'i kalo*, or wetland taro cultivation, dominated the landscape of the valleys of O'ahu, and extensive fishponds produced fish over 4,200 acres of shoreline on that island alone (Kame'eleihiwa, 2016). Native Hawaiians had a land footprint of an estimated 380,000 acres throughout the archipelago, including settlements and food producing areas (Melrose et al., 2016). This supported a population of around one million people (Kame'eleihiwa, 2016). Unfortunately, since Western occupation of the islands, this high level of food self-sufficiency has been steadily decreasing.

Melrose et al. (2016) document the land use changes in the islands over time. Less than 50 years after the American overthrow of the sovereign nation state of the Kingdom of Hawai'i, land use was thoroughly influenced by sugar and pineapple plantation agriculture (Melrose et al., 2016). In 1937 the Territory of Hawai'i was still mostly food self-sufficient, with communities providing for most of their own egg, dairy, meat, and fresh vegetable needs. All the beef produced was locally consumed and

nearly half of the land mass was considered grazing land. However, native Hawaiians had lost their food sovereignty to the occupying government and a shift to cash crop production was underway.

By 1980, the agricultural production of the islands was dominated by monocrop plantation crops for export. Over half of all cropland was planted in sugarcane at 255,784 acres (Melrose et al., 2016). Pineapple was the second largest crop at 44,858 acres (Melrose et al. 2016). These large scale plantings resulted in significant loss of pastureland which had been halved since the 1937 report, down to 1.1 million acres (Melrose et al., 2016). This decline in pastureland is pictured in Figure 1 below.

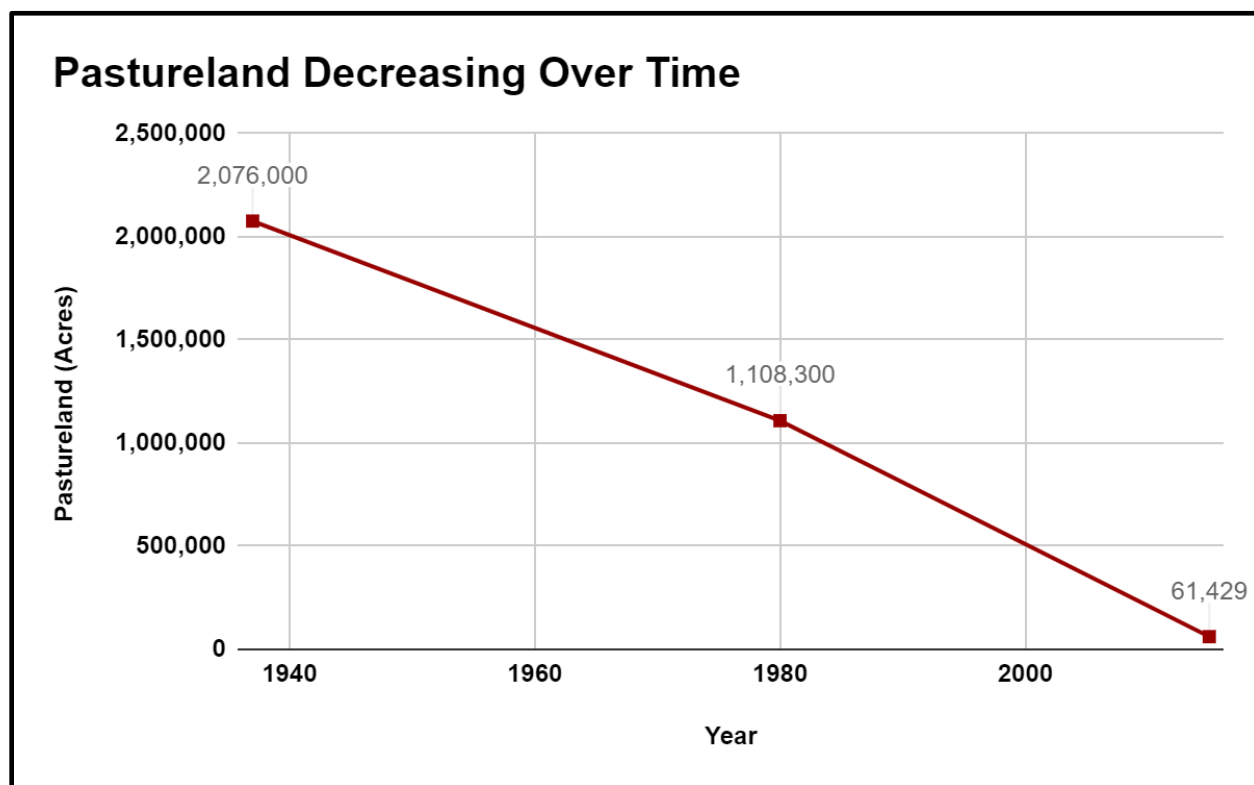


Figure 1: Pastureland Over Time (Data Source: Melrose et. al., 2016)

By 2015, crop acreage was less than half of what it was in 1980, down to 151,831 acres (Melrose et al., 2016). This was largely due to the widespread closure of sugar cane plantations across the islands, with the final plantation closing operations in 2016. Commercial tropical fruit crops grown that year totaled 3,990 acres, 77% of which were located on Hawai'i Island at 3,100 acres (Melrose et al., 2016). Additionally, Hawai'i Island is home to the majority of papaya production in the islands, with 3,207 acres estimated in 2020 (Perroy and Collier, 2020).

This decrease in food security and self-sufficiency over time has been the subject of increasing attention and concern across the public sphere. The state's 2050 Sustainability Plan and the Aloha+ Challenge—Hawai'i's framework to achieve the UN Sustainable Development goals—both aim to double local food production by 2030 (State of Hawai'i, 2017; Aloha+ Challenge, n.d.). In the 2019 legislative session, Hawai'i passed Act 151, which directs the Hawai'i Department of Agriculture to develop “a strategic plan outlining strategies, benchmarks, and metrics to achieve the goal of doubling food production in, and increasing food exports out of, the State by 2030” (State of Hawai'i Department of Agriculture Office of the Governor, 2019). The statute also provided \$100,000 in FY 2019-2020 to work toward this goal. As of September of 2021, the Hawai'i Department of Agriculture had not yet completed the strategic plan due to the COVID-19 pandemic which led to shifted priorities for the department (E. Yamamoto, personal communication, August 11, 2021).

To build more resilient and democratic food systems in Hawai'i, there is a developing conversation around community-based food systems. A 2018 Hawai'i Department of Health study *Good Food for All: Advancing Health Equity Through Hawai'i's Food System* identified the need for building community-based food systems that use “inclusive processes,” and that “both small- and large-scale agricultural models are necessary” as “small-scale operations can adapt quickly to changing consumer needs and climate conditions (p.15).” Such small-scale, community-based initiatives are important for food sovereignty, supporting the most vulnerable populations through increased self-determination in what their food system will look like and valuing the contributions of local food producers over corporate food (Nyéléni, 2007).

In the face of decreasing food security, sovereignty, and self-sufficiency over time, a pivot to conversations around community-based food systems is encouraging. Olohana Foundation developing a grower-owned juicing cooperative could be one answer to this call for establishing community-led food security projects. Below we explore some of the barriers to increased food security in the islands today and how this project hopes to address these barriers.

Barriers to Increasing Food Self-Sufficiency

Despite the wide-scale closure of the sugar and pineapple plantations across Hawai'i and the subsequent opening of thousands of acres of agricultural lands, the islands have struggled to achieve a diversified agricultural system that meaningfully contributes to food security and self-sufficiency. This is due to the many dynamics that make attaining food self-sufficiency in Hawai'i more difficult, primarily associated with the high costs of production in nearly every arena.

Table 1: Barriers to Food Self-Sufficiency in Hawaii

Barriers to Increased Food Self-Sufficiency in Hawai'i
Land
Labor
Energy
Inputs
Mid-Tier Value Chain Infrastructure

Land

It is expensive to be a farmer in Hawai'i. The cost of land is often out of reach. As Melrose et al. note, “[t]he sale of agricultural lands at prices that exceed the farmers’ ability to farm economically is one of the strongest forces working against sustained agriculture in Hawai'i.” With limited land availability, the increasing cost of arable lands is in stark competition with development (Melrose et al., 2015, Yerton, 2021b). Additionally, there are other competing uses for land, including the installation of increasingly more solar farms to meet state goals for 100% renewable power production by 2045 (Yerton, 2021a & Kim et al., 2015).

Labor

Agricultural workers in Hawai'i are paid the highest in the US, at an average hourly rate of \$23.94, with annual average incomes at \$49,790 (based on full-time, year-round employment) (U.S. Bureau of Labor Statistics, 2021). This compares to agricultural workers in California who are paid an average of \$20.42 hourly, for an annual wage of \$42,480. Additionally, Hawai'i's wages are 31% higher than the US average of \$16.51

per hour or \$34,330 annually (U.S. Bureau of Labor Statistics, 2020). This is, therefore, a major contributing factor to farmers' costs.

Table 2: Average Hourly Wage: Agricultural Labor- Hawai'i vs. California vs. US

Average Hourly Wage: Agricultural Labor	
Hawai'i	\$23.94
California	\$20.42
US	\$16.51

Despite high wages, farmers struggle to find skilled and reliable labor, with many farmers noting it as their number one barrier (HIAP, 2021). This labor shortage seems in part to be due to a lack of adequate and affordable housing for laborers available on or near farms (HIAP, 2021).

Energy and Inputs

Another important barrier is the high costs of energy and other agricultural inputs. Electricity for "Medium Power Use Businesses" costs around 23.92 cents per kilowatt hour on the island of O'ahu, 243% higher than the US national average for industrial power generation at 6.97 cents per kilowatt hour (Hawaiian Electric, n.d., U.S. Energy Information Administration, 2021). Agricultural input prices are significantly higher in Hawai'i than on the US continent, in part due to high shipping costs. A recent estimate found that the Jones Act, which governs shipping between US ports, is responsible for adding an additional \$33,261 annually to the cost of all nitrogenous fertilizers shipped into the islands alone (Grassroot Institute of Hawai'i, 2020).

Mid-Tier Value Chain Infrastructure

Related to the nearly prohibitive costs of land, labor, energy, and agricultural inputs is a lack of aggregation, processing, and distribution infrastructure, all of which are central to increased food self-sufficiency (Hollier, 2014, Department of Health, 2018, Meter and Phillips, 2017, Aloha+ Challenge, n.d.). With high production costs, processing infrastructure would allow producers to add value to their crops to be sold at a higher price point, as well as increase import substitution for non-perishable food items (Page et al., 2007).

Fruit Processing

In the face of these challenges, the need to improve food self-sufficiency through developing processing capacity in a community-based manner is clear. That said, significant questions remain regarding the viability of establishing an industrial scale juicing operation. To sustainably develop the equipment while contributing to food security, there are several broad considerations that we will examine in the following sections.

Key Considerations for Fruit Processing

- *Equipment & Start-up Costs*

Though there may be many ways to reconfigure the equipment, we seek to understand the start-up costs of re-establishing the juicer in a similar format as it once was set up.

- *Sourcing and Aggregation*

If the processing equipment were to be used to produce fruit juices and purees once again, we must determine whether there is an adequate supply available of locally grown fruit in order to supply a system of this scale. Many residents and experts note anecdotally the abundance of local fruits that go to waste, however, examining the data on fruit production will allow us to better understand fruit supply availability.

- *Products and Markets*

We seek to understand whether adequate demand exists for locally grown fruit products at the local level, as well as the potential products that retailers, restaurants and chefs are interested in purchasing.

- *Business Structure*

The Olohana Foundation values food sovereignty, self-sufficiency, and security, so choosing a business structure that aligns with such values will be of primary importance. We seek to understand what business structure best aligns with community values and supports small farmers.

Methodology

This pre-feasibility study included field research via recorded qualitative interviews with experts in various aspects of Hawai'i food systems, business development, farmers, and those with knowledge of the juice industry. Through these interviews, the research team aimed to understand knowledge and best practices within four main content areas:

- a) Equipment: start-up and operational costs,
- b) Supply: availability and accessibility of local fruit supply,
- c) Demand: important markets for fruit products including juices and purees, and
- d) Potential business structures, including non profit corporation, member-owned cooperatives, Limited Liability Company (LLC) and Sustainable Business Corporation.

In the pursuit of a larger sample size than could be gathered via interviews, two surveys were produced and distributed. These surveys were used in tandem with the interviews to canvas the market and lend additional insight into the current market landscape for whole, fresh fruits, fruit juices, purees and other fruit products. Additionally, secondary data was also collected via desk research.

This research was reviewed by the Arizona State University Institutional Review Board (IRB) and was deemed exempt pursuant to *Federal Regulations 45CFR46 (2) tests, surveys or observation* on 7/2/2021. The IRB number for this project is STUDY00014125.

Research Design and Framework

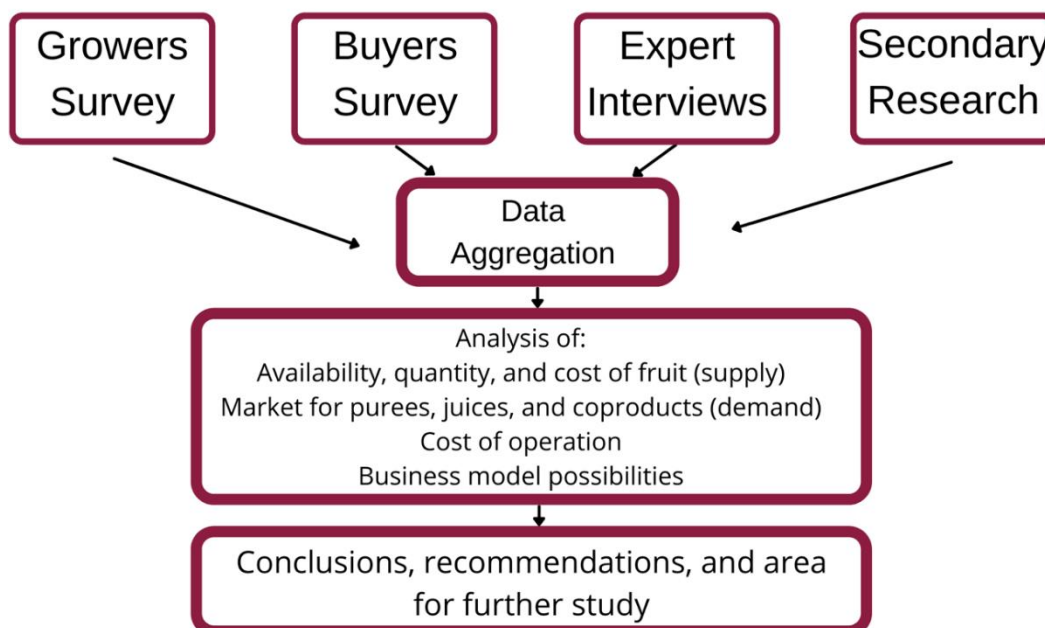


Figure 2: Research Design

IRB process

Institutional Review Board certification was sought and approved for this project. All potential question categories were included in this review process. An informed consent form was developed to ensure participants were aware of their rights as participants in this study. Each participant was asked to confirm their consent to be a part of this study and given the option of being recorded via Zoom for the sake of clarity and accuracy in quotations. Participants were not guaranteed anonymity, but were given the option to opt into participating anonymously.

Sampling and Aggregation

In total, the research team conducted 14 interviews with 15 experts in the sectors of Hawai'i agriculture, business development, and the juice industry. These interviews provided around 17 hours of informative data. The growers survey returned data from 67 participants, while the buyers survey yielded 11 responses. These data were cleaned and checked to remove potential irrelevant information such as incomplete answers.

Interview data was separated and aggregated to determine relevant themes across each of the pertinent areas of inquiry – start up and operational costs, supply, demand, and business structure. We developed a color-coded spreadsheet where themes and quotations could be easily identified across interviews. This aggregated data tool informed the analysis, conclusions, and recommendations.

Primary Data

Interview Protocols

Interviews were conducted via Zoom and lasted approximately one hour. Interview subjects were selected via referral from other experts, or in some cases recommendations from Olohana Foundation. At least two members of the research team attended each interview, one as notetaker, and one as lead interviewer. With consent, the Zoom sessions were recorded for accuracy in quotations.

Fruit Growers Survey

Two surveys were developed to broaden the amount of data collected on two primary areas of emphasis: supply and demand.

To determine potential fruit supply, a survey was sent to fruit farmers and growers throughout Hawai'i. Various outreach methods were utilized for this survey, primarily through peer-to-peer outreach, as well as various farmer community forums on the social media site Facebook. Table 3 lists the Facebook forums, their areas of focus, whether they were open to the public or private members only, and number of members on each forum. These groups were primarily focused on Hawai'i Island agricultural producers, many of which are focused on community groups in the Puna District of Hawai'i Island. The data received from these surveys, therefore, may be skewed to over-represent the Puna district more so than other districts throughout Hawai'i and Hawai'i Island.

Survey questions focused on the varieties and amounts of various juicing fruits currently being grown by these farmers and growers, the amount of fruit waste they are seeing, and their interest in being a part of a cooperative aimed at finding markets for their fruit. A copy of the survey can be found in Appendix B.

Table 3: Facebook Community Forums where Fruit Growers Survey was Posted

Group Name	Focus	Public or Private	Members
Homesteadin' Hawaii	Information sharing among hobbyist homesteading enthusiasts in Hawai'i	Private	11,000
Puna Happenings	Information sharing for residents of the Puna district of Hawai'i Island, a highly rural and agricultural area.	Public	11,000
Red Road Ohana	Information and event sharing for residents of lower Puna district, a highly rural and agricultural area	Private	3,400
Hawaii Permaculture	For enthusiasts and those interested in permaculture in Hawaii	Public	3,000
Zero Waste Hawai'i Island	Community forum for residents of Hawai'i Island who are interested in reducing their waste impact	Public	2,000
Puna Farmers Cooperative	Connecting farmers and residents in the Puna district to encourage sharing local food	Private	335
Pana'ewa Farmers Market	Facebook page for Pana'ewa farmers market, a small market in Hilo, to help connect farmers and producers to local consumers	Public	219
Ku 'Āina Pa	Private facebook group for Hawai'i teachers who have completed a school garden teacher training through the Hawai'i School Garden Network (HSGN)	Private	85

Fruit Buyer Survey

To determine the local commercial demand for juice and other fruit products such as pasteurized and unpasteurized fruit juice, fruit pulp, frozen fruit, fruit syrups, and frozen fruit concentrate, a separate survey was distributed to potential buyers of products. We chose buyers based on peer-to-peer outreach.

Survey questions regarded current fruit products purchased by these buyers, as well as their interest in expanding the amount/variety of fruit products they purchase for resale in various forms. Also included in this survey were questions pertaining to attributes

these companies look for when sourcing fruit products, including cost, reliability in supply availability, taste, growing practices, geographic location of growth/production, supplier business model (corporation, worker cooperative, etc.) and utilization of fruits that would have otherwise been wasted. A copy of the survey can be found in Appendix C.

Secondary Data

USDA NASS collects data on various aspects of agriculture including crop production across the United States. This is done through the Census of Agriculture, which is collected every 5 years. However, the agency also produces more targeted reports between Census years. Much of our analysis of fruit and other crop production levels in Hawai'i was based off of NASS reports from 2018-2020, with some use of data from the most recent Census of Agriculture completed in 2017. We strived to use the most recent data available. We also conducted reviews on the literature pertaining to different aspects of the report, as well as additional secondary data as needed.

Mixed Methods

Both qualitative and quantitative data analyses were used in this study for a few core reasons. First is the geographic location of the study site. Hawai'i is an incredibly unique state in many ways, primarily regarding its physical location. Hawai'i is a small chain of islands about 2,500 miles away from the continental United States. This presents unique challenges in imports and exports of goods, primarily food, that do not affect other parts of the United States or many other countries. Second, the climate of the islands features growing seasons year-round and a wet and dry season typical of tropical and sub-tropical climates. These factors contributed to the necessity of primary research with secondary research used to inform salient trends gleaned from the interviews and surveys.

Equipment, Start-up Costs & Considerations

In 2021, Olohana Foundation acquired the legacy aseptic juicing line from Calavo Growers, Inc. (Calavo), a self-described “worldwide leader” in avocado marketing and fruit processing (Calavo, 2008). Olohana secured the equipment to avoid it leaving the islands to the continental United States with the intent of preserving processing capacity locally. They acquired the equipment for a bargain price—a fraction of the forced liquidation value (FLV)—on the condition that they would quickly disassemble and move the large, industrial-scale juicing line from its facility.

A team of volunteers removed the equipment in mere days to meet Calavo’s deadline. At the time of writing this report, the equipment sits disassembled on pallets in non-food-grade storage. This section will explore what it would take to put this equipment back into operation including: startup costs, cost-drivers for operation in Hawai‘i, and options for reconfiguring.

Equipment

Prior to its disassembly, the equipment was operating on Hawai‘i Island to process and pack papaya and guava puree. It was purchased by Calavo in 2008 as part of a transaction that would allow the company to “pack an estimated 65-70% of all Hawaiian-grown papayas and 80% of the mainland supply originating from the islands” (Calavo, 2008). A company release highlighting the transaction—which included multiple operations—celebrated that it would bring “papaya packing under direct Calavo control” (Calavo, 2008). Historically, however, much of the equipment was initially purchased in the late 1960’s and 1970’s by former sugar company Amfac Inc., to diversify operations from sugar production to fruit purees (Sklarwitz, 1982).¹

The specific equipment acquired by Olohana just over 10 years later has the capacity to process fresh fruits, vegetables, and even nuts (A. DalPorto, personal communication, 2021, August 13). A simplified explanation of the process that the equipment employed when it was initially running, as best can be determined by the authors, follows as pictured in the diagram below (Figure 3) The fruit is sliced into smaller pieces by the disintegrator, the seeds, skin, and other potential coproducts are separated by the

¹ Amfac Inc. (previously American Factors) was one of the “Big Five” sugar companies in Hawai‘i and still exists today. The other four are: Alexander & Baldwin, C. Brewer, Castle & Cooke and Theo H. Davies.

paddle finisher, and then the screw finisher refines the liquid, removing pulp and other smaller pieces that will not find their way into the finished product.

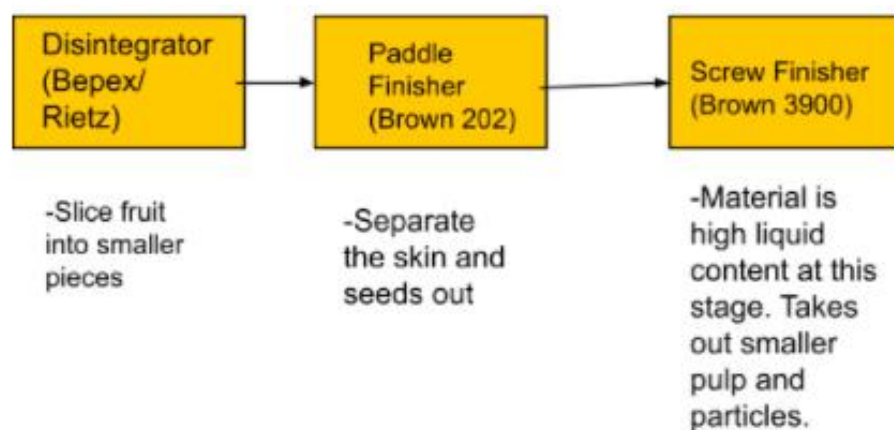


Figure 3: Core equipment process order

Once the raw food product is refined, the aseptic process begins. Per our interviews, aseptic processing is difficult to employ correctly—and with high stakes for food safety—but it is easy to understand (A. DalPorto, personal communication, 2021, August 13). Essentially, high heat is used to kill any potential pathogens in the food product before it is packaged in a sterile container (Bates, Morris, & Crandall, 2001). In the case of this system as it was configured for Calavo, the puree was sterilized by pumping it through heated pipes before being pumped into large, pre-sterilized 50-gallon plastic bags using a filler which maintains a sterile environment.

The aseptic equipment is unique and valuable, while also being difficult and expensive to operate safely and correctly (A. DalPorto, personal communication, 2021, August 13). Pressed fruit—and the juice, for that matter—is highly susceptible to microbial spoilage (Aneja et al., 2014). This risk to human health creates a central concern for juice manufacturers (Snyder & Worobo, 2018).

A list of much of the equipment acquired by Olohana can be found below (Table 4). When considering its functionality for the purposes of processing food and creating greater food sovereignty and self-sufficiency on the island, it will be important to note that it can be divided into both 'upstream' and 'downstream' equipment. 'Upstream' equipment is that which turns the fruit into puree, while the 'downstream' equipment packages it aseptically.

Table 4: Equipment Basic Data (see Appendix D for pictures)

Short name	Manufacturer	Model	Year	Serial No.
Disintegrator	Bepex	RP-12-K122	1982	82003159
Paddle finisher	Brown	202 Finisher	1967	203RA-27
Screw finisher	Brown	3900 Finisher, Series 3902	1969	3902-31
Sanitary pump #1	Waukesha Cherry-Burrell	Universal series	1975	D055936SS
Sanitary pump #2	Waukesha Cherry-Burrell	--	1960	D010980SS
Pump #3	Fristam	FL2100 S99 054	--	--
Control panel	Waukesha Cherry-Burrell	--	1960*	1317
Heat exchanger	--	AR56-S	1998**	98162
Thermutator	Waukesha Cherry-Burrell	672 L	1960*	1228
Aseptic filler	Scholle	Auto-Fill X-1 Aseptic Ban in Box Filler	1978*	--

*Approximate

**Date of purchase, not manufacture

-- Information not found

Before diving deeper, it is worth highlighting three key attributes of this equipment that will guide decision-making and inform the rest of this analysis. Before analyzing supply

and demand locally, an understanding of the abilities and start-up considerations of the equipment will be necessary, as the equipment itself is the initiator for the project.

First, the equipment is old by industry standards. As B. Keahi Tajon, Community Project Director at Olohana Foundation described, the equipment was designed in the 1960s and '70s and put into operation in the '80s. "Food regulation has come a long way since then," as has technology (B.K. Tajon, personal communication, 2021, July 16). This fact was underscored by conversations with equipment manufacturers. While representatives of these companies often guessed that they could still find wear parts², they all made clear that this equipment was not commonly still in operation. For example, one shared that she would need to consult paper files to find a list of wear parts. And an industry expert estimated that certain components, and certainly the user interface, would need to be upgraded to put the line back into operation as it was originally configured for Calavo (A. DalPorto, personal communication, 2021, August 13). All that said, no one we spoke with stated concerns that redevelopment of some of this equipment was not worth pursuing.

Second, this equipment was built and originally configured to operate at a massive scale. This is important for the project's feasibility and ability to contribute to food sovereignty, because there is a finite amount of fruit grown on the Hawaiian islands. We have a window into the original scale not only from the Calavo press release that celebrates this equipment bringing papaya processing under their direct control, but also from conversations with the manufacturers. Because the material being processed is pumped through the pieces of equipment much of it has both a maximum and a minimum throughput.

Take for example the paddle finisher, which removes the seeds, skin, and other pieces of the fruit not wanted in a final puree. If it were processing avocados, it has a minimum throughput of approximately two thousand pounds per hour. This is then compounded by the fact that due to onerous cleaning and sterilization processes between uses, companies typically run this equipment non-stop for five to six day stretches (A. DalPorto, personal communication, 2021, August 13). This would mean that for just one, conservative, five-day week of operation this machine would require a minimum of 240,000 pounds of avocados—approximately six semitruck loads (Martinez, 2017).

² Wear parts: parts that are designed to "wear in their normal working condition, including for example, seals, gaskets, etc. (Law Insider, 2021)". Such parts require regular replacement with use of machinery.

Table 5: Paddle Finisher Throughput Estimates (Brown, 2021)

	Avocado		Papaya		Lilikoi*	
	Min	Max	Min	Max	Min	Max
Lbs / hour	2,000	4,000	1,000	2,000	6500	11,000
Lbs / 5-day wk	240,000	480,000	120,000	240,000	780,000	1.32 mil
Lbs / 50-wk year	12 mil	24 mil	6 mil	12 mil	39 mil	6.6 bil

*Lilikoi = Passion fruit

Third and finally, it is worth noting the system is incomplete. Putting the equipment back into operation as it was configured for Calavo would require investment in additional equipment (A. DalPorto, personal communication, 2021, August 13). We will go into more detail on this below.

These notes aside, as we conducted interviews throughout the summer of 2021, experts and potential partners continued to see potential in the project and this equipment. Far from insurmountable obstacles, these are key considerations to take into account when deciding how this equipment can contribute to a profitable venture that contributes to food sovereignty and security in the Hawaiian Islands.

Start-Up Costs

Now that we have detailed the equipment and described some key considerations, we will dive deeper into the potential for restarting this juicing line as it was configured for the previous owners. This section is not a roadmap for redeploying this equipment, but instead a benchmark for evaluating options and developing recommendations for best leveraging this equipment into a viable project.

Through conversations with project partners, industry experts, equipment manufacturers, and online research, we identified some key categories for start-up costs. Those include facilities, additional equipment, equipment refurbishing, consulting, and research. These costs—all of which come before a single piece of fruit is processed by this equipment—are briefly described below.

Facility - \$100,000

The equipment is currently stored on pallets in a temporary facility that does not meet food safety standards. A first step in putting the equipment back into operation will be securing a suitable facility. When operated by Calavo, the equipment was set up in a 3,000 square foot warehouse. According to a 2014 study commissioned by the State of Hawai'i, industrial space rents for an average of \$1.35 per square foot per month (Munekiyo & Hiraga, 2015). Based on a survey of current real estate listings on the big island, this average seems like a reasonable estimate for commercially-zoned property (Loopnet.com, 2021). This average gross rent would bring the per month cost to just over \$4,000 and the yearly rent to just over \$48,000.

Another consideration for the space—and a potential cost driver—is that not just any industrial space will suffice. While the facility does not need to be a commercial kitchen, it will require drains for effluent, gas lines, 3-phase power, and a working space that is easily cleaned ((A. DalPorto, personal communication, 2021, August 13. B.K.Tajon, personal communication, July 16, 2021). If a facility does not meet these requirements, it may not be suitable or it could require modification, adding to the cost.

With additional costs anticipated, we will assume a rounded, conservative estimate for the facility of \$100,000 in the first year.

Equipment refurbishing – \$21,000

In addition to the facility, the equipment would likely need to be upgraded and refurbished. This is in large part due to its age. As part of our research, we worked to contact the original manufacturers of the equipment to confirm that wear parts and service are still available (see Table 6).

Table 6: Equipment servicing and wear parts

Short name	Service	Parts	Consultant fee	Estimated shipping
Disintegrator	Maybe	Available	--	\$1,016
Paddle finisher	Available	Available	\$1,000*	\$2,834
Screw finisher	Available	Available	\$1,000*	\$2,834
Sanitary pump #1	No	No	--	--
Sanitary pump #2	No	No	--	--
Pump #3	--	--	--	--
Control panel	No	No	--	--
Heat exchanger	--	--	--	--
Thermutator	No	No	--	\$1,016
Aseptic filler	--	--	--	\$2,834

*Approximate

-- Information not found

While we received more details from some companies than others, we were able to confirm a couple of important points. First—and though the companies have changed names, merged, and updated their technology—wear parts and service for some of the equipment are still available. Second, because the equipment is large, heavy, and located on an island, it will be expensive to ship the equipment away for refurbishment (nearly \$3,000 one-way). This makes it more likely that bringing consultants, company representatives, and other experts to Hawai'i will make more financial sense.

Without experts looking at the equipment, it is hard to know whether wear parts will be needed out of the gate. Assuming that the “guts are good” and all that is needed is some company time to confirm that for each manufacturer, we will put a conservative estimate for refurbishing at \$3,000 for each piece of specialty equipment.

If pieces that are no longer serviced break down, redeploying the line might require upgrading to newly purchased equipment, which could drive this cost up significantly higher.

Additional Equipment – \$275,000

Beyond refurbishing the equipment, there is also a need for additional equipment. On reviewing the equipment list an industry expert identified that the project would need to invest in additional equipment including a 50 to 70 watt boiler and an upgraded Human Machine Interface (HMI) needed to run the equipment. The expert estimated that they would cost \$125,000 and \$150,000 respectively, bringing the budget for additional equipment up to \$275,000.

As with other sections, this is a conservative estimate of known costs. This assumes that none of the other equipment—pumps for example—will need to be replaced.

Consulting – \$20,000

In our interview with industry expert, Anthony DalPorto, he emphasized the need for consulting in order to put all of these pieces together and—in particular—to certify that the aseptic system is working as it should to produce a sterile, shelf-stable, product. In his estimation, a good aseptic consultant would cost approximately \$1,000 - \$1,500 per day with travel and would likely be required for at least two to three days (DalPorto, 2021). With a conservative travel budget and this estimated consultant fee, a conservative base budget for consulting fees would come to approximately \$5,350 (see Table 7).

Table 7: Consulting cost estimate

Item	Cost
Consulting Fee	\$1250 / day
Room & Board	\$300 / day
Travel (plane / car)	\$700 (3-days)
TOTAL:	\$5,350 for three days

This budget for consultants is conservative not only because it is assuming a short, no-frills trip. It is also likely underestimated because consultants will be needed throughout

the process of redeploying the equipment. The consultant hired with the above budget could, for example, survey the equipment and provide recommendations for putting it back together. Or certify that the equipment is still in good working order. But then once the work is done to reassemble the line, the project would likely also require a “process authority” or another expert to certify that the equipment is working as it should be and that the end product is shelf stable (A. DalPorto, personal communication, 2021, August 13).

The need for consultants might also be augmented if the project is not able to secure the help of an employee with experience in aseptic processing. Given the likelihood of needing multiple consultants throughout the process of redeploying the equipment, we estimate approximately \$20,000 in consultant fees and travel in order to get the equipment operational.

Expert staff - \$200,000

Finally, likely the largest start-up cost will be hiring a skilled staff person who knows how to run the equipment. DalPorto emphasized the importance of this for the aseptic process and suggested that the best way for a new entry to do this would be to try to hire someone away from another company. The going rate in California, he estimated, was approximately \$100 to \$80 per hour or between \$150,000 - \$200,000 in the first year. Because there is limited food manufacturing in Hawai'i, Olohana Foundation would likely need to recruit a hire to move to the state. For this reason, we will estimate salary on the high end of this range.

This estimate is conservative, because it only includes the single expert when the juicing line will, in reality, take more people to operate. For the purpose of this estimate—and in keeping with how the juicing line was disassembled, we will assume that Olohana is deploying existing staff and volunteers for much of the work.

Total start-up costs - \$616,000

Above we detailed a few driving start-up costs that are unique to this project, the sum of which comes to approximately \$616,000. However, there are other standard costs that we have not yet included. These include vehicles and fuel for transporting the equipment, tools and consumables for reassembly, business insurance, business registration, computer and internet access, marketing materials, and other incidental costs (Hawai'i SBDC, 2015). This total also does not include the cost of the raw product, which is significant.

It is easy to see how start-up costs could easily reach \$1-2 million, a rough estimate confirmed via our interview research (A. DalPorto, personal communication, 2021, August 13).

Operational Costs in Hawai'i

Start-up costs are high and so are the costs of operation in Hawai'i. This may have been a reason that the previous owners, Calavo, planned to sell the equipment. As noted previously in the study, the price of electricity, labor, transportation, and goods needed to run a business are all higher on the islands. This is a central limiting factor to this project's feasibility, particularly when it comes to competing in the commodity market (A. DalPorto, personal communication, 2021, August 13).

Electricity

As mentioned previously, power for "Medium Power Use Businesses" costs 23.92 cents per kilowatt hour on the island of O'ahu, 243% higher than the US national average for industrial power generation at 6.97 cents per kilowatt hour (Hawaiian Electric, n.d., U.S. Energy Information Administration, 2021). Manufacturers in California, the undisputed leader in food manufacturing, contend with an average Kwh hour of approximately 16.89 cents, still well below that of Hawai'i (USDA ERS, 2017; eia.gov, 2021).

A University of Hawai'i report connects the high price of electricity in the state back to the price of oil (Roberts, 2014). That is because much of the island state's electricity is produced via generators that run on fossil fuels. It is also more expensive to manage a resilient grid when you cannot rely on neighboring states for power.

Labor

The average hourly wage for people working in Hawai'i's production occupations is \$22.55, approximately 12% higher than the national average of \$20.08 (BLS, 2020). The more challenging market for labor could be intensified by a shortage of workers on the island brought about by changes having to do with COVID-19 (Martinez, 2021; KITV, 2021).

Transportation

Finally, a key, ongoing cost driver will be the cost of transporting fruit and finished products. Gasoline, like many other goods, is more expensive on the islands, costing

Hawai'i's consumers nearly a dollar more per gallon as compared to the national average (AAA.com, 2021).

While these are not all the ongoing costs it would take to operate the juicer should it be redeployed, they do illustrate the fact that—fruit supply aside—operating the juicer in Hawai'i would be more expensive than doing so in the continental US.

Key Takeaways

Start-up Costs

Our research found that a rough estimate for getting the equipment back into operation in the manner that it was previously set up would be between \$1-\$2 million. This cost includes facility, equipment refurbishment, additional equipment, consulting, and expert staff. However, this estimate does *not* yet include other standard costs including vehicles and fuel for transporting the equipment, tools and consumables for reassembly, business insurance, business registration, computer and internet access, marketing materials, and other incidental costs (Hawai'i SBDC, 2015).

Equipment Value

Despite the high start-up costs for line restoration, there is clear value in the equipment that may be leveraged into a viable business, perhaps in ways not previously operated. Potential markets and availability of supply should be carefully evaluated in this project and the equipment can be deployed in the best manner to suit these market considerations. There are many options for reconfiguring the equipment. The disintegrator, for example, could be put on a skid to pulverize fruit on farm to be used for hog food or fertilizer (DalPorto, 2021). Two themes became clear in conversations on this topic:

- *Upstream equipment* – It would be safer, cheaper, and easier to put upstream equipment into operation. Where the project gets complex, expensive, and risky is on the aseptic end of the operation.
- *Fermentation* – Many of our interviewees were enthusiastic about the prospect of fermentation. This could be for human food (i.e., kombucha), for animal feed, or for soil amendments (as with Korean Natural Farming). From a technical perspective, all three categories of coproducts could benefit from fermentation.

This process limits risks to human and animal health from anti-nutritional factors and supports the growth of microorganisms in healthy soil (Torres León et al., 2018; Soluk, 2021). This could present an opportunity for either future research or on-the-ground experimentation.

Hawai'i Specific Costs of Operation

The high costs of operating a manufacturing business in Hawai'i illustrate the importance of finding a niche product that can be marketed with a significant margin. Competing in the commodity market will prove difficult because the costs of operating in Hawai'i are so expensive. As DalPorto shared with us, "I don't want to chase a commodity crop, because I can't win (2021)." When international and continental US competitors pay so much less for electricity and labor, it will be difficult to make an operation selling guava puree, for example, competitive. However, a niche product that includes local 'made in Hawai'i' branding and carries a health claim, could be competitive.

Supply

Documenting available supply of fruit was of paramount importance in this pre-feasibility study. Is there a sufficient and consistent supply of fruit to supply a juicing operation given the equipment in question? To answer this question, survey and interview data was paired with and informed by assorted secondary data from the U.S. Department of Agriculture National Agricultural Statistics Service and other sources. These data together formed a clearer picture of fruit supply on the islands and informed other sections of this study.

Figures 4 through 7 detail some of the findings from the fruit grower survey.

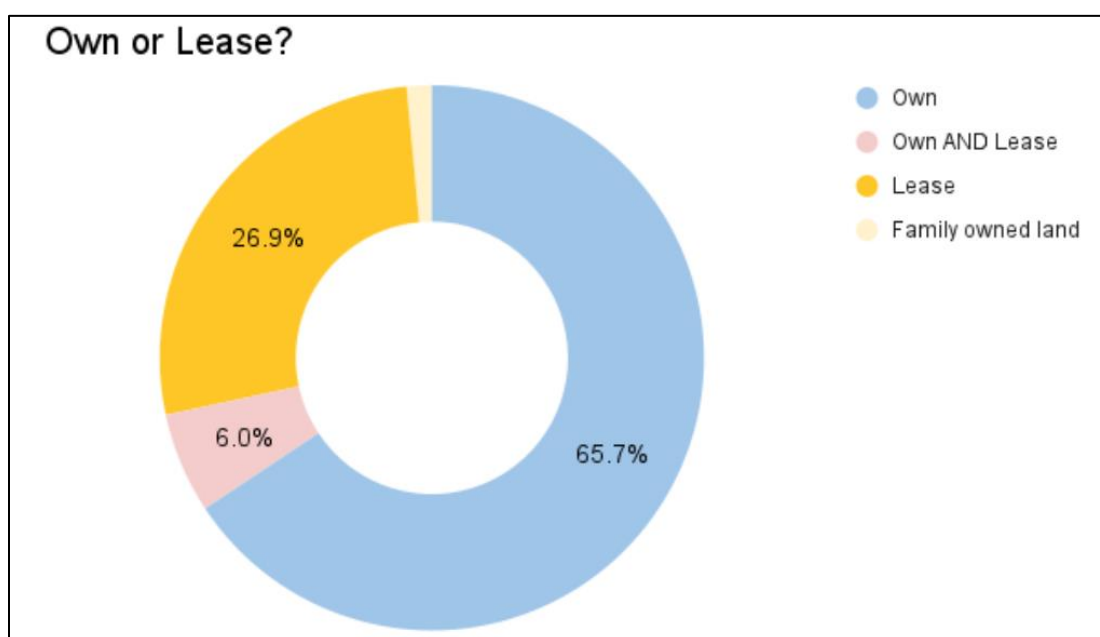


Figure 4: Status of Fruit Growers Land: Own or Lease. The majority of fruit growers (65.7%) own their land. This is an important aspect for fruit production in particular, which are long-term and permanent crops. N= 67

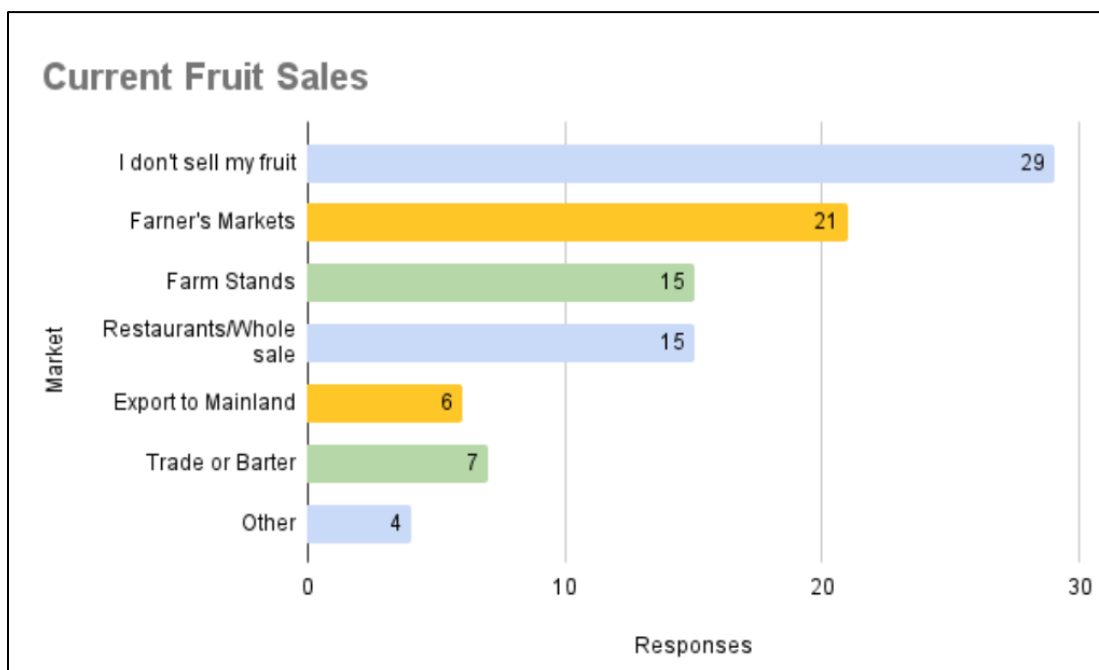


Figure 5: Current fruit sales by fruit growers. Nearly one third of growers do not currently sell their fruit. N= 67

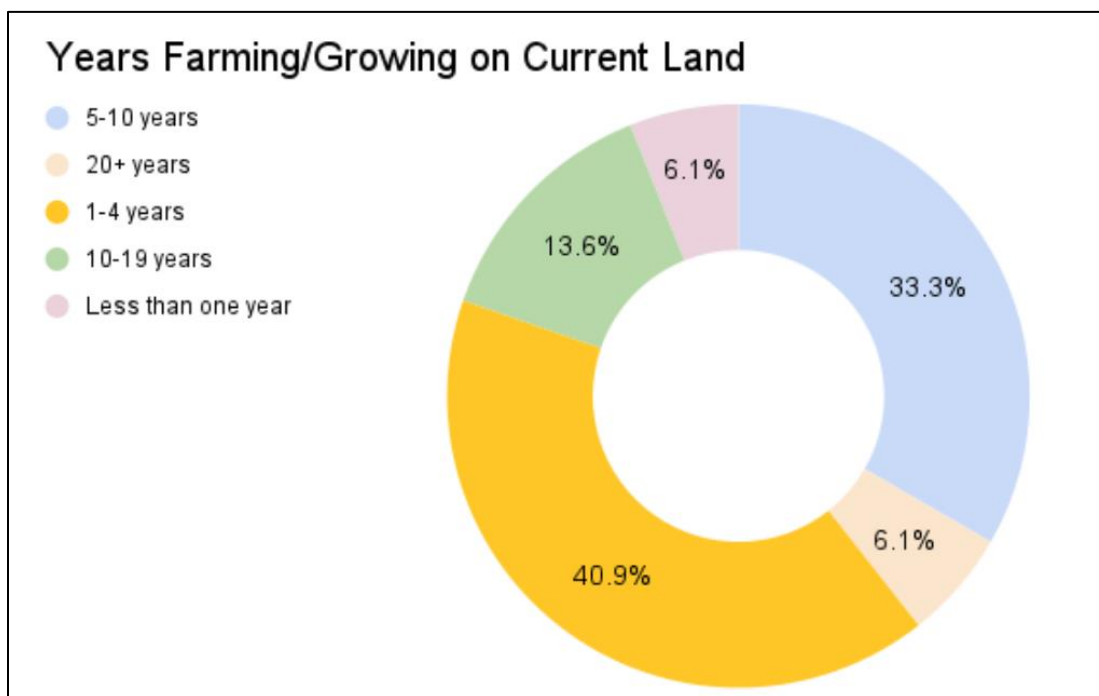


Figure 6: Years Farming/Growing on Current Land. Nearly half of growers have only been growing between 1-4 years on their current land. N= 67

48% Percentage of respondents with excess fruit
15 Average number of varieties of fruit trees
68% Percentage interested in joining a farmer cooperative

Figure 7: More grower survey results. Notably, nearly half of respondents have excess fruit. A diversity of fruit tree varieties is also the norm. Nearly 70% are interested in joining a farmer cooperative.

Biodiversity

The survey sample was made up of mostly small producers who owned their own land. It was clear that biodiversity was a commonality among these respondents. Of the 67 respondents, the average number of species of fruit bearing plants was over 15. This sentiment was confirmed in interviews as well. Traditionally, “Agroforestry is the way it works on the islands. Nowhere is there a monocrop (Avegatio, 2021).”

This variety is certainly a positive attribute in that it provides resilience against disease, pests, and other unforeseen circumstances. This resilience does not necessarily exist in a monocultural agricultural system, which relies on pesticide applications and synthetic fertilizers. However, given the average farm size in Hawai‘i (151 acres, firmly in the bottom third in the country), and the fact that, as of 2017, 66% of farms on the Hawaiian Islands were 9 acres or less, this diversity does pose some problems in terms of sourcing fruit for industrial scale juicing (USDA NASS, 2017). Additionally, the sheer number of pounds of fruit needed to run the juicing equipment efficiently may preclude certain fruits of which there is a low number of individual plants spread across many farms. As one expert shared with us, “you either need to scale, or you need to look at other sources of juicing... what fruits out there grow in such abundance that you have a shot at meeting the tonnage requirements for the local and export markets (Avagatio)?”

As evidenced by statewide data, fruits that grow in large enough abundance may be few and far between. Take, for instance, avocado production, which ranked as the second most common crop among survey respondents. Statewide production of avocados in 2020-21 totaled 610 tons (around 1.7 million pounds) (USDA NASS, Non-citrus Fruits and Nuts, 2021). The total pounds of avocado needed for running the juicer equipment for 5 days is at least 240,000 pounds, or roughly 14% of all the avocados produced in the entire state of Hawai‘i in 2020-21. Papaya, which ranked as the third most abundant

crop among survey participants, may fare better as a potential juicing fruit. In 2020, 11.7 million pounds of papaya were produced in Hawai'i. This means a 5-day juicing operation could potentially use roughly two percent of the total papaya produced in the state for the year. Our expert interviews also confirmed this lack of volume. Therefore, the options for the equipment in question may be limited by the sheer quantity necessary to make this juicing operation viable economically.

Table 8 shows a side-by-side analysis of the top three non-citrus fruits according to our sample and statewide data (banana, avocado, and papaya). This data can help inform the fruit production potential and cost for the top three non-citrus fruits in production.

Table 8: Side-by-Side Comparison of Top Three Fruits

Side-by-Side Comparison of Top Three Fruits			
	Avocado	Banana	Papaya
Average Annual Yield per Tree (lbs.)*	212	35	65
Average Trees per Acre*	105	565	450
Yield per Acre (lbs.)*	2,080	7,000	17,020
Price per Ton*	\$2,040.00	\$1,820.00	\$934.00
NASS Data**			
Total Acreage	840	950	690
Total Yield per Year	1,747,200	6,650,000	11,750,000
Glean Possibility (lbs. not sold)	180,000	-	1,170,000
Percent Wasted	10.30%	-	9.96%

* Source: University of Florida (2010)

** Source: NASS, Tropical Fruit, (2020)

Most Ubiquitous Fruit Varieties

The survey results gave some insight into which fruit varieties were most common among respondents. Table 9 gives an overview of the fruits with the highest number of respondents reported having at least some plants. This list is not necessarily reflective of the total pounds of fruit available, but rather, indicative of the most ubiquitous fruits grown among the population sample.

Table 9: Top Ten Fruits in Production (Source: Fruit Growers Survey)

Fruit	Number of Farms Producing
1) Banana	61
2) Avocado	58
3) Orange	40
4) Lemon	47
5) Passionfruit	45
6) Papaya	42
7) Lime	42
8) Mango	40
9) Cacao	38
10) Tangerine	37

Bananas were both the most ubiquitous fruit as well as the highest quantity of the sample. This is corroborated by NASS data. In 2018, 6.3 million pounds of bananas were produced on the islands (NASS, Tropical Fruit, 2020). Three citrus fruits (orange, lemon, lime), also ranked in the top ten of highest fruit production, suggesting there is quite a lot of citrus being harvested. Lisa DeSantis, Project Coordinator at Kokua Harvest, a gleaning nonprofit in Hawai'i suggests, much of the citrus on the islands isn't being harvested at all (personal communication, August 10, 2021). The juicing equipment has only one of the components of a full citrus juicing line (a final secondary finisher) but is missing other crucial components. Our data nevertheless suggests there is an abundance of citrus fruit available.

Issues of scale remain however. Utilizing NASS data, the combined production of citrus fruits in the top ten (orange, lemon, lime, tangerine) was 281,300 pounds. This is not nearly enough to meet the minimum threshold for industrial juicing. But it may be an area to expand on in the future given the amount of potential crop going to waste currently. It should be noted that NASS data is gathered via an agricultural census. The number of farms counted in the 2017 agricultural census in Hawai'i was a little over 7,300 (Hawai'i.gov, 2020). There certainly are farmers and small-scale backyard growers who do not complete the census, thus undercounting the amount of produce available on the islands. Additionally, much of the citrus being gleaned comes not from farmers but from landowners with a few trees on their property. More data that incorporates farmers who are not counted in the NASS data, as well as landowners who are not farmers would need to be gathered to gain an accurate picture of the amount of citrus going unharvested statewide.

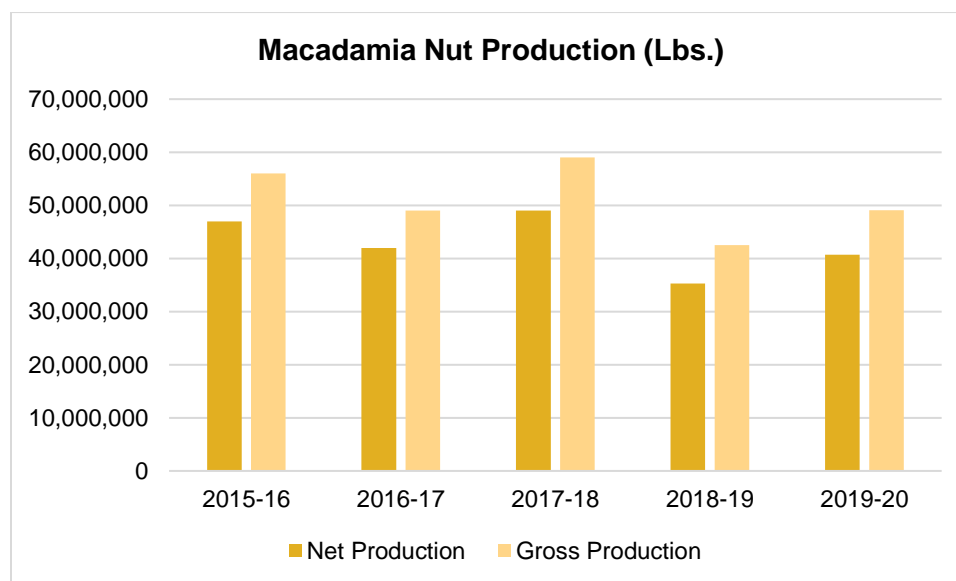
Table 10: Citrus Production by Pounds (NASS, 2020)

Fruit	Production (lbs)
Orange	69,500
Lemon	105,500
Lime	71,700
Tangerine	34,600
Total	281,300

Other Opportunities

Macadamia Nuts

Although not represented in our survey sample because it was solely focused on fruit production, macadamia nuts could be a reliable supply of product on the islands. This crop, which grew 15% in utilized net production in 2019-20, can be used to produce milk and other value-added products. Hawai'i saw 40.7 million pounds of net production of macadamia nuts in 2019-20. The price per pound has increased by 53% in the last decade, from 78 cents per pound in 2011, to 120 cents per pound in 2021 (USDA NASS, Macadamia Nuts, 2020).

**Figure 8:** Macadamia Nut Production by Year (USDA NASS, Macadamia Nuts, 2020)

Strawberry Guava

Guava could also be an abundant fruit source. Ken Love, Executive Director of the Hawai'i Tropical Fruit Growers West Hawai'i Chapter confirmed that guava, including the invasive strawberry guava, is likely the most plentiful fruit on the islands. This plant, native to Brazil, was introduced in Hawai'i in 1825 and has taken over a large part of the islands because of a lack of natural predators. It has been estimated that East Hawai'i alone produces 400 million strawberry guava fruit per year, totaling over 9 million tons (State of Hawaii Department of Agriculture, 2011). Because of its invasiveness and its impact on native species, utilizing strawberry guava fruit for juice production would have a significant beneficial environmental impact as well. The map in Figure 9, produced in 2011, estimates the extent of strawberry guava infestation on the islands, which has likely only spread in the intervening decade since publication. At the time, there were 495,000 acres of dense infestation of the tree across the islands, making up 38% of all forested areas (State of Hawaii Department of Agriculture, 2011). Another 52% of forests were partially or potentially invaded by strawberry guava, at 680,000 acres. At the time, the report found that only 10% of native forests in the islands were not threatened by this highly invasive species.

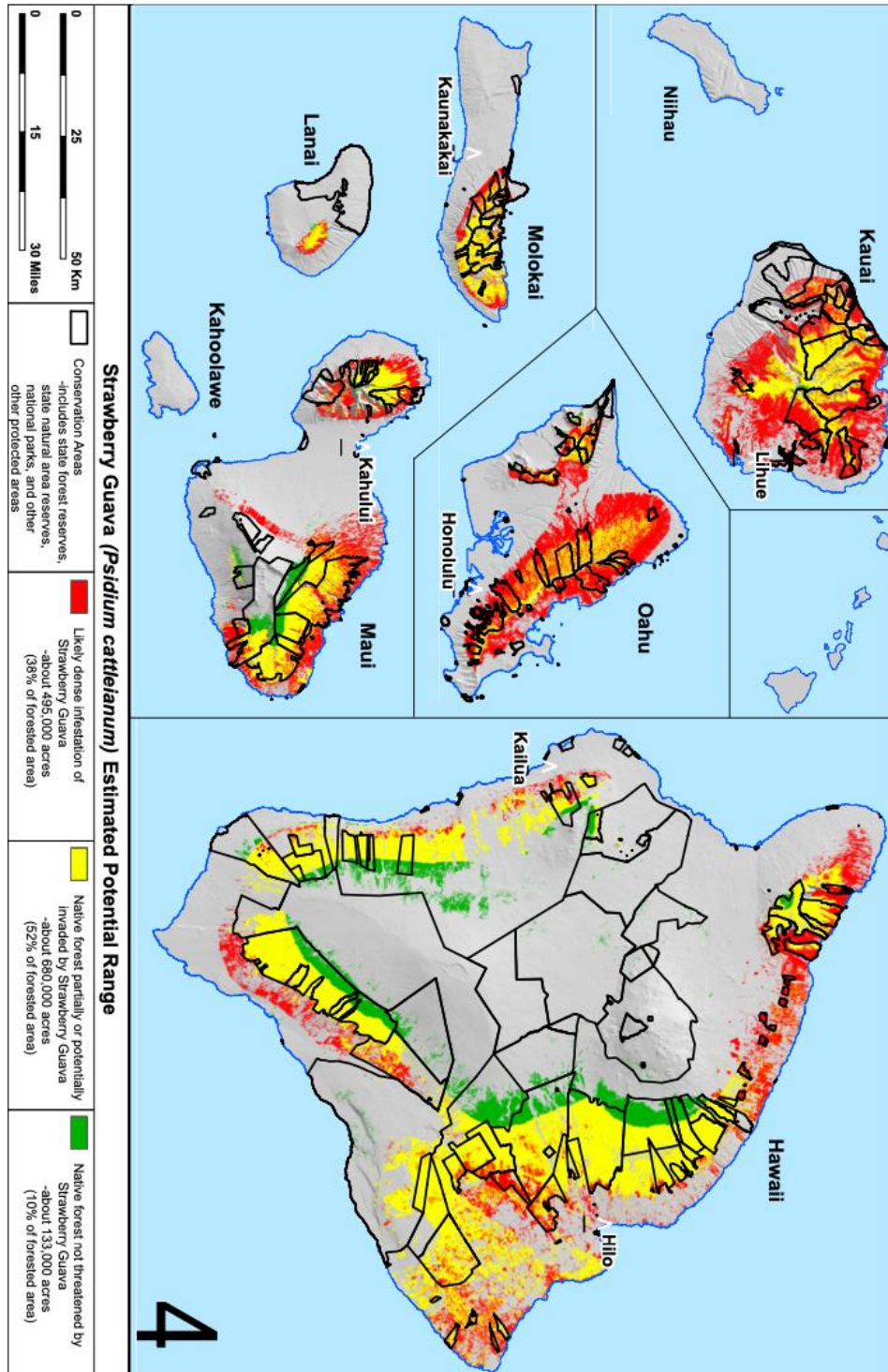


Figure 9: Map of Strawberry Guava Infestation (Source: State of Hawaii Department of Agriculture, 2011) The red areas below are densely infested with strawberry guava. The yellow areas are partially or potentially infested, and the green areas are native forests not threatened by strawberry guava.

Passion Fruit, Jaboticaba, Mango, Star Fruit, Durian

Passion fruit (36,700 pounds produced in 2018), jaboticaba (1,460 pounds produced in 2018), mango (273,000 pounds produced in 2018), star fruit (31,500 pounds produced in 2018), and durian (5,260 pounds produced in 2018) have potential for creating value-added products as well (Love). However, likely the production levels of these crops would need to be increased. The production levels of these crops in 2018 is pictured in Figure 10 below.

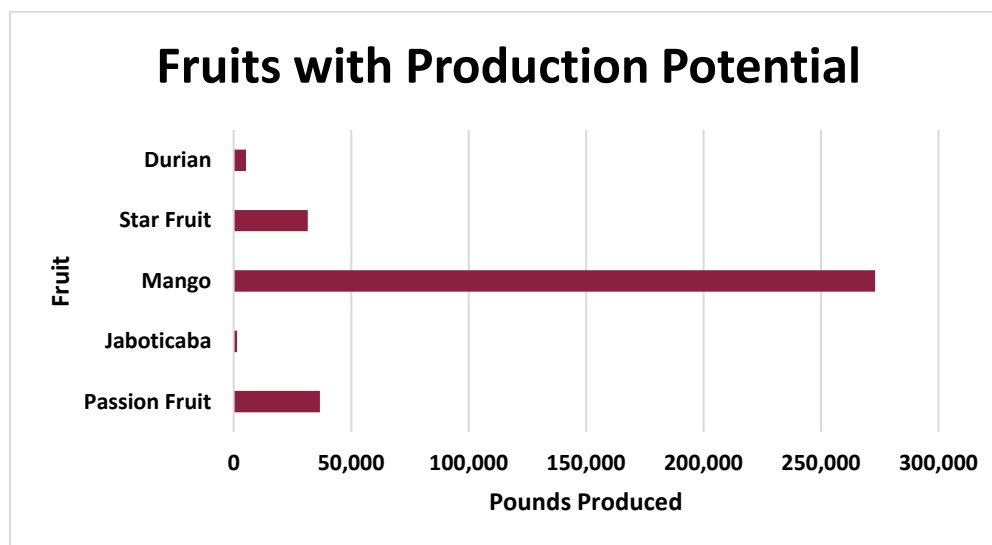


Figure 10: Pounds Produced in 2018: Fruits with Production Potential. (Data source: NASS, 2018).

The importance of thinking long term instead of season to season will be incredibly important for success. Because of how long it takes to establish new tree crops, creating certainty for farmers that there will be a market for products they produce several years in the future poses a particular challenge, but one that has incredible potential if it can be done effectively. Of survey respondents, 87% said they would be at least “somewhat interested” in joining a co-op and that a “guaranteed market for excess or overripe crops” was a benefit of membership. Other noted membership benefits of interest to survey respondents were: bulk purchasing of fertilizers, seeds, soil, planting stock, and amendments, and education and information sharing among growers.

Another potential source of fruit supply might be to tap into the entire Pacific Island region’s fruit supply, rather than solely relying on Hawai’i-grown product. The Pacific Island Farmer’s Organisation Network (PIFON) is a group of 80,000 farmers from throughout the Pacific region working together to pursue six focus areas: breadfruit and seeds, women in agriculture, policy engagement and partnership development,

sustainable agriculture, youth in agriculture, and organizational capacity building. This group could be a tremendous partner in creating consistency in the juicing fruit supply and tapping into a network of producers from throughout the Pacific Islands (Pacific Farmers Organisations).

Other opportunities may revolve around ingredients. There are certain niche tropical crops that have potential as ingredients in a beverage product in part because of their health benefits, including ginger (153,000 pounds produced in 2018), turmeric (220,000 pounds produced in 2018), and noni and kava (combined 2.3 million pounds in 2005).³ Developing partnerships with farmers to grow these products could be a piece of the juicing co-op's long-term agenda.

Transportation, Logistics & Gleaning

Transportation and cold chain storage will be important aspects to consider. Logistics associated with transporting an extremely perishable product from farm to juicer or cold storage is a leading cause of food waste globally (FAO, 2020). Gleaning operations have begun to tackle the problem of food waste through coordinated food rescue efforts. Kōkua Harvest on Hawai'i Island utilizes volunteers to "glean" produce that would otherwise not be harvested and redirects that produce to charitable organizations and food pantries. Gleaning operations utilize volunteers to keep costs low, and do not charge fees to producers willing to donate their produce. Though financial costs for these operations tend to be low, successful programs often require large time commitments to run successfully, and do not provide a consistent or predictable amount of produce.

There are, however, obvious upsides to gleaning. The start-up costs associated with gleaning as a model are low. Additionally, there is an added environmental benefit of reducing food waste, pests, and, in the instance of strawberry guava, reducing the spread of an invasive species. Gleaning could also be a benefit to co-op members. Roughly 81% of respondents said they would be at least "somewhat interested" (encompassing "very interested," "quite interested," and "somewhat interested") in joining a co-op if assistance with gleaning/harvesting was a benefit to membership.

³ Data on noni and kava are no longer being collected individually, and were collected together most recently in 2005 under the category "medicinal herbs."

Key Takeaways

Quantity

Quantity of locally grown fruits is the main supply hurdle facing the initial launch of the juicer. Strawberry guava, macadamia nuts, papaya, banana, avocado, and citrus encompass the fruits that are currently grown in abundance and could be harnessed to create fruit purees, juices, or other products. However, relying on any single crop may not be feasible for meeting the poundage requirements to justify running this industrial-scale juicer. Fruit juice blends could be developed, as well as establishing a limited schedule for sustainable operation of the equipment. Establishing partnerships with growers now to ensure growth in production in the future would be an important strategy for ensuring adequate supply in the long-term.

Logistics and Transportation

Logistics and transportation of produce pose hurdles. Further exploring models currently in operation for community coops or gleaning programs will be helpful in determining options available. A cooperative model may provide more flexibility regarding logistics by relying on producers to provide transportation of product on a set schedule. Although this model does have downsides, particularly in putting more responsibility on already time-strapped farmers, many may be interested if they see benefits financially or environmentally. Gleaning as a basis for acquiring fruit may be appropriate to a certain point but has definite limitations in terms of the time and volunteer base necessary to acquire the amount of fruit needed for this equipment, and usually relies on the farmer giving excess produce away for free, as opposed to paying them for the product.

Demand

The juicing equipment has the potential to produce a variety of products. To determine which products may be worth pursuing with the equipment in question and that contribute to increasing food self-sufficiency, it is important to understand the market landscape for Hawai'i-grown and produced fruit juices and fruit juice products locally. We accomplished this through the survey distributed to commercial fruit buyers, located primarily on Hawai'i Island, an analysis of the Hawai'i Department of Education's (HIDOE) demand for local produce, as well as through market research into the the juice industry in the US more broadly.

100% of survey respondents were located on Hawai'i Island, though two respondents also had operations on O'ahu, Maui and Kaua'i and one on Lāna'i. The largest share (36%) of respondents were food service businesses, identifying as either a restaurant, cafeteria, or catering. The second largest share (18%) of respondents were retailers. Figures 11 through 13 depict some of the findings from the fruit buyers survey. A copy of the survey can be found in Appendix C.

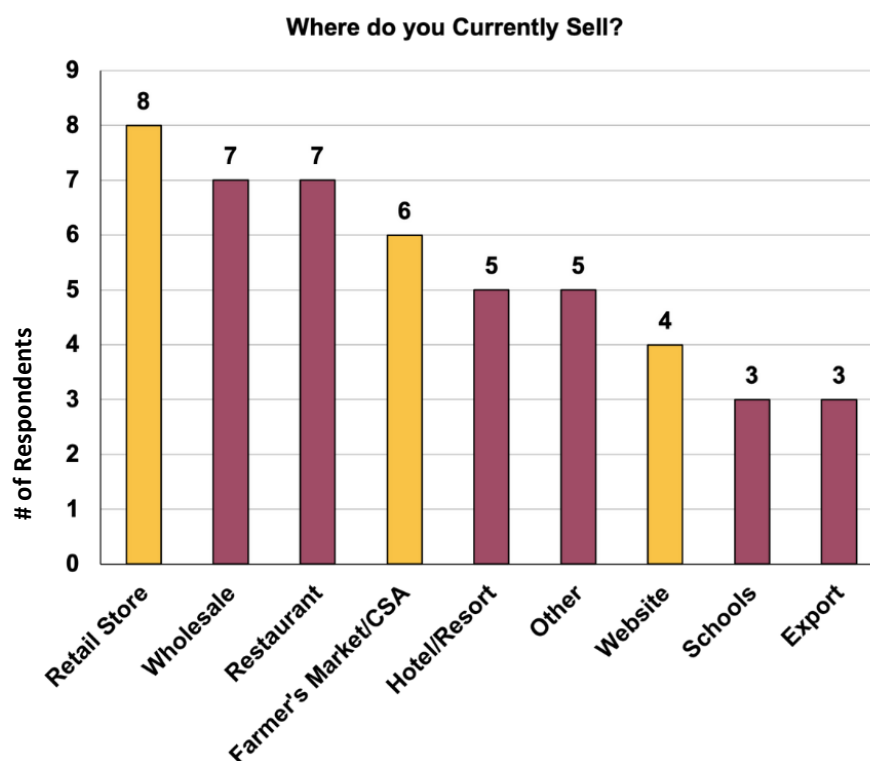


Figure 11: Through which channels are commercial fruit buyers selling their products? 73% sell via more than one market channel.

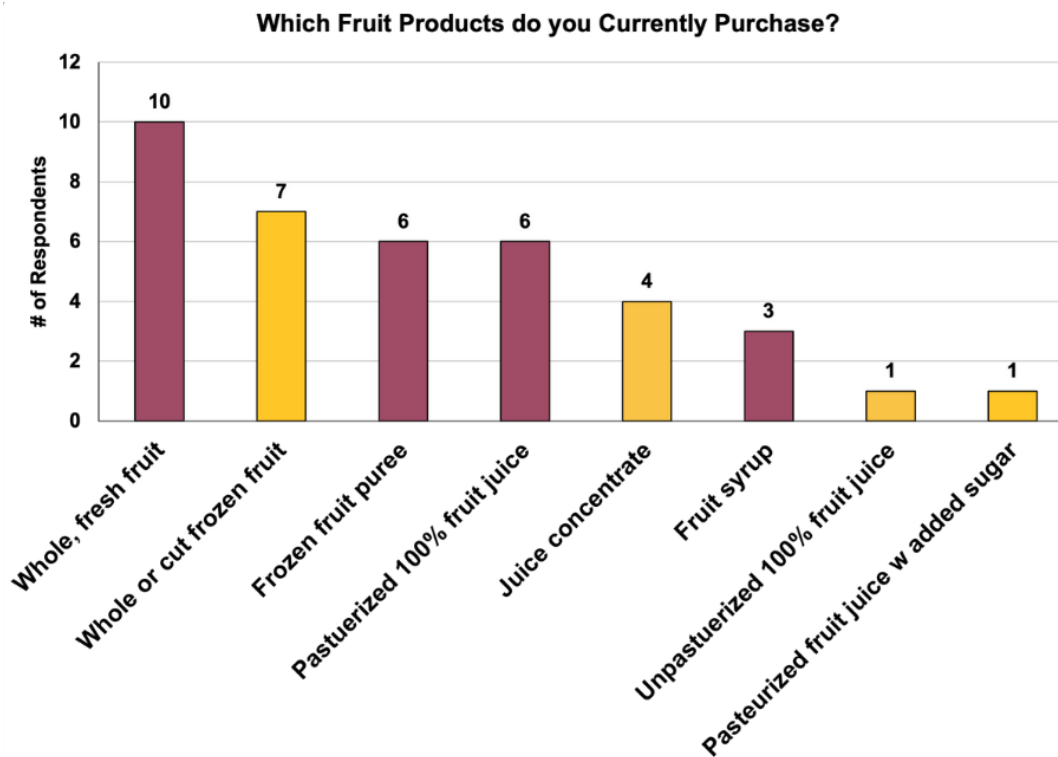


Figure 12: Fruit products currently being purchased.
100% are purchasing more than one kind of fruit product.

Fruits and Fruit Products in Highest Demand

Because small Hawai'i growers grow a diversity of fruit products, as opposed to large monocrops of any single fruit, our research team created the survey with an eye towards a cooperative providing a diversity of products. This includes whole, fresh fruits, frozen purees, juices, and concentrates. The survey explored types of fruits currently in demand by commercial buyers, as well as questions as to what they would like to purchase in the future.

Of our 11 commercial fruit buyer survey respondents, 54% currently purchase citrus and lilikoi (passionfruit). Banana was third highest, at 45% of respondents currently purchasing banana.

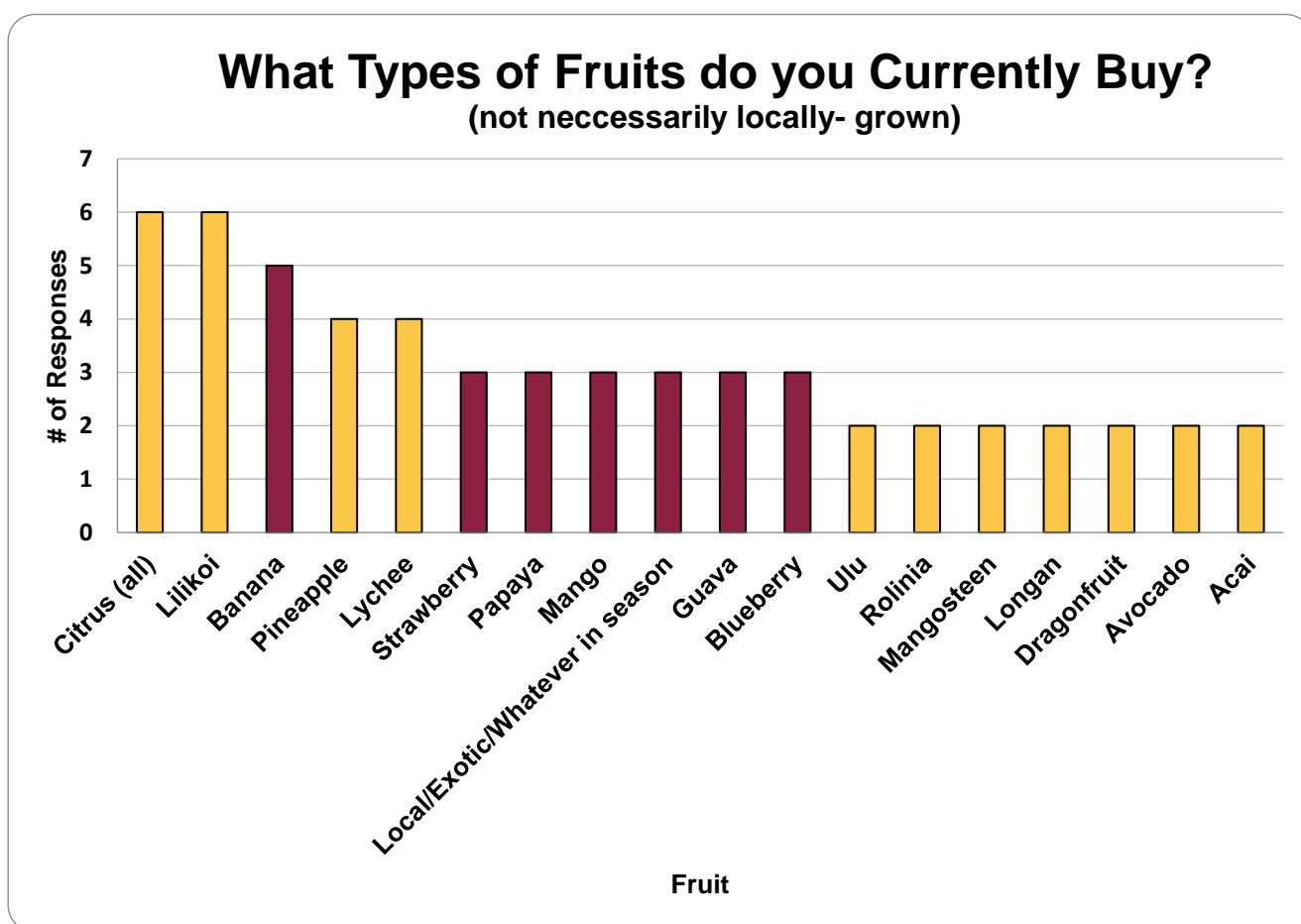


Figure 13: Buyer Survey Results by Types of Fruit

Note: 'Ulu = Breadfruit

When asked which types of fruit products out of a predetermined list of fruits that buyers are interested in sourcing, 100%, were interested in sourcing lilikoi (passionfruit). Ninety percent of respondents were interested in purchasing oranges. Dragon fruit, lime, lychee and mango were also highly in demand, with 81% responding that they were interested in sourcing these fruits. Figure 14 shows the fruits for which at least 5 of the 11 respondents said they were interested in either a) purchasing more or b) were not yet purchasing but were interested in sourcing.

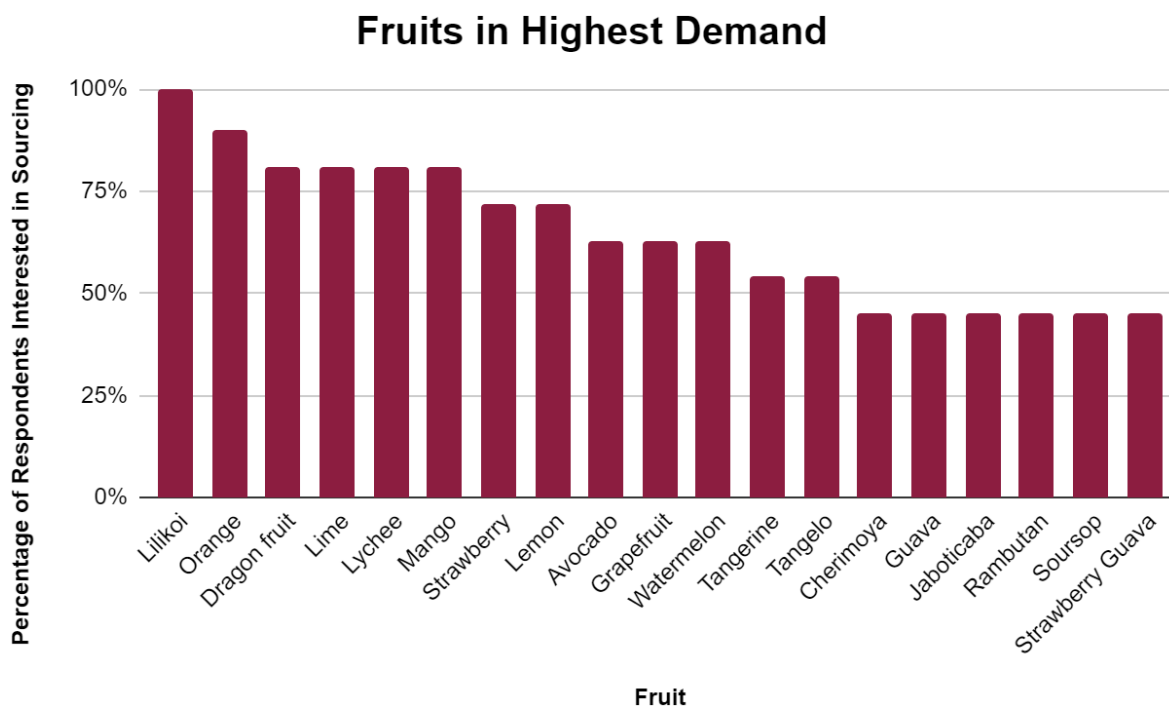


Figure 14: Types of Fruit Buyers are Interested in Sourcing

On the high end of demand, one respondent indicated that 550-660 gallons per week of guava puree packaged in 50-gallon drums would fulfill their needs. On the other hand, another respondent indicated that they would need 40 gallons of concentrate packed in 5-gallon bags to meet their monthly demand for lilikoi. As for fresh fruit, one respondent indicated that anywhere between 5,000-15,000 pounds of fruit packaged in pallets would fulfill their need seasonally. This indicates a wide range in demand for fruit puree, fruit concentrate, and fresh fruit that varies based on business size, customer base, and seasonality.

Survey participants were asked “Which fruit products below do you currently purchase? Mark all that apply,” and were given the options:

1) Whole, fresh fruit, 2) Frozen Fruit Puree, 3) Whole or cut frozen fruit, 4) Pasteurized 100% fruit juice, 5) Unpasteurized 100% fruit juice, 6) Pasteurized fruit juice with added sugar, 7) Unpasteurized fruit juice with added sugar, 8) Fruit syrups, 9) Juice concentrate 10) Other

Importantly, 10 out of the 11 respondents are in the market for whole, fresh fruits. The next in-demand product was whole or cut frozen fruit, followed by frozen fruit puree, and then pasteurized 100% fruit juice. The graph below shows the demand for fruit products for which respondents are either interested in purchasing more or are not yet purchasing but are interested in sourcing. It is important to note that pasteurized fruit juice with added sugar was the product with the lowest demand. This is in alignment with national trends in which consumers are seeking more what they perceive as more healthful beverage products, including without added sugar.

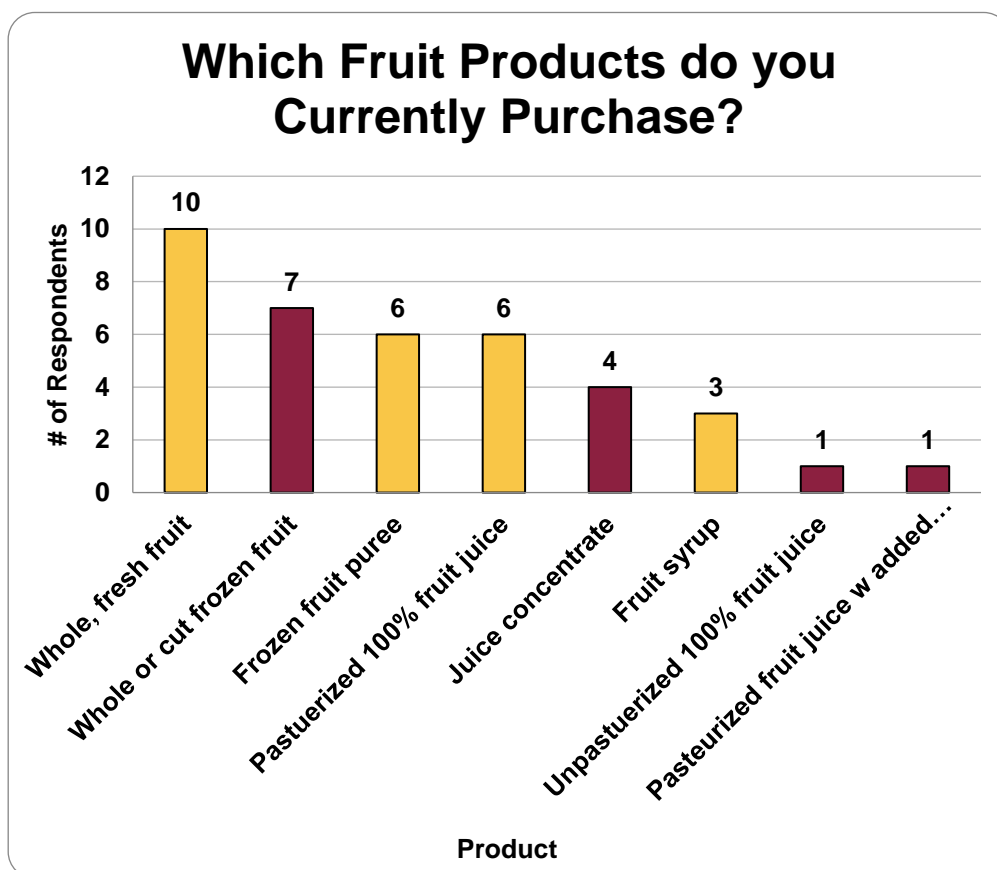


Figure 15: Buyer Survey Results: Types of Fruit Products Purchased

When asked what fruit products they are not yet buying but would be interested in buying, one respondent noted that they “would buy the other products if available” and a second indicated interest in purchasing “dried fruit, fruit leathers.”

Local Sourcing Matters

One hundred percent of respondents valued local sourcing as important when considering sourcing their fruit purchases, marking it as either “Quite Important” or “Very Important.” (Options were: “Not Important”, “Somewhat Important”, “Quite Important” or “Very Important.”)

100% of commercial buyer survey respondents valued local sourcing as important when considering sourcing their fruit purchases.

Buyers were asked about the barriers they face in marketing or serving Hawai'i-sourced fruit products. The options given were:

1) Cost, 2) Lack of consistent supply at amounts needed, 3) Lack of demand from my customers, 4) Lack of relationships with local producers or distributors and 5) Other

The cost of local fruits and the lack of consistent supply at the amounts needed were by far the most prominent barriers. By contrast, *no respondent listed lack of demand from their customers as a barrier*. In other words, commercial fruit buyers do not perceive lack of demand for locally-source fruits and fruit products as a barrier to marketing such products. This may also indicate that there is high demand for such local products. There is, however, a lack of adequate available supply at affordable prices, as well as some missing bridges between local producers and their potential buyers.

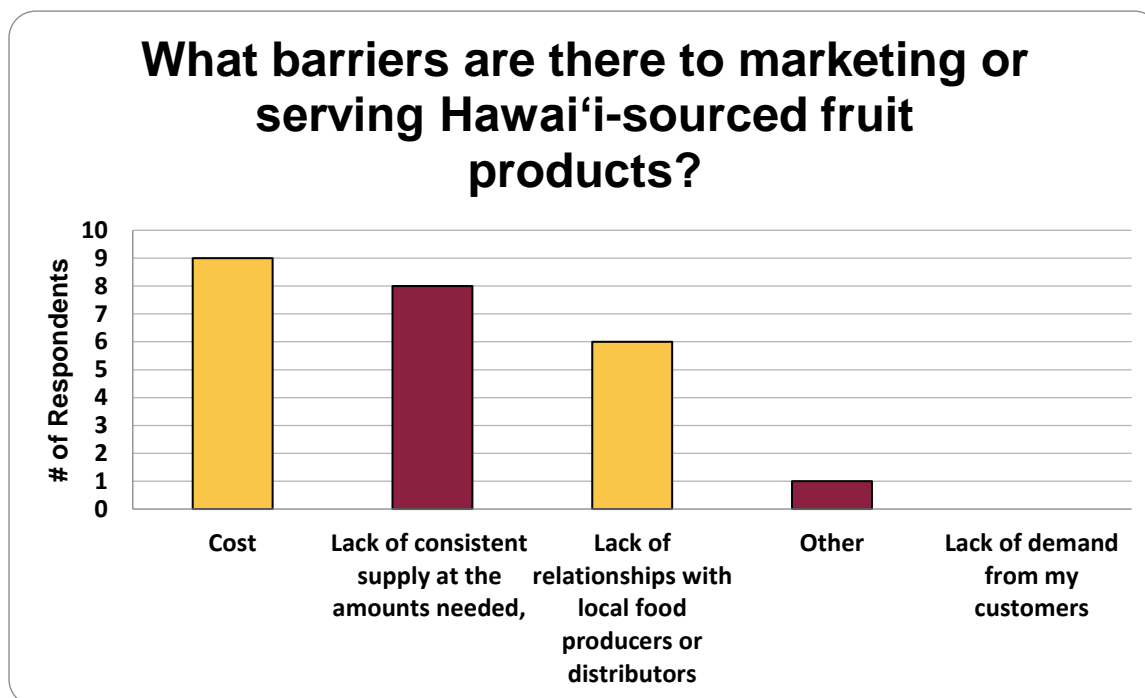


Figure 16: Buyer Survey Results, Barriers to Serving Locally-Sourced

When it comes to purchasing, survey participants showed cost and flavor to be the two most important things affecting their sourcing decisions, indicating that commercial fruit buyers want quality products at reasonable prices. Additionally, the survey found that 63% of buyers find organic-certified products as “somewhat important” when considering sourcing their fruit products. Additionally, 90% value that products are grown sustainably, though not necessarily certified organic.

“Certified organic is great

however many local farmers grow organically but aren't able to afford the steep price of the certified organic label so we don't hold that as a requirement, just that they don't use chemicals to spray their crops.”

-One buyer's survey response when asked whether they require any certifications from growers.

Meeting Institutional Demand

The State of Hawai'i is one of the largest single purchasers of food in the islands. Accessing this market would therefore be important for economic sustainability of any local food-processing endeavor. In this study, we focused on meeting the institutional demand of the Hawai'i Department of Education school system. Through interviews with a farm to school expert and local producers, we were able to gain a better understanding of the demand for local foods in public schools and the role local producers play in filling these needs. This information can help to inform how to implement the use of the juicing equipment to help meet these needs.

Recent local food legislation signed into law in the summer of 2021 will play a key role in increasing the demand for local, Hawai'i-sourced fruit products. House Bill 767, now Act 175, mandates increased purchasing of local food to comprise a minimum of 30% of foods purchased by 2030 for the Hawai'i Department of Education (Hawaii State Legislature, 2021a). Similarly, House Bill 817, now Act 176, hopes to ensure that by 2050, at least 50% of the food purchased by all state agencies will be locally produced foods (Hawaii State Legislature, 2021b). This shows that institutional demand will be increasing in the coming years and opens several windows of opportunity for the juicing project to help meet that demand.

The Hawai'i State Department of Education (HIDOE) oversaw the enrollment of 171,600 students in Hawai'i's 257 public and public charter schools for the 2021-22 school year (Hawaii State Department of Education, 2021). One important aspect of local food procurement by Hawai'i schools is the state's farm to school efforts. In 2015, the state's inaugural Farm to School Initiative was signed into law as Act 218 (HIDOE, n.d.). HIDOE increased local food in student meals through its 'Aina Pono programs, including Farm to School and Harvest of the Month" (HIDOE, n.d.). The program's goal was to address the supply and demand issues surrounding the purchasing of local food for Hawai'i's public schools (HIDOE, n.d.). The program also aimed to systematically increase state purchasing of local food for student meals. These programs helped to connect students with the 'āina (land) through food, while using products from Hawai'i's local agricultural community. The Farm to School Initiative, which was included under 'Aina Pono, featured the school food services branch's other educational programs, test kitchens, meal programs, menu planning, nutrition, school gardens and more. According to a 2020 Hawai'i DOE webinar, at that time, products were needed to fill both the needs of the Harvest of the Month program and ongoing unfulfilled needs. Table 11 below shows the most in-demand local produce for the HIDOE.

Table 11: In Demand Produce for Department of Education

Most in Demand Local Produce Items in Hawaii School Cafeterias		
Oranges	Banana	Lettuce
Luau Leaf (Taro Leaf)	Starfruit	Papaya

Sources: Hawai'i Department of Education School Food Services Branch, 2020, Malama Kauai, 2020, Lydi Bernal, personal communication, 2021, August 4.

However, there are significant barriers, particularly availability and cost, that affect the procurement of local, Hawai'i-sourced fruit products within the Hawai'i school system. Few Hawai'i farms are in a position to fulfill the needs of a district serving 176,000 children each day, even with the HIDOE's current menus that do not require many fresh ingredients. A consideration then is whether the Hawai'i Department of Education School Food Authority should wait for larger farms to be able to supply their needs on a manageable contract or should they work with smaller growers to help them ramp up production and change the way the state buys food for students. A 2012 study, "The Politics of School Lunch in Hawai'i," presents similar findings regarding the issue of local producers not meeting the demand of the massive Hawai'i public school system and how an insufficient supply on a regular basis presumes an "all or nothing" approach that does not allow for smaller farm-to-school programs to flourish (Mironesco, 2012).

The issue of availability of adequate volume was also expressed during our interview with farm to school expert Lydi Bernal, coordinator of the Hawai'i Farm to School Hui network. There is one menu development committee and menu cycle for the state. School Food Services Branch is currently looking at what items are already on the menu to determine what could be switched to locally produced items without having to alter the entire menu. By doing this, local foods will enter school classrooms on a regional or island-by-island basis where they are available, rather than having the previously mentioned "all or nothing mindset." However, according to Bernal, availability of local foods in school cafeterias has also been affected by the COVID 19 pandemic as local purchasing has basically stopped and the DOE has switched to pre-packaged foods. This is due to school closures during the 2020-2021 school year and a pivot to drive-through meal pickups as students learned virtually from home.

Hawai'i Department of Education regulations also require additional steps for their procurement, some of which create additional barriers to small local farmers meeting the demand of the institutional market. These regulations cover aspects of local food procurement such as contractor/supplier insurance, deliveries, site visits, production practices, and educational outreach. According to a 2020 webinar for producers

interested in supplying the DOE there are several necessary items for producers selling directly to the DOE, listed in Table 12 below (Malama Kauai, 2020).

Table 12: Hawaii DOE Vendor Requirements. (Source: Malama Kaua'i, 2020)

Requirements to sell to the Hawaii DOE
<ul style="list-style-type: none"> • \$2 million dollars general liability insurance • \$1 million dollar automobile insurance in order to deliver on DOE campuses • Shall be able to deliver to school sites between 6:00am and 2:00pm • Shall practice Good Agricultural Practices • Shall allow DOE SFSB to conduct site visits • Shall work with Cafeteria Managers on pack sizes and delivery schedules • Shall be registered in complaint status in Hawaii Compliance Express • Be OK with Net30 Billing • Allow a farm visit or farmer to school visit (optional)

These things are considered barriers because according to one local producer, many small farmers don't go through the whole process of becoming licensed to sell because "it's too much work for farmers, many of whom are already stretched very thin when it comes to time and resources (Topham, personal communication, 2021)."

FFVP and Harvest of the Month

One approach to connecting farmers to school cafeterias is to take advantage of existing programs. For example, the Fresh Fruit and Vegetable Program (FFVP) is a snack program funded by the USDA to bring fresh fruits and vegetables to children during the school day (Malama Kauai, 2020). With the juicing operation acting as a collective representative to the schools, this program would be a good avenue to help get fruits and fruit products from small, local farmers into schools. Such programs require a lower volume that is more manageable for small-scale producers.

Harvest of the month programs may similarly be a valuable outlet for local fruits and produce in schools without needing to meet consistent volume requirements. This program supports the introduction of fruits and vegetables in schools by featuring selected crops, including educational resources.

Additionally, when schools return to doing more scratch cooking, which has decreased because of the COVID-19 pandemic, the juicing equipment can potentially be used to make papaya puree, a main ingredient used in papaya bread, one school dish that can feature locally sourced fruit.

Retail Juice Market in a Resurgence

The leader in this surge in growth in the juice market is **functional beverages-organic, low-sugar, and premium beverages** with added ingredients that provide health benefits.

Over the last decade, juice sales, especially in the orange juice category, have seen a significant decline in volume. Many companies have developed new products to accommodate consumers' changing needs. Because of this, the retail juice market is in a resurgence, with the juice/drinks category up 8.9% in 2021. For orange juice, which saw the most notable turnaround, companies such as Tropicana,

Florida's Natural, and Simply all increased their sales by around 10% (Jacobson, 2021). The fastest-growing products in the juice category were single-serve shots, with products from companies such as Remedy Organics, Kor, So Good so You, and Vive Organic popping up in store aisles (Harfman, 2020). Retail companies like Starbucks, Jamba Juice, and pressed juicerries are also introducing competitive offerings to grocers. Additionally, the DTC model (Direct to Consumer) was adopted by companies for subscription services such as Remedy Organics, Kor, So Good so You, and Vive Organic, which utilize subscription-like services to distribute their juice products. The leader of this surge in growth is functional beverages, which are organic, low-sugar, and premium beverages with added ingredients that provide health benefits. Moreover, smoothie blends that included protein were of increasing popularity (Innova, 2020). While orange juice saw the biggest turnaround in a decade, apple juice remains the most appealing flavor to consumers, as almost 70% of survey respondents claimed it was their favorite (Conway, 2020).

Market Trends

This shift in sales volume is accommodated by changes not only in the food and beverage industry but from pandemic-related factors as well. While the main factor affecting the juice market is consumers' distaste toward sugar, COVID-19 has inspired food buyers to be watchful for other additives, as well as practice value-based buying.

There was a decline in aseptic juicing and juice sales from 2020-2021. While juice sales in terms of dollars increased by 3.2%, sales units sold declined by 0.4%, which shows that aseptic juice prices are rising (Canning, 2021). This may signal a waning interest for this type of product, which is marketed towards kids with its simple flavors and high amounts of sugar. On the other hand, aseptic pineapple juice broke through this trend, with Dole Pineapple Juice showing a growth trajectory of 18.8% (Harfman, 2020).

Continuing with the health-conscious eating movement, functional beverages are experiencing a huge surge in sales. Beverage sales containing functional ingredients increased 17% across all categories during the pandemic (Crawford, 2021). This includes beverages with immunity boosting, anti-inflammatory, and energy and hydration ingredients. Beverages with these ingredients are not just premium drinks such as single-serve shots, but can range from lemonades, sodas, and sparkling water. More importantly, nootropics, which are additives that claim to aid brain health, is expected to increase at a compound annual growth rate (CAGR) of 12.5% (Grand View Research, 2019).

Hawai'i-branded ingredients are set to be crucial ingredients in upcoming products, as they are both more appealing to consumers and carry many health benefits. Hawai'i is rich in naturally functional food products which are popular now with today's health-conscious consumer. For example, coconut water is high in electrolytes and nutrients and is growing as an energy hydration beverage (IcrowdNewsWire, 2021). It can serve as a flavor and functional base in Hawai'i juice blends. Pineapple, a popular beverage with a long history in the islands, is high in the digestive enzyme bromelain which helps fight pain and inflammation (National Center for Complementary and Integrative Health, 2020). It is also high in Vitamin C, A, and beta carotene (USDA Agricultural Research Service, 2019). Flavorman, a beverage development company, predicts upcoming top drink flavor trends will include flavors that consist of fragrance and comfort, premiumization in locations of interest and nostalgia, and ingredients with functional benefits (Flavorman, 2020). These trends are consistent with the characteristics of the most popular Hawai'i ingredients.

Notably, as Figure 17 shows, many of the most in-demand functional ingredients for beverages are specialty crops grown in Hawai'i, including citrus, turmeric, cacao, ginger, and kava.








































 Immunity	 Stress-relief Relaxation	 Pain-relief Anti-inflammatory	 Mood enhancement Arousal	 Energy Cognitive	 Indulgence
 Vitamin C	 Chamomile	 Turmeric	 Lion's mane	 Guarana	 Sugar
 L-Theanine	 Cannabis	 Cannabis	 Cannabis	 L-Theanine	 Cannabis
 Vitamin D	 Valerian	 Ashwagandha	 Cacao	 Cacao	 Cacao
 Zinc	 Kava	 Aloe Vera	 Kava	 Caffeine	 Caffeine
 Reishi	 St John's Wort	 Ginger		 Cordyceps	 Nicotine
 Pre/probiotics	 Rhodiola			 Acai berry	
 Apple vinegar		Note: List not exhaustive, represents popular natural or botanical ingredients used to deliver specific consumer need states (including synthetic variants of naturally occurring hormones such as vitamin D, zinc being the exception)			

Figure 17: The most popular functional ingredients with the health and mental benefits they provide (Source: Ward and Abagnale, 2021).


























Packaging and Placement

Should a retail product be pursued, packaging will be an important consideration. Packaging is the means of transporting a product from producer to consumer, carrying marketing benefits along the way. The objectives for packaging vary for each product, brand, and company's main objective, but the central goals are the targeted consumer, the product's distribution system, and its sensitivity (CupBarn, n.d.). Bottled juice, like any other product, carries its own problems that need to be addressed through packaging. The central goals for bottled juice packaging are a) providing convenience and b) protection from oxidation (CupBarn, n.d.). This entails working around the main components of bottled juice packaging, which are the aroma, gas, and lights barriers (CupBarn, n.d.).

Considering each of those factors when designing and picking packaging material comes with their own tradeoffs. The tradeoffs are most prominent when selecting

between standard packaging materials, which are glass, PET, paper cartons, aseptic, and metal cans.

Table 13: Ranked-choice chart for packaging materials and their effectiveness (Source: Author ranking)

	Cans	Aseptic	Cartons	PET	Glass
Visual Appeal					
Functionality					
Shelf Life					
Cost					
Recyclability*					

Key: Darker orange slices indicate higher ranking.

*Since October of 2019, Hawai'i County only accepts the following for recycling at county transfer stations: corrugated cardboard and brown paper bags, non-HI-5 glass bottles and jars (such as pickle jars and wine bottles), and HI-5 redeemable containers (single-serve beverage containers that are either glass or aluminum cans) (County of Hawai'i Department of Environmental Mangement Solid Waste Division and Recycling Section, 2021).

Labeling that includes ingredient transparency is crucial for constructing successful packaging, due to health concerns and value-based buying which has increased since the COVID-19 pandemic. According to FoodDive Magazine, 91% of consumers believe

that food with recognizable ingredients is healthier (Devenyns, 2019). The best practice for ingredient transparency is following the clean label trend. This trend includes ‘front of pack’ messaging to consumers, with claims and certifications clearly visible, as well as ‘back of pack’ ingredient lists that are “short, simple, [devoid of] artificial ingredients, not ‘chemical-sounding’ with ‘kitchen cupboard ingredients’ that are expected and familiar” (Asioli et al., 2017, p. 61). Research shows that 70% of consumers are likely to seek out products that utilize such clean labels (Shayne, 2020).

Packaging used for juice also affects the product’s placement within a store. We conducted research in California grocery stores in the summer of 2021 and found the following placement trends. Specifically, bottle size plays the biggest role, with two ounces for single-serve shots, eight ounces for pure juice, 11 to 16 ounces for single-serve smoothies, 32 ounces for multi-serve, and 52 to 64 ounces typically for family/home size. Most single-serve juices and occasionally shots are placed in front-end aisles, signaling that these options are impulse buys, similar to cold brew coffees and kombucha. Family-size juices are placed near produce or dairy. Functional beverage shots appear in multiple areas of a store and are sometimes placed at checkout registers. In general, higher price per fluid ounce are on higher shelves and lower price per fluid ounce are on lower shelves.

Manufacturing juice packaging in Hawai’i presents challenges, as bottling options are limited and shipping costs are the highest in the country. Utilizing bottling plants or co-packers in California produces extraneous costs as well. One approach involves self-manufacturing PET or outsourcing metal can production, which is what many Hawai’i companies’ practice. The alternative option would be to purchase bottles from the continent for freight shipping or coordinate with local sustainability projects to repurpose recycled or reused glass bottles.

Certifications

Claims and certifications that verify a product’s natural qualities and nutritional benefits are becoming increasingly important, as people demand more from the US’s largest companies. A valuable certification for food producers is USDA certified organic, and according to Hannah Esper from New Hope Network, it is the cost of entry for functional beverages (Crawford, 2021). This is because consumers believe organics are healthier since they are free from GMOs, chemicals, and pesticides. Organic food production often involves improved culturing techniques and concern for environmental health. Subsequently, 32% of consumers view organic as a marker for premium quality (The Hartman Group, 2021). Though there is a price premium attached to organic foods, consumers are willing to pay more

Organic food and beverage sales increased by 12.8% in 2020.

for products that uphold these values. Pandemic-driven changes heightened these views, helping organic food and beverage sales increase by 12.8% in 2020, up to \$56.4 billion (The Hartman Group, 2021).

While obtaining USDA organic certification does come with costs, often perceived as prohibitive to Hawai'i's producers (Kohala Center, 2014), such certification would allow the juicing operation to fetch a higher price in the marketplace. The CCOF (California Certified Organic Farmers) is one of the first organic certification agencies and primary certification service for many Hawai'i growers and manufacturers (USDA, n.d.). For a company to utilize the USDA organic logo, it is required that their products be made with 95% certified organic ingredients and processed in a certified organic facility (USDA, n.d.). This process takes at least 12 weeks from the completed application to obtaining the logo and comes with service fees along the way. This includes an application fee, inspection rate of usually \$80 per hour, and an annual certification fee ranging from \$750 - \$12,370 (USDA, n.d.). However, many of these costs can be reimbursed by cost-share programs including the Organic Certification Cost Share Program (OCCSP), which will cover up to 75% of fees up to \$750 (USDA, n.d.).

The other meaningful certifications that brands use are the Non-GMO project, Keto Certified, and Certified Gluten-Free. Non-GMO Project certification costs \$70 per product and requires a thorough review of invoices associated with the manufacturing of said product (*Steps to Verification*, n.d.). The process involves coordination with a Technical Administrator and client team that guides producers through the process (*Steps to Verification*, n.d.). Obtaining Keto Certified requires meeting limits for net carbs or effective carbohydrates (Keto Certified, n.d). Cost is relative to revenues of products, and \$1,000 for a 10-day rush fee, \$2,000 for 2-day rush fee, with each additional product costing an additional \$50 (Keto Certified, n.d). The process is usually shorter than other certifications, taking 6-8 weeks for reviewing the item labels (Keto Certified, n.d). Certified Gluten Free certification expects that all facilities and equipment must be certified for a \$100 annual fee before the product formula can be reviewed (Certified Gluten Free, n.d). There must be fewer than 20 ppm of gluten in the reviewed product, with no cross-contamination from other sources (Certified Gluten Free, n.d). Third Parties can certify the product, but their services can cost much more (Certified Gluten Free, n.d).

Design

Like many other areas in the bottled juice market, the COVID-19 pandemic has shifted marketing design trends for juice products. From 2020-2021, social distancing restrictions were lifted and vaccine rollouts began. People began to reconnect as areas of society reopened and created a need for positivity for many. As such, many brands are using softer and soothing colors in their designs more than ever (The Drinks Report, 2020). This includes single-color designs, muted colors, colors found in nature, and palettes that blend. For instance, a popular color arrangement is supersaturated colors, combined with worn and faded-looking colors (The Drinks Report, 2020). Another method for creating positive-feeling packaging is designing packaging that embraces fine art and intricate design. This includes tiny, illustrated patterns that reveal ingredients and function, product names being front and center on the packaging, and story-driven packaging featuring quirky characters (The Drinks Report, 2020). Examples of these designs can be seen in Figure 18 below.



Figure 18: Coca Cola’s packaging design for its newest product lines. (Source: Coca Cola, 2020).

Location-based marketing in Hawai‘i is important for farms and manufacturers that have no previous establishment in their markets. Product design that connects to Hawai‘i’s culture can be especially successful. For example, Hawai‘i-created POG juice, which was invented in Maui, is one of the most popular beverages in Hawai‘i and is known worldwide. The blend was created in 1971 by a beverage consultant for Haleakala Dairy; Its name comes from the blend of juices it consists of – passionfruit, orange, guava (Kubota, 2005). The beverage is now recognized everywhere in Hawai‘i and seen in almost every store. An alternative way to utilize location-based marketing is through government or community support. A Hawai‘i Agricultural Marketing Program to consider is the Made in Hawai‘i with Aloha branding program (MIHA), which can be

obtained by submission of valuation and photos of products with singular price points (Hawai'i.gov, n.d).

Juice Prices

Tables 14 and 15 display the prices for a variety of juice products at Whole Foods Market and Safeway. The tables compare the summer 2021 prices of the same products in Hawai'i and California. This data was collected by retrieving the grocery delivery prices for the products in California and Hawai'i stores before service charges are factored in. Olohana Foundation should keep these competitor prices in mind when setting the prices for their retail juices, should they pursue producing them.

Table 14: Prices of conventional juice, premium juice, and single -serve shots from Hawai'i and California Safeway locations, summer 2021.

Safeway					
Brand, Type & Size	Price		Price Per Fluid Ounce		
	California	Hawai'i	California	Hawai'i	HI. Mark up
Conventional Juice: HI. mark up = 40%					
<i>Tropicana- Orange Juice Family Size 52 fl. oz.</i>	\$4.69	NA	9¢	NA	NA
<i>Simply- Pulp Free Orange Juice Family Size 52 fl. oz.</i>	\$4.99	\$6.99	9¢	13¢	40%↑
Premium Juice: Avg. HI. mark up = 18%					
<i>O Organics- Pulp Free Organic Orange Juice Family Size 52 fl. oz.</i>	\$5.99	\$6.99	12¢	13¢	16.7%↑
<i>Smart Juice- Organic Tart Cherry Multi-serve 33.8 fl. oz.</i>	\$7.99	\$8.99	24¢	27¢	12.5%↑
<i>Evolution Fresh- Essential Greens With Kale Multi-serve 32 fl. oz.</i>	\$7.99	\$9.99	25¢	31¢	25%↑

Table 15: Prices of conventional juice, premium juice, and single-serve shots from Hawai'i and California Whole Foods locations, summer 2021.

Whole Foods					
Brand, Type & Size	Price		Price Per Fluid Ounce		
	California	Hawai'i	California	Hawai'i	HI. Mark up
Conventional Juice: Avg. HI mark up = 36.3%					
<i>Tropicana- Orange Juice Family Size 52 fl. oz.</i>	\$3.99	NA	8¢	NA	NA
<i>Simply- Pulp Free Orange Juice Family Size 52 fl. oz.</i>	\$3.99	\$5.49	8¢	11¢	37.6%↑
<i>Simply- Lemonade Single Serve 11.5 fl. oz.</i>	\$1.99	\$2.69	17¢	23¢	35%↑
Premium Juice: Avg. HI. mark up = 27.8%					
<i>Uncle Matt's- Pulp Free Organic Orange Juice Family Size 52 fl. oz.</i>	\$6.79	\$8.99	13¢	17¢	32.4%↑
<i>Evolution Fresh- Cold Pressed Organic Orange Juice Family Size 59 fl. oz.</i>	\$9.99	NA	17¢	NA	NA
<i>Evolution Fresh- Cold Pressed Organic Green Devotion Multi-serve 32 fl. oz.</i>	\$9.99	\$12.49	31¢	39¢	25%↑
<i>Suja- Organic Raspberry Lemon Focus Single Serve 12 fl. oz.</i>	\$4.99	\$6.29	42¢	52¢	26%↑
Shots: Avg. HI. mark up =7.5%					
<i>Suja- Immunity Defense Shot 2 fl. oz.</i>	\$3.99	NA	\$1.99	NA	NA
<i>Kors- Potent C Shot 1.7 fl. oz.</i>	\$3.99	\$4.29	\$2.34	\$2.52	7.5%↑
<i>Vive- Immunity Shot 2 fl. oz.</i>	\$3.99	\$4.29	\$1.99	\$2.14	7.5%↑

The cost for juice in Hawai'i was significantly higher than the same product in California, regardless of the serving size or store. This is indicative of the high costs of doing business in Hawai'i and should be an important consideration for setting prices should Olohana Foundation pursue production of retail juices.

Issues and Opportunities

Though many metrics predict that juice beverages and products are growing in sales and popularity, there is also worrying news that challenges this outlook. While juice-flavored waters are growing, CPG (consumer packaged goods) companies are selling off their "juice holdings." For example, Coca-Cola sold Suja in 2021, one of the fastest-growing beverage companies, as well as discontinuing Odwalla, one of the biggest retail blended smoothie brands. Campbell's sold Bolthouse Farms in 2019, a longstanding vertically integrated food company that specializes in beverage production.

However, many opportunities are opening up based on the current trends in the food industry. Small manufacturers drove as much growth as larger players at the end of 2020 (Sloan, 2021), an enormous undertaking considering the market share of small-sized firms compared to large-sized firms. With the health-conscious movement increasing in influence, leveraging the tropical flavors of Hawai'i for functional benefits, and networking with local growers of functional ingredients is a good route to take for Hawai'i manufacturers looking to break into the industry.

Korean Natural Farming (KNF)

In addition to researching the market for juices and other fruit products, our team also explored the possibility of utilizing the juicing equipment to produce agricultural inputs utilized in a growing organic farming movement, Korean Natural Farming (KNF). With a goal of contributing to local food security, the production of agricultural inputs could help to lower the cost of inputs for Hawai'i's food producers. KNF is a holistic growing method first brought to Hawai'i by Cho Han Kyu, or "Master Cho." This agricultural method emphasizes the cultivation of indigenous microbial soil life and involves nine home-made recipes that are rotated for use based on the lifecycle stage and condition of the plants (M. Duponte, personal communication, July 7, 2021).

Table 16: Korean Natural Farming benefits

Reasons to Explore Production of KNF Inputs
Potential to increase import substitution of fertilizers and inputs, reducing reliance on imported fertilizers and increasing the self-sufficiency of local producers
Market is accessible - Currently few other companies producing such inputs commercially
Cost analyses have shown such practices can save farmers money
Lower regulatory barriers to product certification than some food products

Our interview and survey data suggests a mixed reaction to Korean Natural Farming practices in Hawai'i. Korean Natural Farming is viewed as unnecessary by some producers. According to one industry professional interviewed during this study, farmers are not using KNF inputs correctly and are overloading their plants with the inputs due to lack of education on proper application rates (Industry professional, personal communication, July 9, 2021). On the other hand, Korean Natural Farming practices are seen as a viable alternative to importing fertilizers and other agricultural inputs (M. DuPonte, personal communication, July 7, 2021). After completing a cost analysis, one interviewee determined that it is much cheaper to use KNF inputs as opposed to conventional inputs (M. Duponte, personal communication, July 7, 2021). This could meaningfully contribute to increased food self-sufficiency through lowering dependency on expensive imported agricultural imports. However, increasing farmers' adoption of these practices will require increased outreach with farmers to educate them on proper use of these soil amendments. The majority - 67%- of producers surveyed were at least somewhat interested in accessing "compost and other inputs" from a cooperative. As well, 71% were interested in the potential for cooperative members to pool their resources for bulk purchases of fertilizers, seeds, planting stock, soil amendments and others. This shows that producers do seek support in finding affordable agricultural inputs.

Currently, there is a lack of large-scale production of KNF inputs in Hawai'i. Fortunately, the juicing machinery has the capability to help fill that need in production and meet the demand of those interested in implementing Korean Natural Farming practices into their operations. Specifically, fermented KNF inputs such as vinegars or fish amino acids (FAA) could be produced on an industrial scale utilizing components of the juicing equipment.

Key Takeaways

Demand is High

Our research clearly indicates that there is no shortage in demand for Hawai'i-grown fruit products and other specialty crops, both at the local and national levels. Commercial buyers surveyed indicated high interest in sourcing a diversity of such products.

Lilikoi (passionfruit) and citrus were particularly popular fruits among the commercial buyers surveyed. With recent legislation passed to increase purchasing of local products at the state level, demand for locally-grown fruits and fruit products will only increase in the coming years, including at the public school level. Staying aware of the fruits that are in highest demand at the school level will be important for pursuing this institutional market. The main barriers commercial buyers face to sourcing more of such products are high cost and the lack of adequate supply at the amounts that they require – though they experience no shortage of demand for such products from their customers.

Retail Market

There are encouraging trends in the retail juice market overall that Olohana Foundation could capitalize on should they pursue producing a retail juice product. Capitalizing on island-grown specialties with functional or health benefits could be a path forward for bringing a viable product to market. There are several important factors when considering packaging and design of such products, including the ability to access certain materials in the islands. Because organic certification allows companies to charge a higher price-point, Olohana could consider achieving this certification for any retail products, while also supporting producers in becoming certified organic as well. This is an issue that warrants further research and policy-level advocacy to lower barriers (actual and perceived) to organic certification for producers in Hawai'i overall.

Production of Agricultural Inputs

Another way that this equipment can contribute to food security, self-sufficiency and sovereignty in the islands is through producing regenerative agricultural inputs such as those utilized in Korean Natural Farming. The primary use of the equipment could be to produce such inputs, or as co-products to a primary food product. Our research indicates that demand for agricultural inputs is also present, though this topic should be

explored further as an in-depth analysis of the market for agricultural inputs was outside of the scope of this study. While farmers surveyed expressed interest in accessing agricultural inputs from the cooperative, it was also clear that should Olohana Foundation produce Korean Natural Farming inputs for farmer-members, that it will be necessary to educate growers on proper application of such inputs. Production of KNF inputs would help to reduce reliance on imported fertilizers from outside of Hawai'i, contributing to valuable piece of food security and self-sufficiency overall.

Business Structure

Through our interviews and survey data, we more deeply examined the opportunities and drawbacks of applying the cooperative structure to the juicing operation while placing it in the greater context of Hawai'i's legislation, fruit production, and processing. As the previous sections highlight, the issue of fruit supply on the islands influences the following discussion of relevant business models to apply to an operation developed to take advantage of some, or all of the juicing equipment. As we will elaborate further below, many fruit producers we spoke with are growing fruit with the objective of biodiversity to bolster food security. They are not pursuing monoculture production—great for long-term food security and biodiversity in Hawai'i, but less optimal for sourcing a sufficient quantity of fruit to produce juice or other fruit-based products from one or more fruit inputs. Recognizing these supply challenges, our team considered a long-term growth plan and business models that allow for that growth, as well as the ability to work with producers to create a market for products while ramping up fruit production.

Comparative Business Structure Overview

As we found in our research and heard repeated by business development experts, choosing a business model or entity—the legal structure under which a business operates—is about understanding the goals of the business being created and then deciding how best to achieve those goals (Business Development Expert, personal communication, July 12, 2021). Selecting the right entity when forming a business is important as it has ramifications for the application of liability, taxation, and employment law, among other things (Sustainable Economies Law Center, 2020). Experts reinforced that there is no right or wrong answer regarding what business entity structure to pursue for an agricultural value-added operation such as this, but it is important to analyze the contextual factors contributing to business operations and the ultimate objectives of the organization (D. Shapiro, personal communication, August 6, 2021).

There is flexibility in business model structure versus the type of incorporation a business may pursue and how that business operates. For example, it is possible to have a membership organization without being formally recognized as a cooperative. As with the food security and producer benefits sought with the juicing operation, more and more companies are embracing a social mission in how they operate. These social objectives can be integrated into operating agreements when members are included in ownership or not (M. Brown, personal communication, July 16, 2021). One expert noted that the importance of creating a corporate structure with strict rules of operations

increases as the number of owners increases, so to avoid ambiguity and governance issues (M. Brown, personal communication, July 16, 2021).

The following sections describe in brief the key aspects of potential business structures, including non-profit corporation, member-owned cooperatives, Limited Liability Company (LLC) and Sustainable Business Corporation. We provide an overview of relevant Hawai'i legislation, ownership, taxation, and liability, and comparative advantages and disadvantages of each entity type. A detailed comparative table of types of legal for-profit entities provided by the Hawai'i SBDC Network can be found in Appendix E.

Based on our research and interviews, we recommend that the Olohana Foundation consider several business structures to operationalize the juicer:

- (1)** incorporate a juicing project into Olohana Foundation's existing 501(c)(3) organization that remains not-for-profit in its operations;
- (2)** create a for-profit subsidiary business; or
- (3)** create an independent but associated for-profit business.

The Kohala Center and the Hawai'i Small Business Development Center are invaluable resources as the foundation continues to explore and pursue setting up a business of any kind to operate the juicer.

Retaining a Nonprofit Corporation Model

Given Olohana Foundation's 501(c)(3) status, there is an opportunity to incorporate a juicing project into their existing portfolio. Operationalizing the juicing project as a nonprofit has several advantages. Given the identified startup costs, using Olohana Foundation's existing nonprofit tax-exempt status would allow the Foundation to accept grants and donations as low or no-risk sources of startup capital (Center for Cooperatives, University of Wisconsin-Madison, 2019). In operationalizing the juicer, activities would need to be aligned with the foundation's charitable, educational, or other exempt purpose upon which it attained its nonprofit status. The juicing operation could be built, at least in part, using volunteer work and be able to accept produce donations or mobilize a volunteer gleaning operation to source produce. To further Olohana's organizational mission, the foundation could, for example, use the juicer for projects that build community resilience through building jobs skills of economically marginalized individuals, youth, or formerly incarcerated individuals in production. The profits from sales could then be used to continue to fund the operations of the project.

Generating Income as a Nonprofit

A nonprofit organization like Olohana can operate a business that generates income to fund their charitable activities, but the nonprofit must consider whether the revenue generated by the business is subject to taxes and whether the nonprofit's tax-exempt status would be in jeopardy if the operation becomes too significant. If a nonprofit generates income from a business that it operates that is not "substantially related to the performance by the organization of its exempt purpose or function, except that the organization uses the profits derived from the activity," then according to the IRS that income is subject the Unrelated Business Income Tax (UBIT). To be subject to UBIT, the activity must be a trade or business, must be regularly carried on, and not be substantially related to the organization's exempt purpose. There are a few exceptions to UBIT including that business activities are conducted substantially by a volunteer workforce, which may be a relevant exception for running a juicing operation. To determine whether a nonprofit is making too much unrelated business income tax and, therefore threatening its tax-exempt status, the IRS examines whether the nonprofit conducts its charitable programs in a way that is "reasonably commensurate" with its financial resources, looking at the organization's operations, impact of exempt activities, and the amount of resources dedicated to the business activities compared to its mission. If a nonprofit finds that its business activities are becoming more significant than its exempt activities, it can consider creating a for-profit subsidiary to conduct unrestricted business activities (Chen, 2020).

Creating a For-profit Subsidiary or Associated For-profit Entity

A nonprofit can own all of the ownership interest in a for-profit entity, whether it is a corporation or an LLC, but there are regulations governed by state-level prudent investment rules regarding start-up investments that a nonprofit can make to start or acquire a for-profit. If Olohana Foundation considers creating a for-profit subsidiary there are different ramifications based on the type of for-profit business entity created. By creating a pass-through entity like an LLC or S corporation, "the activities of the for-profit will be treated as the activities of its nonprofit parent" meaning that if a substantial part of the combined activities of both entities does not further the nonprofit's exempt purpose, the nonprofit could lose its tax-exempt status and the for-profit's income may require the application of the UBIT. If the for-profit is a C corporation, and therefore not a pass-through entity, then the activities of the for-profit will not be attributed to the nonprofit and distributions of profit to the nonprofit owner are not generally taxable (Takagi, 2019).

Olohana Foundation could consider the juicing operation as a social enterprise—an organization that applies commercial strategies to maximize improvements in human and environmental well-being, rather than maximizing profits for external shareholders—whether for-profit or nonprofit. Table 17 outlines the major advantages and disadvantages of starting and operating a social enterprise as a for-profit, nonprofit, or hybrid structure.

Table 17: Comparing different ownership and governance models (Pokrasso, 2016)

	For-Profit Considerations	Nonprofit Considerations	Hybrid Structure: For-Profit and Nonprofit (Parent-Subsidiary/Brother-Sister)
Advantages	Ability to bring in investors and take equity investments that can help grow and scale organization. No limit on revenue generation.	Able to obtain grant funding and offer tax deduction to donors. Tax exempt status.	Flexible access to funding through grants, donations, and equity investors. No limit on revenue-generation under the for-profit.
Disadvantages	Limited grant funding opportunities and no tax deductions for donors. Must pay taxes on profit.	Limit on revenue generation. No ability to bring in investors and take equity investments as there are no “owners.”	Complicated structure and legal issues to run two distinct organizations formally and legally.

A cooperative can be considered as operating as a not-for-profit organization if it provides member services at cost. However, operating as a for-profit would allow the cooperative to generate a profit should it choose to, creating a financial buffer for future losses and the opportunity to use the profit for capital reinvestments in the business (Center for Cooperatives, University of Wisconsin-Madison, 2019).

The following section provides an overview of the for-profit entities that Olohana may consider creating as a subsidiary or as an associated organization to operationalize the juicing equipment.

Limited Liability Company (LLC) and Sustainable Business Corporations

LLCs are entities that protect personal assets by creating a limited liability shield. An LLC is a more formal business structure than a sole proprietorship or partnership. To create and maintain an LLC, certain corporate processes must be followed, including filing requirements with state and local governments, maintaining financial records, and contracting in the entity's name (Sustainable Economies Law Center, 2020).

LLC Legislation and Legal Formation Registration

Legal provisions regarding LLCs are covered in *Hawai'i Revised Statutes HRS Chapter 428 – Uniform Limited Liability Company Act*. LLCs are composed of one or more persons or entities as owners with multiple members requiring an Operating Agreement. To legally register an LLC, entities must file Articles of Organization. Business income or loss is reported at a personal level.

General Considerations, Advantages, and Disadvantages of LLC

Limited liability protection is designed to give individuals legal protection. From the perspective of the IRS, an LLC is not an official entity because the individual is paying taxes on the profit. LLCs have an advantage in being simple to manage, but the owner is responsible for accounting for federal withholding tax, including social security, Medicare, Medicaid, among other things (M. Brown, personal communication, July 16, 2021). LLCs have an advantage over typical corporations in that corporations pay taxes on their profits at the corporate level and then shareholders also pay taxes once they receive dividends. LLCs, in contrast, allocate profits to members who are then responsible for paying taxes on that profit. The rules governing an LLC are contained in the Operating Agreement and LLCs have a process for bringing members in and out.

The juicer operation could be structured as an LLC and still have a profit-sharing model with its members. In this case, the cooperative principles of “one member, one vote” could be included in the Operating Agreement (Sustainable Economies Law Center, 2020). Such an LLC could be run by one or more individuals with a contract-based

structure for engaging producers (Business Development Expert, personal communication, July 12, 2021). Single or multi-member LLCs allow for more flexibility and fewer constraints on the owner. The operating agreement with owners is the only element that creates a constraint. The government does not have a lot of requirements in place for what is required to become and operate as an LLC (M. Brown, personal communication, July 16, 2021).

B-Corporation

Sustainable Business Corporations—or B-corporations—are governed by *Hawai'i Revised Statutes 420D* and offer entrepreneurs and investors the opportunity to create businesses that operate in socially and environmentally sustainable ways.

Demonstrating this commitment to sustainability is not regulated by government enforcement but enforced through provisions for transparency and accountability. A domestic corporation already incorporated can become a sustainable business corporation by including in its articles a statement that the corporation is a sustainable business corporation. According to the Hawai'i statute, a sustainable business corporation must have among its purposes “the creation of a general public benefit,” including benefits relevant to the juicing operation such as providing underserved communities with beneficial products or services, promoting economic opportunity for individuals or communities, and improving human health. Importantly, the statutes apply a third-party standard for defining, reporting, and assessing the corporate social and environmental performance of a sustainable business corporation and mandates that this information be publicly available (Hawai'i Revised Statutes, Chapter 420D, 2016).

As a business entity, a B-corporation has similar ownership, taxation, and liability structure and requirements as a C-corporation. There is some marketing value in operating as a B-corporation in that B-corporation certification is a demonstration of the commitment of the business to certain values and the willingness of that business to pay an outside auditor to confirm it is operating in that manner, but there is little difference in the structure in terms of the regulatory process (M. Brown, personal communication, July 16, 2021). While the number of B-corporations is growing globally, as of 2019 there were more than 3,000 globally with seven in Hawai'i. These include companies such as Hawaiian Paddle Sports and Hawaiian Ola. Some have noted the relative dearth of businesses with B-corps status in Hawai'i compared to other states. Explanations for this include the time and resources, including fees for certification, that are required to obtain and retain this status as well as the natural period of time for such business trends to grow in popularity (Coleman, 2021). Hawai'i passed benefit corporation statutes in 2011 and B Lab, the non-profit that created and awards B-

corporation certification, has published a “Hawai‘i Sustainable Business Corporation How-To-Guide” on the process for incorporating a sustainable business in Hawai‘i (B Lab, 2013).

Cooperative

A cooperative is a company owned and operated by the people who use its products and services and benefit from the offerings of that company. Cooperatives often have shared common core principles as outlined by the National Cooperative Business Association (NCBA) CLUSA, including voluntary membership, democratic member control, member economic participation, autonomy and independence, education, training and information, cooperation among cooperatives, and concern for community (National Cooperative Business Association CLUSA, 2021).

Legislation

In Hawai‘i, cooperative structures are governed by two sets of statutes included in the Hawai‘i Revised Statutes, *HRS 421 Agricultural Cooperative Associations* and *HRS 421C Consumer Cooperative Associations*. A value-added fruit cooperative would be governed by HRS 421, stating that:

“an association may be organized for the purpose of engaging in any cooperative activity for the producers of agricultural products in connection with: (1) Producing, assembling, marketing, buying or selling agricultural products or harvesting, preserving, drying, processing, manufacturing, blending, canning, packing, ginning, grading, storing, warehousing, handling, shipping, or utilizing the products, or manufacturing the byproducts, thereof; provided seventy-five per cent of such agricultural products shall be of Hawaiian origin; (2) Manufacturing, buying for or supplying to its members machinery, equipment, feed, fertilizer, fuel, seeds, and other agricultural supplies; (3) Performing or furnishing business or educational services, on a cooperative basis, or to its members; (4) Financing any of the above enumerated activities for its members (Hawai‘i Revised Statutes, Chapter 421, 1996).”

Qualifications for incorporation of a cooperative in the statute includes three or more adult persons engaged in agriculture as bona fide producers or two or more associations of producers. The statutes require articles of incorporation, association bylaws, board of directors, and additional stipulations for management, mergers, reporting, and taxation, among others. There is an initiative underway to advocate for

more general cooperative statutes in Hawai'i so that people can be multi-stakeholders in the cooperative structure—such as producers and consumers. Worker cooperative structures are not currently outlined in the existing Hawai'i legislation (Business Development Expert, personal communication, July 12, 2021).

General Considerations, Advantages, and Disadvantages of Cooperatives

Cooperatives exist to serve the common needs of their members (D. Shapiro, personal communication, August 6, 2021). Cooperatives are only successful if their members use them, so ensuring cooperative goals and structure are aligned with member needs is critical (Business Development Expert, personal communication, July 12, 2021). Importantly, a successful cooperative model in Hawai'i will come from the community itself, building on the community-based nature of business and aligning community values with the values of the cooperative (F. Avegalio, personal communication, July 16, 2021). It is easy to bring members in and out of cooperatives compared to other structures like LLCs (Business Development Expert, personal communication, July 12, 2021). It is more difficult to shift from a more complex corporate structure, such as a cooperative, to a less complex structure like an LLC.

However, founding an LLC and then shifting to a cooperative is comparatively easier (M. Brown, personal communication, July 16, 2021). The strength of a cooperative is having like-minded members. If members are operating in the same manner, it can be easy to operate. However, if this alignment does not exist, it can be difficult to organize members effectively (Business Development Expert, personal communication, July 12, 2021).

Cooperatives do pose challenges. These include governance, member commitment, and capitalization as discussed in various research on the subject of cooperative models (Holland and King, 2004). It can be challenging to raise capital within cooperatives in an economy more suited to investor ownership and in traditional cooperatives, membership is linked to member patronage but not directly to member equity, which creates a free rider problem as members have limited incentive to increase their investments in the cooperative, undermining attempts at raising capital from members (Holland and King, 2004). Traditional cooperative structures tend to create incentives for members to invest in projects with a short-term return on patron investment, but not long-term returns—which investments in value-added processing usually are. In addition, cooperatives experience challenges maintaining the sourcing of raw material for production in the absence of binding obligations for members to patronize the cooperative (Holland and King, 2004). Should a fruit producers

cooperative be established, Olohana Foundation could therefore consider including patronage requirements from members.

Opportunities for capitalization are also directly linked with membership commitment. Research has found that cooperatives with more committed memberships demonstrate higher levels of capitalization, and that capitalization is correlated with innovation (Marcos-Matas, et al., 2018). While the democratic decision-making structure of one member, one vote is a core positive characteristic of the cooperative model, such processes can be slow and create additional challenges for management and growth. One study of cooperatives found that the slower pace of democratic decision-making processes within cooperatives contributed to them being less consistently able to measure and manage business performance and slower to respond to challenges and opportunities as they arise compared to publicly traded companies (McKinsey & Company, 2021). As Dana Shapiro, General Manager of the Hawai'i 'Ulu Cooperative noted, the challenges of cooperative management do not disappear with scale. Reaching a large scale can assist cooperatives to outgrow capitalization challenges, but many of these governance and membership challenges remain (D. Shapiro, personal communication, August 6, 2021). According to experts and cooperative leaders interviewed, major challenges that can undermine cooperatives also include bad management and the lack of a market for value-added products if not well cultivated. These challenges highlight the importance of champions needed to lead cooperatives. Cooperatives struggle with the same challenges of other businesses but they are navigating an entire community in the process (Business Development Expert, personal communication, July 12, 2021). Addressing the issue of commitment from cooperative members can be done by aligning the goals of the cooperative with its members' needs as well as using strategies such as the Hawai'i 'Ulu Cooperative that sets membership and annual fees. While these fees are kept at levels low enough for members to afford and are not sufficient to capitalize the business, the fees ensure that members feel they have "teeth in the game." This is based on evidence that shows that without such fees, members may not utilize the cooperative as expected (D. Shapiro, personal communication, August 6, 2021).

Application of a Cooperative Model to the Juicing Operation

With 66% of farms at nine acres or less, Hawai'i is a place of small farmers (USDA NASS, 2017), many of whom rely on selling directly to consumers (Melrose, 2015, Perroy and Cares, 2015). The juicing project could be one solution for supporting these small farmers by pooling their small fruit harvests, as well as establishing a means for sharing resources such as inputs, tools, and information. The otherwise prohibitive

costs of production and processing may be collectively addressed through the cooperative model. The cooperative could handle larger contracts with potential markets such as institutional purchasers, restaurants, and retailers, including securing necessary certifications and licenses. This will allow the farmers to do what they do best – farm. A cooperative could harness the collective power of small farmers to move beyond direct to consumer sales to engage meaningfully with the local food economy and increase food sovereignty and self-sufficiency.

Hawai'i fruit producers interviewed and surveyed are interested in joining a value-added product cooperative. A relatively low percentage of producers surveyed are currently members of a cooperative or other growers' association. The most significant membership (almost 22%) belong to the Hawai'i Tropical Fruit Growers, a "nonprofit organization...with the primary purpose of promoting the interests of any and all aspects of tropical fruit in the State of Hawai'i." No cooperative engagement of any kind was reported by 17% of respondents. Our data also indicates interest in the cooperative providing a few different benefits for cooperative members. Specifically, fruit producers surveyed reported interest in receiving support or training in business planning and marketing; horticulture and crop sciences; almost 74% reported interest in receiving training in sustainable, organic, or natural farming and gardening practices; 57% reported interest in new tools and technologies; and 39% reported interest in learning information about grants, loans, and other funding (Figure 19).

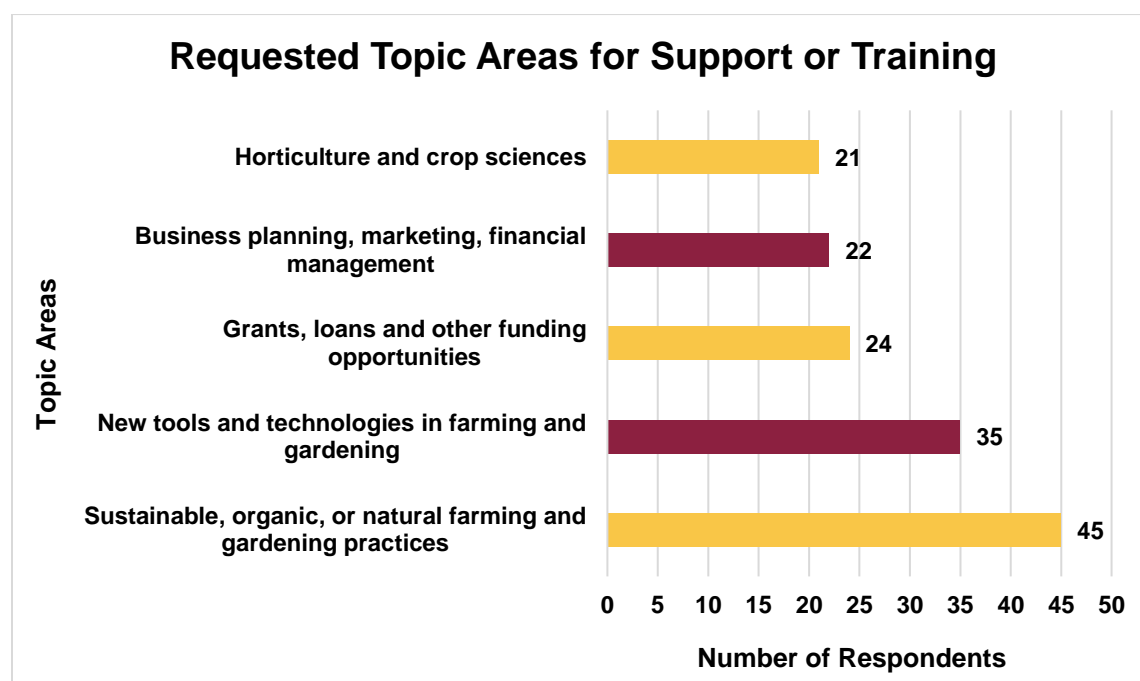


Figure 19: Requested Topic Areas for Support or Training

Respondents were “very interested” in cooperative benefits such as bulk purchasing of inputs; guaranteed market for excess or overripe crops; education and information sharing; accessing compost and other inputs from the cooperative; and assistance with harvesting (Figure 20).

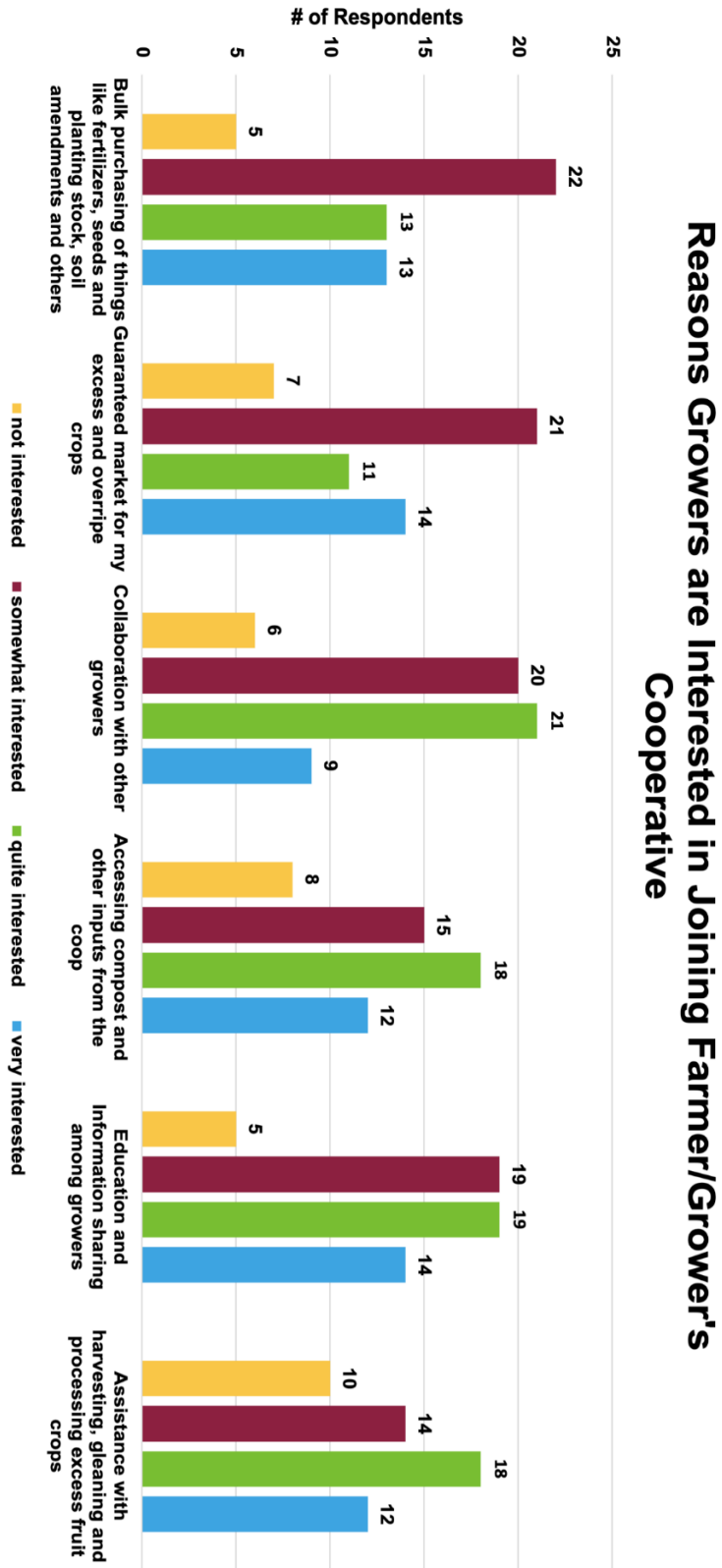


Figure 20: Reasons Growers are Interested in Joining Farmer/Grower Cooperative

Overall, almost 70% of survey respondents were interested in learning more about joining a fruit growers' cooperative.

Interviewees reinforced interest in a cooperative structure with benefits they were seeking. One grower noted interest in resource pooling for machinery such as woodchippers, education opportunities and sharing of knowledge resources across members, and excitement about engaging in such a community-based initiative. The same producer noted that it was important that the benefits of joining the cooperative are clear up front (A. Crowe, personal communication, July 8, 2021). Cooperatives such as the Hawai'i 'Ulu Cooperative have invested significantly in cooperative member support through farmer education, including technical support via annual visits and group workshops virtually and in person. The role of the cooperative to provide a guaranteed price for their product remains paramount for cooperative members of similar businesses like the 'Ulu Cooperative (D. Shapiro, personal communication, August 6, 2021). The incentive of having a value-added production facility will likely be sufficient to garner support for a cooperative business. The 'Ulu Cooperative's growth pursued an "if you build it, they will come" mentality which was successful, knowing that once producers were aware of a value-add processing opportunity, they would be interested in engaging (D. Shapiro, personal communication, August 6, 2021). Similarly, Catarina Zaragoza-Dodge, owner of The Locavore Store in Hilo, Hawai'i island, and someone very familiar with fruit producers on the island, noted that once a processing facility exists, that alone will likely be a sufficient incentive for producers to engage with the cooperative and increase production (C. Zaragoza-Dodge, personal communication, July 2, 2021).

One fruit producer noted some of the challenges to joining a cooperative, including the time obligation and the ability to participate in meetings; whether the price point for the fruit being purchased was sufficient to make the engagement worth it; concerns regarding leadership and organization of a cooperative with multiple members with diverse ideas; and accessibility issues based on the location of the facility (K. Crowe, personal communication, July 8, 2021).

Fruit Growers Discuss the Challenges of Joining a Cooperative

- “Obligations, making it to meetings at certain times...If there were membership fees that were substantial or if they took a big enough cut of whatever that didn’t seem to make it worth it for us to continue. Lack of organization or too many varying ideas so maybe lack of leadership could get frustrating and make it seem like it wouldn’t be worth it.” – *Farmer interviewee*
- “Time-based constraints. I think the incentive for some of the things mentioned might balance out with the time-based constraints and so if it was all very clear upfront what the benefits were, I think people would have an easier time dedicating chunks of their schedule to it, you know. Most people I know that do what we do, it’s like, I’d love to see them more than I do and if something like this brought people together and I think you know just having it be... a community-based gathering sort of thing where... it was an enjoyable experience too, not just like going through the list of... what we have to achieve as a group this week so there was a feeling of... communal enjoyment. I think that would help some of the farmers here from breaking free from some of their ridiculously tied up in their land grid life.” – *Farmer interviewee*

Successful cooperatives in Hawai‘i that the foundation can continue to keep in mind and seek further guidance from based on direct experience include the Hawai‘i ‘Ulu Cooperative, the Hawai‘i Island Meat Cooperative, and the Moloka‘i Livestock Cooperative (Business Development Expert, personal communication, July 12, 2021).

Direct Outreach to Build a Cooperative Membership Base

As interviewees noted, the simple existence of a market for their fruit and a value-added fruit processing facility will bring some fruit producers to the cooperative. The cooperative should also consider how it can ease the burden of transportation on members as this may continue to pose a barrier to entry for some producers. The Hawai‘i ‘Ulu Cooperative, for example, has a network of third-party harvesters that can connect with ‘ulu producers if the producers agree upon a profit split for this labor (D. Shapiro, personal communication, August 6, 2021). To build its base, The Hawai‘i ‘Ulu Cooperative reached out to an initial number of farmers and by word of mouth reached about 20 potential farmers, nine of whom initially were interested in moving forward. Since then, the cooperative has done relatively little direct recruitment, but it does have a membership page on its website that directs interested farmers and a printed pamphlet that can be shared in person when the opportunity arises (D. Shapiro,

personal communication, August 6, 2021). Olohana Foundation can use its already extensive community network and VICTree Gardens project to reach backyard growers that may be interested in joining a cooperative of this nature as well. Through word of mouth, offering a good, guaranteed price for fruit and offering other membership benefits of interest to potential members, building a base of members is achievable.

Conclusions and Recommendations

Summary of Key Findings

Start-up Costs

A rough estimate for getting the equipment back into operation in the manner that it was previously set up would be around \$616,000. This cost includes facility, equipment refurbishment, additional equipment, consulting, and expert staff. Importantly, this figure excludes other standard business costs such as business insurance, business registration, computer and internet access, marketing materials, and other incidental costs. Other cost drivers not included in this estimate are vehicles and fuel for transporting the equipment, tools and consumables for reassembly, and the cost of the raw fruit/produce product.

Hawai'i-Specific Costs of Operation

The high costs of operating a manufacturing business in Hawai'i illustrate the importance of finding a niche product that can be marketed with a significant margin. Competing in the commodity market will prove difficult because the costs of operating in Hawai'i are so expensive. However, a niche product that includes local 'made in Hawai'i' branding and carries a health claim, could be competitive.

Equipment Value

There is clear value in the equipment that may be leveraged into a viable business other than as it was previously operated. There are many options for reconfiguring the equipment. The disintegrator, for example, could be put on a skid to pulverize fruit on farm to be used for hog food or fertilizer (DalPorto, 2021). The upstream equipment in the juicing line will be safer, cheaper and easier to put into operation in various configurations. Where the project gets complex, expensive, and risky is on the aseptic end of the operation.

Quantity of Fruit Supply

Quantity of locally grown fruits is the main supply hurdle facing the initial launch of the juicer. Strawberry guava, macadamia nuts, papaya, banana, avocado, and citrus encompass the fruits that are currently grown in abundance and could be harnessed to

create fruit purees, juices, or other products. However, relying on any single crop may not be feasible for meeting the poundage requirements to justify running this industrial-scale juicer. Gleaning as a basis for acquiring fruit may be appropriate to a certain point but has definite limitations in terms of the time and volunteer base necessary to acquire the amount of fruit needed for this equipment, and usually relies on the farmer giving excess produce away for free, as opposed to paying them for the product.

Logistics and Transportation

Logistics and transportation of produce also poses hurdles. Further exploring models currently in operation for community coops or gleaning programs will be helpful in determining options available. A cooperative model may provide more flexibility regarding logistics by relying on producers to provide transportation of product on a set schedule. Although this model does have downsides, particularly in putting more responsibility on already time-strapped farmers, many may be willing if they see benefits financially or environmentally.

Demand is High

Our research clearly indicates that there is no shortage in demand for Hawai'i-grown fruit products and other specialty crops, both at the local and national levels. Commercial buyers surveyed indicated high interest in sourcing a diversity of such products. Lilikoi (passionfruit) and citrus were particularly popular fruits among the commercial buyers surveyed. With recent legislation passed to increase purchasing of local products at the state level, demand for locally-grown fruits and fruit products will only increase in the coming years, including at public schools. The main barriers commercial buyers face to sourcing more of such products are high cost and the lack of adequate supply at the amounts that they require – though they experience no shortage of demand for such products from their customers.

Retail Market

There are encouraging trends in the retail juice market overall that Olohana Foundation could capitalize on should they pursue producing a retail juice product. Capitalizing on island-grown specialties with functional or health benefits could be a path forward for bringing a viable product to market. Popular functional ingredients of Hawai'i could be harnessed, including ginger, turmeric, kava, cacao, or other specialty crops. There are several important factors when considering packaging and design of such products, including the ability to access certain materials in the islands. Because organic

certification allows companies to charge a higher price-point, Olohana should consider achieving this certification for any retail products, while also supporting producers in becoming certified organic as well.

Production of Agricultural Inputs

Another way that this equipment can contribute to food security, self-sufficiency and sovereignty in the islands is through producing regenerative agricultural inputs such as those utilized in Korean Natural Farming. The primary use of the equipment could be to produce such inputs, or as co-products to a primary food product. Our research indicates that demand for agricultural inputs is also present, though this topic should be explored further as an in-depth analysis of the market for agricultural inputs was outside of the scope of this study. While farmers surveyed expressed interest in accessing agricultural inputs from the cooperative, it was also clear that should Olohana Foundation produce Korean Natural Farming inputs for farmer-members, that it will be necessary to educate growers on proper application of such inputs. Production of KNF inputs would help to reduce reliance on imported fertilizers from outside of Hawai'i, contributing to valuable piece of food security and self-sufficiency overall.

Align Business Structure with Goals and Values

While there are various considerations when choosing a business structure, Olohana Foundation should agree upon the ultimate objectives of use of the equipment and then apply the business model option to those objectives. A cooperative model aligns well with Olohana's goals of supporting small-scale, diversified fruit growers while contributing to local food security. However, similar values can be included in the operating agreements of an LLC or other model, with the added benefits that come along with such entities, such as access to private investment capital to scale the business quickly. Retaining the juicing operations under Olohana Foundation's existing 501(c)3 activities would allow the organization to easily access grant funding and utilize volunteer labor and donations, however with limits on business activities in relation to the charitable activities under which the organization initially received nonprofit status. Local producers surveyed are interested in joining a cooperative and the benefits that may come along with it, given that time and monetary commitments are not too high as to make it 'not worth it' for producers to be a part of such an organization. With goals of contributing to food self-sufficiency and supporting small-scale producers economically, a cooperative model is appropriate in this context and should be designed with member needs from the beginning.

Limited Fruit Supply Will Influence Business Structure and Operations

With a goal to engage small-scale farmers and growers with limited fruit harvests, the business structure chosen will need to be flexible enough to accommodate small harvests and diversified product offerings. Including member agreements to patronize the cooperative, implementing member fees, and keeping membership numbers low are potential strategies to address these goals.

Community-Based Leadership

Figure 21 represents the observed and potential relationships among the community stakeholders involved in the juicing project. This shows the importance of the various stakeholders who could both play a role in the implementation of the juicer project, as well as benefit from it.

Hawai'i Island community leader B. Keahi Tajon initially approached the Olohana Foundation with the idea to purchase the equipment out of motivations for improving local food security. This community leadership has therefore been key to the initiation and success of the project so far and will continue to be key moving forward. Support from other institutions including university research and landowners who support the overall mission and vision are useful components to move the project forward as well. The various products produced from the equipment can be marketed toward different types of buyers, including institutional buyers, retailers and food banks, and individual consumers, providing diverse income streams and meeting a diversity of demand. Farmers support the project, benefitting from a new market for their crops, while also receiving some of the outputs from the juicer and cooperative. The juicing project, therefore, serves as a model for understanding how community-led food security projects take shape and find success. Future research into community-based food system projects may consider the following observations identified in the case represented below:

- 1) Community leaders or “champions” are important drivers for such projects,
- 2) A diversity of institutional stakeholders play various intersecting roles,
- 3) Stakeholders both provide inputs as well as receive benefits from such projects, closing the loop for a more sustainable community-led food system.

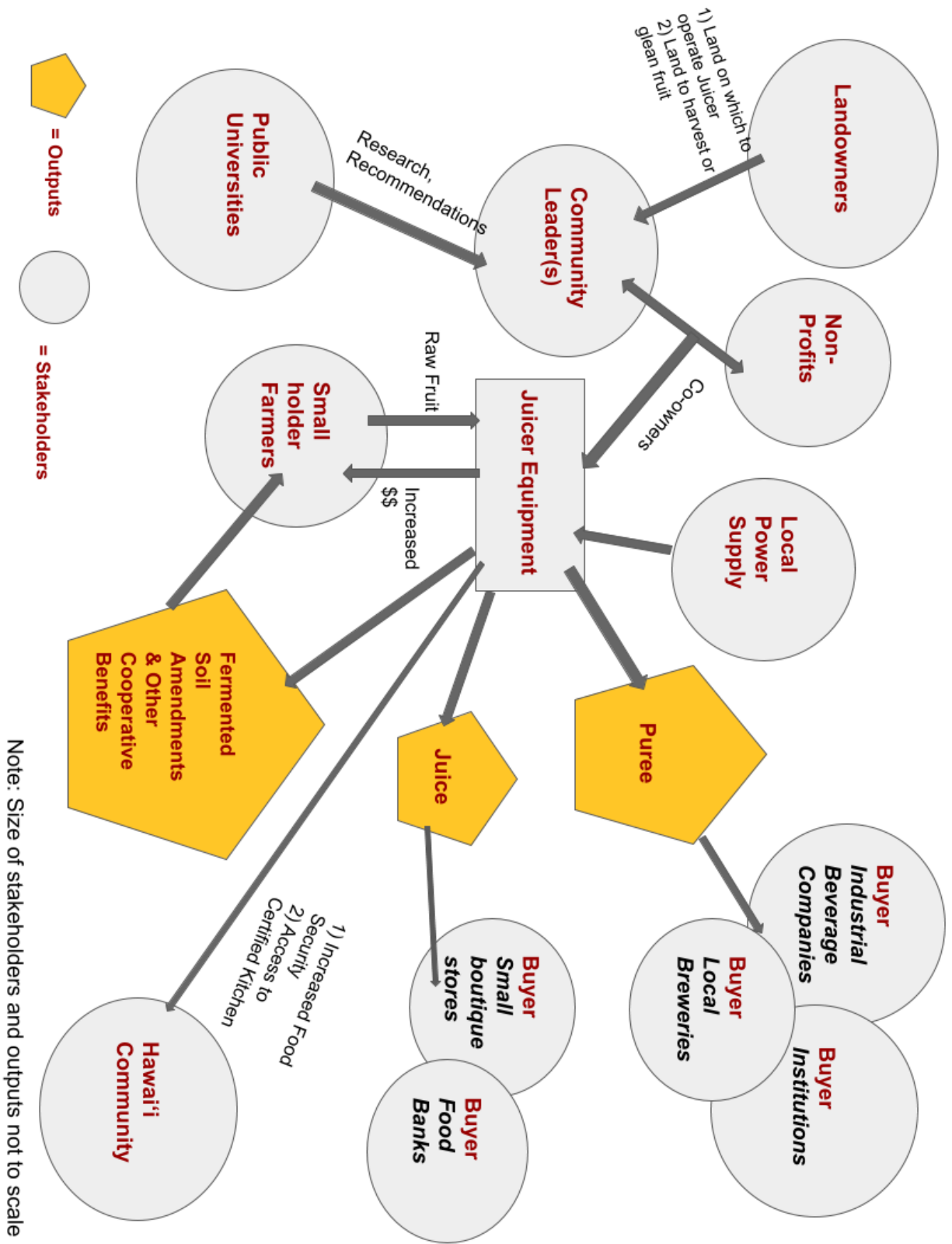


Figure 21: Community Web. Observed and potential relationships of juicer project.

Recommendations

Overall:

Balance the capabilities of the equipment with potential viable markets. There is high value in the equipment that can be leveraged into a viable project, Potential markets and availability of supply should be carefully evaluated in this project and the equipment can be deployed in different configurations as needed. In the meantime, equipment can be leased out to other entities, used for other projects, or even sold to help fund future food security projects.

Continue to build on the success of the juicer as a community-driven project to build strong, decentralized food security in Hawai'i. Thus far, the acquisition of the juicing line and the implementation of this study have succeeded due to the nature of this as a community-driven process based on deep community ties (see community web graphic). Continuing a process as outlined in our recommendations that allows this to continue to develop as a community-driven operation is a likely path forward for success.

Near-term:

- **Agree upon ultimate objectives** of use of juicing equipment in initial startup phase and anticipated growth and then apply business model options to those objectives.
- **Explore reconfiguring upstream equipment.** There are options for reorganizing the equipment that should be explored including:
 - *Upstream Equipment:* It would be safer, cheaper, and easier to put upstream equipment into operation than to immediately utilize the aseptic component. Where the project gets complex, expensive, and risky is on the aseptic end of the operation.
 - *Fermentation:* Many of our interviewees were enthusiastic about the prospect of fermentation. This could be for human food (i.e. kombucha), for animal feed, or for soil amendments (as with Korean Natural Farming). From a technical perspective, all three categories of coproducts could benefit from fermentation. This process limits risks to human and animal health from antinutritional factors and supports the growth of microorganisms in healthy soil. This could present an opportunity either for future research or on-the-ground experimentation.

- *Citrus Juicing:* Consult with food processing manufacturers regarding the cost of assembling a full citrus juicing line. Interviews and survey data indicated both a high demand for citrus from commercial buyers and high levels of wasted citrus occurring. Market research also confirms the popularity of orange juice nationally. A full citrus juicing line could produce valuable co-products including orange oil. Importantly, however, official numbers on citrus production still indicate that increasing production of these crops would be necessary to support industrial juicing capacity.
- **Find niche products and markets.** The high costs of operating a manufacturing business in Hawai'i illustrate the importance of finding a niche product that can be marketed with a significant margin. Competing in the commodity market will be difficult because the costs of operating in Hawai'i are so high. That said, if a product were branded as 'Made in Hawai'i' and carried a health claim, that could be competitive and a better prospect for processing on the island. With the health-conscious movement increasing in influence, leveraging the tropical flavors of Hawai'i for functional benefits and networking with local growers of functional ingredients is a viable avenue to take to break into the retail market. Conducting additional research that specifically explores Hawai'i's demand for non-dairy milk and organic baby food, both products that can potentially include local, Hawaii grown crops, are two potential avenues. Relatedly, Olohana could explore finding a mixture of different juices that could work as a specialty product. This could allow for flexibility in supply availability. This could also be a great opportunity to develop niche products that utilize local ingredients and create a unique brand. Consider offering a diversity of fruits and fruit products to meet the diverse demand from commercial buyers for local fruit products including whole, fresh fruit, fruit purees and juices.
- **Engage experts and academic resources** to further examine the prospect of using the equipment to develop a fermentation operation that produces human food (i.e. kombucha), animal feed, or for soil amendments (as with Korean Natural Farming). Utilize lab testing to discover nutritional factors and bio-compounds in Hawai'i-grown produce that may have viable markets.

While there is currently likely not enough of any one type of locally-grown fruit available at the quantities needed, the machinery has potential for blends, fermented products, and more.

A business model that includes a diversified input mix and diversified output mix would likely be the strongest approach for making the most of this equipment. More research should be conducted with a focus on what local products could work for creating value added markets, and what effort and funding structure it would take to create/produce/market such products.

Medium-term:

- **Consider utilizing crops that are grown in abundance currently** (including strawberry guava, macadamia nuts, banana, avocado, citrus and papaya) and work to establish partnerships long term with growers to increase production in the future to scale up the business.
- **Consider a cooperative model as a business growth phased process.** There is great potential and support for this equipment to be used as a cooperative value-added business and a cooperative model aligns with Olohana and producer core values. However, Olohana could consider the option to begin a business entity as an LLC, given its flexible nature and relatively low-burden process to establish and manage. With this initial business entity in place, it can then continue to grow the fruit producer network needed to scale the business and deepen the base for a cooperative model as it develops other KNF inputs or coproducts. Once the business reputation has been established, the fruit producer network has grown, and the scale of fruit production in the islands has increased, Olohana can consider an expansion to a cooperative model to produce additional fruit-based value-added products like purees, juices, etc. The buyer survey indicates there are barriers to marketing or serving Hawai'i-sourced fruit products that a later-phased cooperative business could overcome. As an additional consideration, growing into a cooperative model will allow the organization to develop responsiveness to producers needs, including setting competitive price points for fruits purchased.
- **Help local farmers meet the demand of the HIDOE.** Help connect small local farmers with the institutional market by expanding upon existing Hawai'i Department of Education (HIDOE) programs and relationships. Encourage

producers to increase production to meet HDOE needs, and act as aggregator for small farmers' harvests. The under-utilized Fresh Fruits and Vegetables and Harvest of the Month programs are two opportunities to capitalize on to get local fruits into Hawai'i's schools.

Long-term:

- **Explore Pacific Region sourcing of fruit and develop partnerships in the Pacific region.** Work with partners to ensure a larger and more consistent fruit supply. Hawai'i alone currently does not produce enough of any one type of fruit to make industrial juicing viable at scale. However, the entire region may be able to produce the supply needed for the domestic and export markets, (if export is an eventual goal) while ensuring economic opportunity and resiliency for the region as a whole.
- **Work at the policy level**
 - **to increase production of fruits.** Most fruit growers surveyed own their land. Fruit trees are long-term crops that require significant investment and time to establish, something that short-term lessees may be less willing to invest in. Through encouraging policies that lower barriers for would-be fruit growers to buy land, fruit production, as well as other staple crops, can be increased in the long term. Utilize public policy for increasing incentives for producers.
 - **to lower costs of production,** including the high cost of electricity and land. Overarching systemic variables create an environment in which Hawai'i's food producers struggle to produce economically. We found that the high cost of local fruits is the main barrier for commercial demand. Increasing support for local food production at the policy level will be of prime importance in the long-term vision for any food sovereignty and security for the islands.
 - **to lower barriers to becoming certified organic.** Certified organic adds value to final products, but many growers in Hawai'i forgo organic certification due to the high barriers, actual and perceived, for doing so. Institutional support for achieving certification will be necessary in the long-term.

Table 18: Recommendations

Near Term	Medium Term	Long Term	Overall
Agree upon ultimate objectives	Consider utilizing crops that are grown in abundance currently	Explore Pacific Region sourcing of fruit and develop partnerships in the Pacific region	Balance the capabilities of the equipment with potential viable markets.
Explore reconfiguring upstream equipment	Consider a cooperative model as a business growth phased process	Work at the Policy Level	Continue to build on the success of the juicer as a community-driven project.
Engage experts and academic resources	Help local farmers meet the demand of the HIDOE		
Find niche products and markets.			

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Appendices

Appendix A: Interview Protocol

The below document was used to guide the interviews discussed in this research.

INTERVIEW QUESTIONS WORKSHEET

Instructions: For each interview, hit file to 'make a copy' of this worksheet and save it with the last name of the interviewee (i.e. Robinson_Interview Qs Worksheet_Hawaii_[DATE]). Then fill out the top first block and take notes below each question as it's applicable.

INTERVIEWEE:

LEAD INTERVIEWER:

OTHER ATTENDEES:

DATE:

Before we begin, can you confirm that you have read the informed consent form that was emailed to you prior to this interview and that you consent to be a part of this study?

Are you okay with us recording this interview for accuracy in quotations or statistical analysis?

Introduction to project

The Hawaiian Islands lack adequate aggregation, processing and distribution networks to distribute food resources both locally and for export. This represents a significant gap in the local food supply chain. In 2015, farms in Hawai'i produced 11,312 acres of papaya, pineapple and tropical fruits combined. Additionally, many backyard gardens produce different kinds of fruits year-round, with pounds of produce often going to waste. Earlier this year, Olohana Foundation, a small Hawai'i-Island based non-profit organization, purchased an aseptic, industrial-scale juicing line. With an eye towards food security and utilizing otherwise wasted fruit resources, Olohana Foundation is poised to make an impact on food security in the state - filling a gap in needed processing facilities and providing a value-added option for local fruits. This project is not just focused on producing fruit juices, however. It is also about engaging the community through networks of gleaners and backyard fruit growers who can help to

turn an unused resource into foods for both local and national consumption. Our team of researchers at Arizona State University is currently conducting a feasibility study to determine the viability of Olohana Foundation and their small team setting up a farmer-owned fruit juicing cooperative business. We hope to determine the best way for them to utilize their existing equipment, provide a value-added option for local fruit growers, and contribute to food security for the Hawaiian Islands overall.

Re: supply: availability, quantity, and cost of fruit

- 1) Demographic questions for farmers
 - a) Number of years farming
 - b) Structure of land ownership or land lease
 - i) Ownership
 - ii) Lease: How long is the lease?
- 2) Where do you think this project could source fruit to process?
- 3) Do you produce fruit that goes unused? Or do you know someone who does?
 - a) How much, where is it, and what type of fruit?
 - b) Would this fruit typically go to waste?
 - c) How much would you need to be paid? And at what rate do you sell your fruit currently?
 - d) Who are you selling to now? And do you need another market?
- 4) What are some challenges that might keep you from participating in a project like this?

Re: demand: market for purees, juices and co-products

- 1) Demographic/ Classification Questions
 - a) Size of company: Annual revenue or customer reach (We might be able to look this up online)
 - b) What is your occupation (owner, employee, communications, product sourcing, etc)
 - c) Geographical location and reach of company products (Hawaii, continental US, etc)
- 2) Product line: What varieties of products do you produce?
 - a) Of these, what fruit products do you source (juices, purees, syrups, raw, cooked, etc)

- 3) What are potential markets for purees, juices, and co-products?
- 4) Do you currently serve / market local, Hawaii-sourced puree/juice products?
 - a) From where do you currently purchase these products?
 - b) What would prompt you to consider another contract?
 - i) What qualities do you look for in juice products?
 - (1) For example: Quantity, reliable supply, color, sweetness level, low cost, etc).
 - ii) How do you use the products that you purchase? What is your end product?
 - iii) What amount do you need of these given products to fulfill your needs on a monthly basis?
 - iv) Would you pay a premium for juice produced by a company that:
 - (1) Is worker- or grower-owned?
 - (2) Limits food waste?
 - (3) Prioritizes sustainability?
 - (4) Is based in Hawaii?
- 5) Are you interested in purchasing soil amendments, like Fermented Fruit Juice (FFJ) or compost?
 - a) How much would you use?
 - b) How much would you pay for it?
- 6) What are the barriers, if any, to marketing or serving local, Hawaii-sourced puree/juice products?

Re: cost of operation

- 1) Demographic/ Classification Questions
 - a) Size of company: Annual revenue or customer reach (We might be able to look this up online depending on the company)
 - b) What is your occupation (owner, employee, communications, product sourcing, engineer, etc)
 - c) Geographical location and reach of company (Hawaii, continental US, etc)
- 2) What should Olohana budget for operating the juicer (staff, power, replacement parts, consumables, transportation, etc.)?

- a) How many staff will it take to run the juicer?
 - b) Do you have any past business plans / budgets that could inform our work?
- 3) What volumes of juice can we expect this aseptic juicing line to produce? What about byproducts?
- 4) How many pounds of produce should we plan to process?
- 5) How did you choose where to locate your facility?
- a) What considerations factored into that decision?
 - b) How is the property that it's located on zoned?
- 6) What licenses do you need to operate a juicer in Hawaii?
- 7) What do you anticipate will be key challenges to getting this juicer operational?
- a) How have you made a fruit harvest to production schedule work for you? Any pitfalls in sourcing, storing, producing, transit thus far?

Re: business model recommendations

- 1) Demographic/ Classification Questions
 - a) Size of company/organization: Annual revenue, customer reach, membership level, etc. (We might be able to look this up online depending on the company)
 - b) What is your occupation (owner, employee, communications, product sourcing, engineer, etc)
 - c) Geographical location and reach of company (Hawaii, continental US, etc)
- 2) What are your recommendations for business structure?
 - a) What are other examples of small-scale juice companies that are finding success?
- 3) What is the ownership structure of your facility / or other juicers?
 - a) For what reasons did you select this model?
 - b) Have you encountered any challenges?
 - c) Did you receive funding for start-up?
 - i) From where?

- ii) What were funding terms?
 - iii) Do you expect to continue to be supported with some source of funding?
- 4) What should Olohana consider if they pursue a cooperative model?
- a) What are legal considerations of creating a cooperative in Hawaii?
 - b) What funding is available to support start-up costs of cooperatives in Hawaii?
 - i) Do you provide advisory services if a cooperative is working to form and operate? If yes, what do these services include?
- 5) What are the comparative advantages and disadvantages to business models of cooperative, B Corps, Non-profit with a for-profit subsidiary?
- a) Are there state statutes that should be considered?
 - b) What ongoing legal assistance may be necessary to establish an organization in any of those business model types?

Appendix B: Hawai'i Fruit Growers Survey Tool

Hawai'i Fruit Growers – Survey

Aloha!

This survey is being collected by Arizona State University food system researchers. The purpose is to gather data to inform a feasibility study on establishing a grower-owned fruit juicing cooperative on Hawai'i Island.

We are a team of graduate students under the direction of Dr. Kathleen Merrigan in the Swette Center for Sustainable Food Systems at Arizona State University and Carly Wyman, M.S. Food Systems Researcher at the Swette Center.

We invite your participation in the study by filling out the survey below. You have the right not to answer any question, and to stop participation at any time. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. Participation in this study will be limited to those 18 years old or older.

The potential benefit to you might be the ability to contribute your expertise to a new and exciting initiative in sustainable agriculture on the Hawaiian Islands. There are no foreseeable risks or discomforts to your participation.

The results of this study may be used in reports, presentations, or publications but your name will not be used if you do not so wish.

If you have any questions concerning the research study, please contact the research team at the below contacts. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Through participation in this survey, you can be entered to win a \$25 Amazon.com gift certificate! You must enter a valid email address to be entered into the raffle.

Please contact Carly Wyman with any questions or concerns: crwyman@asu.edu

This survey can be anonymous if you wish, though we do hope that you share your

name and contact info with us if you are open if we contact you with any follow-up questions we may have.

~Be sure to include your first and last name and email address for a chance to win an Amazon Gift Card~

Mahalo nui for your input!

- 1) Where are you farming/growing? Mark all that apply.
 - a. Hawai'i Island
 - b. O'ahu
 - c. Maui
 - d. Kaua'i
 - e. Moloka'i
 - f. Lana'i
- 2) How long have you been farming/growing on your current land?
 - a. Less than one year
 - b. 1-4 years
 - c. 5-10 years
 - d. 11-19 years
 - e. 20+ years
- 3) The status of my farm/land is... Mark all that apply.
 - a. I own the land
 - b. I lease the land
 - c. Other
- 4) If you lease the land, who do you lease it from? Mark all that apply.
 - a. Kamehameha Schools
 - b. Other private land owner
 - c. Department of Hawaiian Homelands (DHHL)
 - d. Department of Land and Natural Resources (DLNR)
 - e. Bishop Estates
 - f. Department of Agriculture
 - g. County Land
 - h. Other...
- 5) How would you describe your farming/gardening practices? Mark all that apply.
 - a. Conventional (utilizing chemically-derived inputs)
 - b. Certified organic
 - c. Not certified organic, but utilizing organic practices ("no spray" etc.)
 - d. Korean Natural Farming (KNF)

- e. Biodynamic
 - f. Permaculture
 - g. Agroforestry
 - h. Traditional native Hawaiian land management practices
 - i. Other...
- 6) What type(s) of formal training or support in farming or growing have you received? Mark all that apply.
- a. Associates degree in agriculture, horticulture or related field
 - b. Bachelor's degree in agriculture, horticulture or related field
 - c. Master Gardener program
 - d. Beginning farmer/rancher development program
 - e. Permaculture Design Course
 - f. University of Hawai'i Agriculture Extension Services (UH CTAHR)
 - g. Other...
- 7) What type(s) of informal training in farming or growing have you received? Mark all that apply.
- a. Family tradition and knowledge passed down
 - b. Learning from friends and acquaintances
 - c. Attended community workshops and classes
 - d. Support and training from a growers association or cooperative that I am a member of
 - e. Other...
- 8) Which topic areas would you like more support or training in? Mark all that apply.
- a. Business planning, marketing, financial management
 - b. Horticulture and crop sciences
 - c. Sustainable, organic, or natural farming and gardening practices
 - d. New tools and technologies in farming and gardening
 - e. Grants, loans and other funding opportunities
 - f. Accessing land
 - g. Other...
- 9) I grow the following fruits/ crops. Leave blank any fruits that you do not grow.

	Less than 10 plants	10-50 plants	51 Plants to 1 Acre	1-2 acres	2+ acres
Avocado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Banana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cacao	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caimito (Star Apple)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Canistel (Egg Fruit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cherimoya	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dragonfruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strawberry Guava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapefruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jaboticaba	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Lemon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lilikoi (Passionfruit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lychee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mamey Sapote	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mango	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangosteen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mountain Apple	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Noni	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Orange	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Papaya	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rambutan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rolinia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starfruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Soursop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strawberry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tangelo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tangerine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Citrus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watermelon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10) If you listed "Other" above, please describe what other fruits you grow and how many trees or plants of each.

11) Are you interested in increasing the amount of fruit that you grow?

12) Do you sell your fruits and where? Mark all that apply.

- a. I don't sell my fruits
- b. Farmers Market(s)
- c. Restaurant(s)
- d. Farm Stand
- e. Wholesale
- f. Through CSA(s)
- g. Forward-contracting
- h. Continental United States
- i. Export Internationally
- j. Other...

13) Do you have excess fruit that you are unable to harvest and sell?

- a. Yes

Strawberry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tangelo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tangerine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Citrus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Watermelon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15) Of the fruits that you listed above, which do you most often have excess of?

16) What do you do with your overripe or unharvested fruit? Mark all that apply.

- a. I let it fall on the ground
- b. I feed it to my animals
- c. I sell it or share it with pig farmers
- d. I compost it
- e. I make value-added products (jams, jellies, pastries, juices, dried fruit etc.)
- f. I give it to friends and family
- g. Other...

17) Do you sell any value-added products that you make with your fruit? (jams, jellies, pastries, juices, dried fruit etc.) (Just a couple more questions left!)

- a. Yes
- b. No
- c. No, but I would like to
- d. Other...

18) If you answered yes above, what value-added products to you make?

Farmer-owned cooperative organizations exist in many forms. However, all such organizations exist in order to support the farmer-members in achieving their goals. This survey is being used to gauge the feasibility of establishing a fruit farmer-owned juicing cooperative. This would allow farmers to sell their overripe or under-used produce to the

cooperative at a fair price. The cooperative would then handle producing value added products including fruit juice and puree. Other services that the coop could provide include: pooling farmer resources for bulk purchasing of inputs to save money, providing training and education, and making compost and other inputs from excess fruits for farmer-members.

- 1) Are you currently a member of an agricultural or grower's cooperative? If so, please name it below.
- 2) What are your main reasons you might be interested in joining a farmer or grower's cooperative?

Not interested Somewhat interested Quite interested Very Interested

Bulk purchasing of things like fertilizers, seeds and planting stock, soil amendments and others

Guaranteed market for my excess and overripe crops

Education and
Information
sharing among
growers

Collaboration
with other
growers

Accessing
compost and
other inputs from
the coop

Assistance with
harvesting,
gleaning and
processing
excess fruit
crops

- 3) Any other reasons would you be interested in joining a fruit growers cooperative that are not listed above?
- 4) Are you interested in learning more about joining a fruit-growers cooperative?
 - a. Yes
 - b. No
 - c. Maybe
 - d. Other...
- 5) First and last name
- 6) Email Address (optional, though to be entered for the Amazon.com gift card raffle, an email address is required)
- 7) Farm name and website
- 8) May we reach you if we have any follow-up questions? (Please remember to hit "submit" below)
 - a. Yes
 - b. No
 - c. Other...

Appendix C: Hawai'i Commercial Fruit Buyers Survey Tool

Hawai'i Commercial Fruit Buyers- Survey

Aloha!

This survey is being collected by Arizona State University food system researchers. The purpose is to gather data to inform a feasibility study on establishing a grower-owned fruit juicing cooperative on Hawai'i Island.

We are a team of graduate students under the direction of Dr. Kathleen Merrigan in the Swette Center for Sustainable Food Systems at Arizona State University and Carly Wyman, M.S. Food Systems Researcher at the Swette Center for Sustainable Food Systems at Arizona State University.

We invite your participation in the study by filling out the survey below. You have the right not to answer any question, and to stop participation at any time. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. Participation in this study will be limited to those 18 years old or older.

The potential benefit to you might be the ability to contribute your expertise to a new and exciting initiative in sustainable agriculture on the Hawaiian Islands. There are no foreseeable risks or discomforts to your participation.

The results of this study may be used in reports, presentations, or publications but your name will not be used if you do not so wish.

If you have any questions concerning the research study, please contact the research team at the below contacts. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Through participation in this survey, you can be entered to win a \$25 Amazon.com gift certificate! You must enter a valid email address to be entered into the raffle. Please contact Carly Wyman with any questions or concerns- crwyman@asu.edu

This survey can be anonymous if you wish, though we do hope that you share your name and contact info with us if we would like to contact you with any follow-up questions we may have.

~Be sure to include your first and last name and email address for a chance to win an Amazon Gift Card~

Mahalo nui for your input!

- 1) Where are your business operations? Mark all that apply.
 - a. Hawai'i Island
 - b. O'ahu
 - c. Maui
 - d. Kaua'i
 - e. Moloka'i
 - f. Lana'i
 - g. Continental United States
 - h. International
 - i. Other...
- 2) How long has your business been in operation?
 - a. Less than one year
 - b. 1-4 years
 - c. 5-10 years
 - d. 11-19 years
 - e. 20+ years
- 3) The structure of my business is...
 - a. Sole proprietorship
 - b. Partnership
 - c. Limited Liability Partnership (LLP)
 - d. Limited Liability Company (LLC)
 - e. S Corporation
 - f. C Corporation
 - g. Sustainable Business Corporation (B Corporation or Public Benefit Corporation)
 - h. Agricultural cooperative
 - i. Buyers cooperative
 - j. Nonprofit
 - k. Other...
- 4) What channels do you sell your products through? Mark all that apply.
 - a. Retail store

- b. Website
 - c. Farmers market(s)
 - d. Restaurant(s)
 - e. Farm stand or on-farm shop
 - f. Wholesale
 - g. Through CSA(s)
 - h. Export to continental United States
 - i. Export Internationally
 - j. Contracted with State or Federal government for institutional purchasing
 - k. Hotels and resorts
 - l. Charitable donations
- 5) Which food business type best describes your business/ organization?
- a. Retail (grocery store, farmers market stand, other direct to consumer sales)
 - b. Wholesale
 - c. Food processing
 - d. Foodservice (catering, restaurants, cafeterias)
 - e. Food technology (research and development)
 - f. Food service supplier
 - g. Hunger relief
 - h. Other...
- 6) Which fruit products below do you currently purchase? Mark all that apply.
- a. Whole, fresh fruit
 - b. Frozen fruit puree
 - c. Whole or cut frozen fruit
 - d. Pasteurized 100% fruit juice
 - e. Unpasteurized 100% fruit juice
 - f. Pasteurized fruit juice with added sugar
 - g. Unpasteurized fruit juice with added sugar
 - h. Fruit syrups
 - i. Juice concentrate
 - j. Other...
- 7) Of the products listed above, what kinds of fruits are they?
- 8) How do you use these products you purchase? What is your end product?
- 9) What amount do you need of these given products to fulfill your needs on a monthly basis?
- 10) What sizes and packaging do you prefer? Mark all that apply.
- a. Case of six 30-oz containers
 - b. 50 gallon drums

- c. 3 gallon bag in a box (juice concentrate)
- d. Single serving 10oz
- e. Single serving 12oz

11) From where do you source each of the above products? (Hawai'i, continental U.S., Asia, etc.) If you do not know the geographical source of these products, who is the supplier that you purchase from?

12) How important are the following attributes to your company when considering sourcing your fruits and fruit products?

	Not important	Somewhat importa...	Quite important	Very important
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliable and consis...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Color	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flavor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified organic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grown utilizing oth...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grown utilizing Tra...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From a company th...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grown in Hawai'i	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Processed in Hawai'i	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From a company th...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13) Do you require your vendors to have any national or international food safety or other certifications (kosher, certified organic, gluten free, SQF, etc.)? Please list all below.

14) Which fruit products below do you not yet purchase but are interested in purchasing? Mark all that apply.

- a. Whole, fresh fruit
- b. Frozen fruit puree
- c. Whole or cut frozen fruit
- d. Pasteurized 100% fruit juice
- e. Unpasteurized 100% fruit juice
- f. Pasteurized fruit juice with added sugar
- g. Fruit syrups
- h. Juice concentrate
- i. Other...

15) Which types of fruit products below are you (a) interested in sourcing more of,
OR (b) not yet purchasing but interested in sourcing?

	Yes	No	Maybe
Avocado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Banana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cacao	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caimito (Star Apple)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Canistel (Egg Fruit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cherimoya	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dragonfruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strawberry Guava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapefruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jaboticaba	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lemon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lilikoi (Passionfruit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Lime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lychee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mamey Sapote	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mango	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangosteen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mountain Apple	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Noni	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Orange	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Papaya	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rambutan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rolinia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starfruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soursop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strawberry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tangelo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Tangerine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Citrus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watermelon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16) Do you currently serve or market local, Hawai'i-sourced fruit products?

- a. Yes
- b. No
- c. Other...

17) If yes, from where do you currently purchase these products?

18) What barriers are there (if any) to marketing or serving Hawaii-sourced fruit products? Mark all that apply.

- a. Cost
- b. Lack of consistent supply at the amounts needed
- c. Lack of demand from my customers
- d. Lack of relationships with local food producers or distributors
- e. Other...

19) Are you interested in changing or adding supplier(s) to buy local, Hawai'i-grown fruit products?

- a. Yes
- b. No
- c. Maybe
- d. Other...

20) First and last name, title







21) Email Address (optional, though to be entered for the Amazon.com gift card raffle, an email address is required)






22) Company name and website

23) May we reach you if we have any follow-up questions? (Please remember to hit "submit" below)

- a. Yes
- b. No
- c. Other

Appendix D: Pictures of Equipment

Short name	Manufacturer	Model	
Disintegrator	Bepex	RP-12-K122	 
Paddle finisher	Brown	202 Finisher	 
Screw finisher	Brown	3900 Finisher, Series 3902	 
Sanitary pump #1	Waukesha Cherry-Burrell	Universal series	--
Sanitary pump #2	Waukesha Cherry-Burrell	--	--

Pump #3	Fristam	FL2100 S99 054	--
Control panel	Waukesha Cherry-Burrell	--	
Heat exchanger	--	AR56-S	
Thermutator	Waukesha Cherry-Burrell	672 L	
Aseptic filler	Scholle	Auto-Fill X-1 Aseptic Ban in Box Filler	 

-- Information not found or photos not available currently

Appendix E: Small Business Development Center (SBDC)

HAWAII SBDC NETWORK - LEGAL ENTITY REFERENCE SHEET							
ENTITY TYPE	LEGAL FORMATION REGISTRATION	OWNERSHIP	TAXATION	LIABILITY	MANAGEMENT CONTROL	ENTITY LIFE	MAIN/PRIMARY (1) A-ADVANTAGE D-DISADVANTAGE
SOLE PROPRIETOR	Not required unless public notice of trade name is desired (dba).	Single individual	Business income/loss reported at the personal level.	Unlimited owner liability	Owner	Terminates upon passing of owner	A: Simplest business form and easy to establish D: Unlimited personal liability
PARTNERSHIP (Limited, General, Joint Venture)	Within 30-days after formation, file Certificate of Limited Partnership or General Partnership form	2 or more persons	Business income/loss reported at the personal level. All partners taxed on share of partnership via Schedule K-1. Entity files IRS Form 1065	Unlimited for general partners (jointly and severally). Liability limited to investment for limited partners	General partners	Often for a specific time period. May terminate by general partner death, legal disability, withdrawal, or insolvency.	A: Division of responsibilities D: Unlimited personal liability
LIMITED LIABILITY PARTNERSHIP	File General Partnership form with a Statement of Qualification. For non-Hawaii LLPs, file as a foreign LLP	2 or more persons or entities	Business income/loss reported at the personal level. Members taxed on share of income like partnership. Schedule K-1. Entity files IRS Form 1065. Option to file as "S"-Corp.	Limited to respective share of investment in business or as specified by agreement	General partners	Same as partnership	A: Limited personal liability D: Partners not obligated to consult with other partners in certain business agreement
LIMITED LIABILITY COMPANY	File Articles of Organization (LLC-1) For non-Hawaii LLCs, file as a foreign LLC with a Certificate of Authority for LLCs	1 or more persons or entities (multiple member requires Operating Agreement)	Business income/loss reported at personal level. Federal tax treatment by election: default: sole proprietor as disregarded entity or K-1 partnership (IRS Form 1065) or as "S"-Corp.	Limited to investment or as specified in Articles of Organization or Operating Agreement	Member-managed or Manager-managed	May be for a specific agreed-upon time or at-will	A: Limited personal liability Owner draw allowed Income reported on Personal returns D: Requires DCCA registration (compared to sole proprietorship)
S-CORPORATION	File Articles of Incorporation. For non-Hawaii corporation, file Application for Certificate of Authority with a Certificate of Good Standings	Shareholders: Single type of stock. 100max Individuals only. No foreign investors.	Business income/loss pass thru at personal level. Reported to Shareholders via K-1. Entity Federal income filed on IRS Form 1120S. Hawaii income Form N-35.	Limited to investment	Board of Directors	On-going	A: Limited personal liability D: Subject to stricter government regulation and corporate formalities
C-CORPORATION	Same as S-Corporation	Shareholders: unlimited	Business income/loss reported at corporate level. Shareholders taxed on dividends Form 1099 Div. Entity Federal income filed on IRS Form 1120	Limited to investment	Board of Directors	On-going	A: Limited personal liability D: Double taxation - (corp income at 35%, 20% and indivy dividends at 15-30%)

Hawaii SBDC Rev. 06/2017

Advantage Disclosure: (1) For simplicity only one main advantage and disadvantage is listed for each entity type. There are many others considerations when selecting type of legal entity. Prior to selecting entity form it is recommended the business owner(s) seek advice from a CPA or business attorney.

Disclaimer: This simplified chart is for general discussion and comparison of possible forms of organization and does not constitute legal advice in any respect. No reader should act or refrain from acting based on information contained herein without seeking the advice of counsel in the relevant jurisdiction.

Business Model Chart

HAWAII SBDC NETWORK - LEGAL ENTITY REFERENCE SHEET

ENTITY TYPE	LEGAL FORMATION REGISTRATION	OWNERSHIP	TAXATION	LIABILITY	MANAGEMENT CONTROL	ENTITY LIFE	MAIN/PRIMARY (1) A-ADVANTAGE D-DISADVANTAGE
SUSTAINABLE BUSINESS CORPORATION B-Corporation –or– Public Benefit Corporation	File Articles of Incorporation. (Same as C-Corporation) Plus, include a filed statement declaring that this a sustainable business corporation.	Shareholders; unlimited (Same as C-Corporation)	Business income/loss reported at corporate level. Shareholders taxed on 1099 Div. Entity income filed on IRS Form 1120 (Same as C-Corporation)	Limited to investment (Same as C-Corporation)	Board of Directors Plus, required benefit director and optional benefit officer.	On-going (Same as C-Corporation)	A: Limited personal liability. +Replaces priority of creating long-term shareholder value with social and environmental performance D: Double taxation - (income and dividends - same as C-Corporation) +Required Annual Benefit Report on whether goals are being met.
<p>A for-profit corporate entity authorized in Hawaii by SB 298 (http://www.capitol.hawaii.gov/session2011/bills/SB298_CD1.htm) effective July 8, 2011 that commits to sustainable practices and produce a public benefit. The designation SUSTAINABLE BUSINESS CORPORATIONS was authorized along with a code of conduct for a business corporation to offer entrepreneurs and investors the option to build and invest in businesses that operate in a socially and environmentally sustainable manner to positively impact society.</p> <p>Benefit corporations differ from traditional C-Corporations in purpose, accountability, and transparency, but NOT in taxation (although Hawaii may eventually include a process for issuing tax breaks to companies exhibiting a public benefit.) While corporations generally have the ability to pursue a broad range of activities, corporate decision-making is usually justified in terms of creating long-term shareholder value. A commitment to pursuing a goal other than profit as an end for itself may be viewed in many states as inconsistent with the traditional perspective that a corporation's purpose is to maximize profits for the benefit of its shareholders. In a traditional corporation, shareholders judge the company's financial performance, with a benefit corporation, shareholders judge performance based on the company's social, environmental, and financial performance. Transparency provisions require benefit corporations to publish annual benefit reports of their social and environmental performance using a comprehensive, credible, independent, and transparent third-party standard.</p> <p>The law in Hawaii will eventually turn into Sustainable business corporations must meet the following criteria:</p> <ol style="list-style-type: none"> 1. A demonstrable, material public benefit. A measurable, tangible benefit to the broader community. 2. Companies applying must appoint a benefit director. 3. The company must measure its progress and publish a report about how its public benefit is doing against an industry standard, and this needs to be transparent. (No stated requirement to be doing well, just the public commitment to do so. Although a non-profit called B Lab conducts a "B Impact assessment" and publishes reports in accordance with a certification developed by the "Community of Certified B Corporations".) <p>See also: Hawaii Revised Statutes HRS Chapter 420D (http://www.capitol.hawaii.gov/hrscurrent/Vol08_Ch0401-0429/HRS0420D/HRS_0420D_.htm)</p>							

Hawaii SBDC-Rev. 06/2017

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Disclaimer: This simplified chart is for general discussion and comparison of possible forms of organization and does not constitute legal advice in any respect. No reader should act or refrain from acting based on information contained herein without seeking the advice of counsel in the relevant jurisdiction.

About the Authors

Eric Hemphill

Eric Hemphill is the Solid Waste Program Manager for Bridging the Gap Kansas City. In this role, he works with businesses, government agencies, nonprofit organizations, and waste haulers to reduce landfill waste in the Kansas City metro. He holds a bachelor's degree in English from Emporia State University and a Master's in Education from UCO. His research interests focus on the areas of sustainability pedagogy, policy-based solutions, social change, and place-based learning projects.

Stu Lourey

Stu serves as Government Relations Director for Minnesota Farmers Union (MFU), where he helps MFU's family farmer members develop grassroots policy priorities and then drive on those priorities on the state and national level. He grew up on a small farm in east central Minnesota where his family grew organic apples and sold grass-fed beef direct to consumer. Prior to joining MFU, Stu served as a legislative aide to Senator Tina Smith in her Washington D.C. office, where he focused on rural healthcare, education policy, and work with Minnesota's 11 tribal nations. Before that, he worked in Northeast MN for Senator Al Franken. He graduated from Carleton College in Northfield, MN with a degree in Sociology and Anthropology.

Mackenzie Martinez

Mackenzie Martinez is native of the southeastern United States, where currently resides on her Tribe's ancestral lands located in Zwolle, Louisiana. In 2020, she earned a Bachelor of Science from McNeese State University in Lake Charles, Louisiana, where she studied agricultural and animal sciences. Over the span of her professional career, Mackenzie has held the roles of student, advocate, intern, and program associate working in the agriculture and food space, with much emphasis being placed on Tribal food sovereignty issues. She has served various food and agriculture-based nonprofit organizations in the intern capacity and feels that each experience has been critical in molding her into the effective communicator and advocate she is today. Mackenzie especially enjoyed her time as an intern for the US House Committee on Agriculture, where she learned about the legislative process and how policy-driven solutions are formulated in an effort to support farmers and ranchers. Mackenzie's passions include engaging with Tribal farmers and ranchers, implementing farm to school initiatives, and supporting the development of sustainable food systems through policy advocacy. She certainly looks forward to engaging with Tribal farm to school practitioners and helping to expand and institutionalize culturally relevant farm to school programs throughout

Indian Country in her current role as Native Communities Program Associate for the National Farm to School Network.

Claire Robertson

Claire Robertson works in international development, supporting the design and implementation of projects focused on community resilience, social cohesion, and transparent and accountable governance around the world. Claire currently leads Democracy International's Strategy & Outreach Team and previously supported DI's learning work, designing and implementing evaluations, assessments, and research projects across DI's democracy, human rights, and governance portfolio. Claire served as a Peace Corps volunteer in Ukraine, where she taught English as a Foreign Language and coordinated other community development, civic education, and health education projects. When not thinking about governance challenges, Claire works at an Italian-style liqueur maker in Washington, DC. Claire holds a M.A. in Government from Georgetown University and a B.A. in Political Science from the University of Pennsylvania.

Luke Swette

Luke Swette is a junior at Arizona State University pursuing a degree in Economics as well as minors in Mathematics and Sustainability. Additionally, Luke is involved in a variety of activities on campus and volunteers for service events in Phoenix. In the future, Luke hopes to work on creating sustainable solutions to challenges that businesses face.

Carly Wyman

After graduating with an M.S. in Sustainable Food Systems from the Swette Center in 2021, Carly came on board as a Senior researcher with the Swette Center where her research focuses on Hawai'i Food Systems. In addition, she practices agroforestry on a small farm, growing several market crops on the Big Island of Hawai'i. She also holds a BA in International Affairs from Lewis & Clark College and a Masters Certificate in Food Policy and Sustainability Leadership from Arizona State University.



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