Data Summary
Agricultural Innovation Center

In June and July of 2022, the Hāmākua Institute (Institute) conducted primary and secondary research related to crop production, processing, and purchasing as part of a value chain analysis to support the design process for the Agriculture Innovation Center at the Hilo Food Campus planned by The Food Basket (TFB). In total, the Institute held **14 total semi-structured interviews** (9 producers, 2 producer-buyers, and 3 buyers) and collected **59 survey responses** (44 producers, 11 producer-buyers, and 4 buyers). Producers and buyers were of various scales of production/buying, from ⅛ acre of production to 700 acres, and from small local retail fronts to larger local, international, and online retail/distribution.

The purpose of this work was to further the understanding of production and demand in current and projected markets, in order to support the design of the Innovation Center that best facilitates the processing of value-added products on Hawai‘i Island. This is part of a larger project to support the agricultural sector by leaning into Hawai‘i Island‘s agricultural resource base–small and mid-size farmers–and contribute to food resiliency in functional, sustainable, and equitable ways. The queries asked to producer, producer-buyer, and buyers in both interview and survey formats sought to build understanding of:

1) producer interest in utilizing value-added facilities;

2) buyer interest for specific locally-made products, both for local and export (island-wide, U.S. continental, and international) sale;

3) clusters of crop production that might be aggregated and scaled for value-added production, including volume of crops currently produced;

4) specific equipment needs in relation to desired processing/product needs;

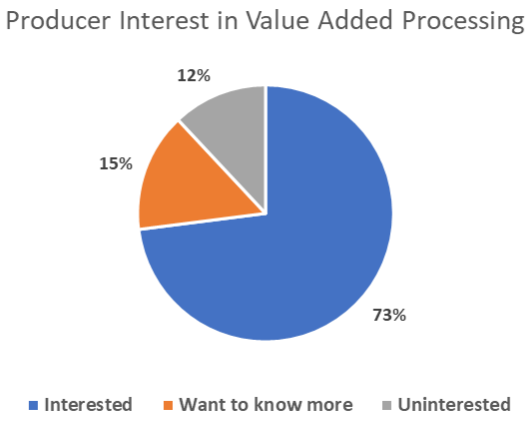
5) ways to assist producers in reaching larger volumes of crop where buyers see current and future opportunity.

The pages that follow represent highlights of data gathered from the surveys and interviews as well as relevant secondary data from available studies and reports. This information is shared to enable

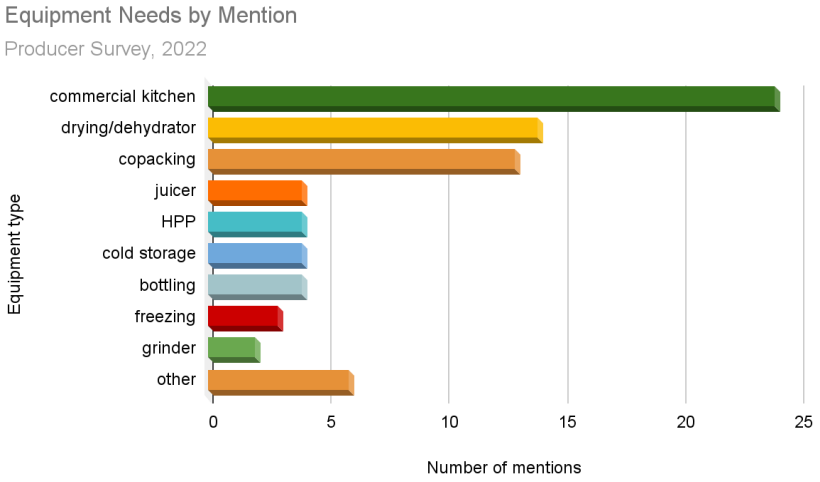
stakeholders to identify the potential opportunities for value added processing that can be incorporated into the plans and designs of the proposed Agriculture Innovation Center.

Interest in Value Added Processing

Those who expressed interest were enthusiastic about the idea of having a processing facility in Hilo.
Larger producers (estimating >1000lbs of production) (18 total–16 yes + 2 maybe) tended to see potential for larger shared-use equipment that is not currently available on island or that holds the potential to change the game for those currently in the industry through larger-scale machine processing.



In this category of producer, spice and nut steam pasteurization equipment (Napasol); co-packing equipment (i.e., Masipack; i.e., shredder-bagger for cabbages, lettuces, broccoli); large scale industrial dehydrators; flash freezers; high-pressure pasteurization (HPP); meat processing equipment (bamb saws, smokers, dehydrators, grinders, sausage stuffers, shrink wrap and vacuum seal machinery); and bottling equipment were mentioned.



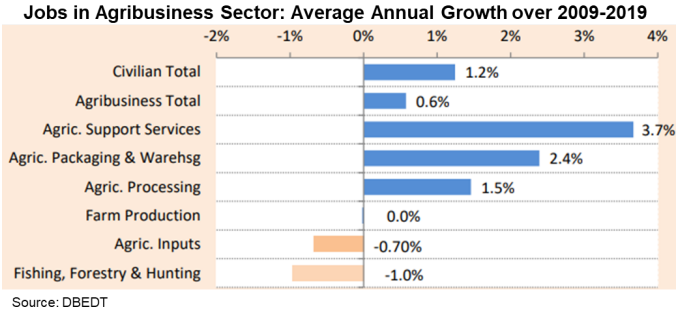
Smaller producers (35 total–28 yes + 7 maybe) tended to see the potential for cottage industry growth via individual use of certified kitchen facilities. Producers who estimated <1000lbs of production or indicated units of a few trees or were not yet producing were included in this category. The upper end of this category (i.e., producers who estimated production in the hundreds of pounds) most often mentioned the need for industrial dehydrators. Smaller producers (30-50lbs, unknown, etc.) most often indicated need for certified/commercial kitchens and equipment, including areas/equipment for pickling and fermentation; cooking equipment, labeling and packaging facilities, and use of refrigeration, freezer, and storage units. Specialty equipment mentioned in this category were a hydro distiller, cane press, and oil press.

10 of 66 producers indicated that they may be interested but needed to know more about the facility. In additional notes, producers indicated interest in what kinds of equipment will be provided, costs of use, and general management of facilities.

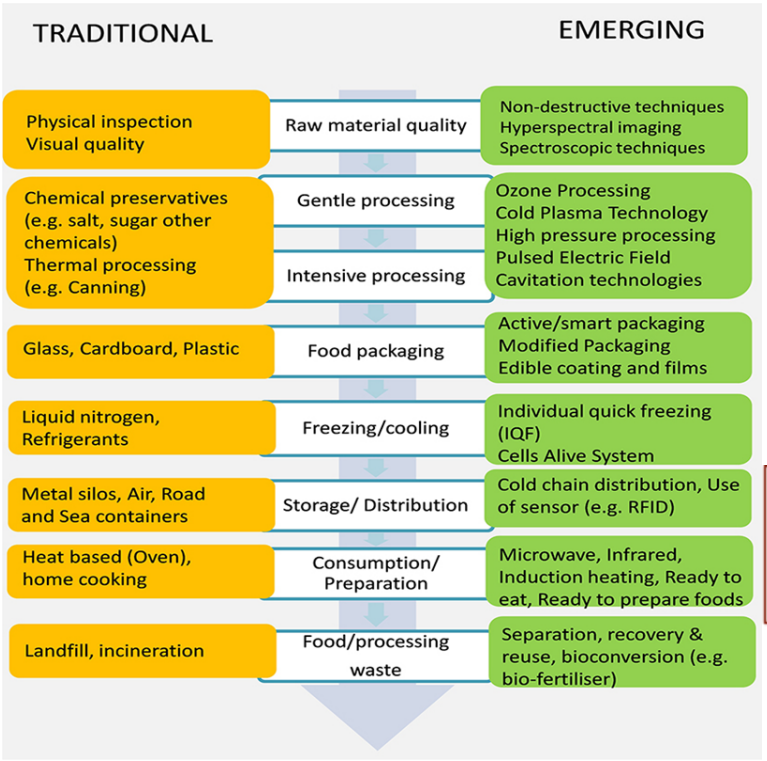
Those who indicated no interest in utilizing processing facilities gave reasons including: 1) that the facility was too far from their farm/areas of production (S. Kona, Hōnaunau, Kaʻū, Kapaʻau); 2) that they already had successful channels to process, distribute, market their product; 3) that their product did not need processing; 4) that they were unsure of what would be profitable to make in order to sell; and 5) that they were trying to retire. 2 who indicated no interest for themselves added that they saw value in a processing facility for others, through aggregation of other producers' crops.

Of the 20 buyers and buyer-producers that participated in the study, 15 listed the lack of facilities as the primary barrier to locally-produced value-added products (2 specifically for animal processing). Other responses included a lack of time, skilled labor, and capital resources required for processing; a lack of capacity within the producer community to know how to process crop for market sale; and legal/permitting requirements for processing.

Agricultural processing jobs have been growing. As shown in the adjacent chart, employment data for the state indicates higher job growth over 2009-2019 in agricultural processing, packaging, warehousing and services than the average for agribusiness.



Source: DBEDT



Processing technology is also changing, reflecting the introduction of more non-thermal processes and alternatives to chemical preservation processes. The following diagram highlights the emerging technologies found in food chains.

Source: Hemphill, et. al. "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, October 2021.

Products that interview and survey participants (buyers and producer-buyers) felt had potential in local and export (island-wide, U.S. continental, and international) markets emphasized the potential for utilization of B-grade fruit and other crop product through dehydration, juicing/puree, and milling processes, as well as processed, high-quality meat products.

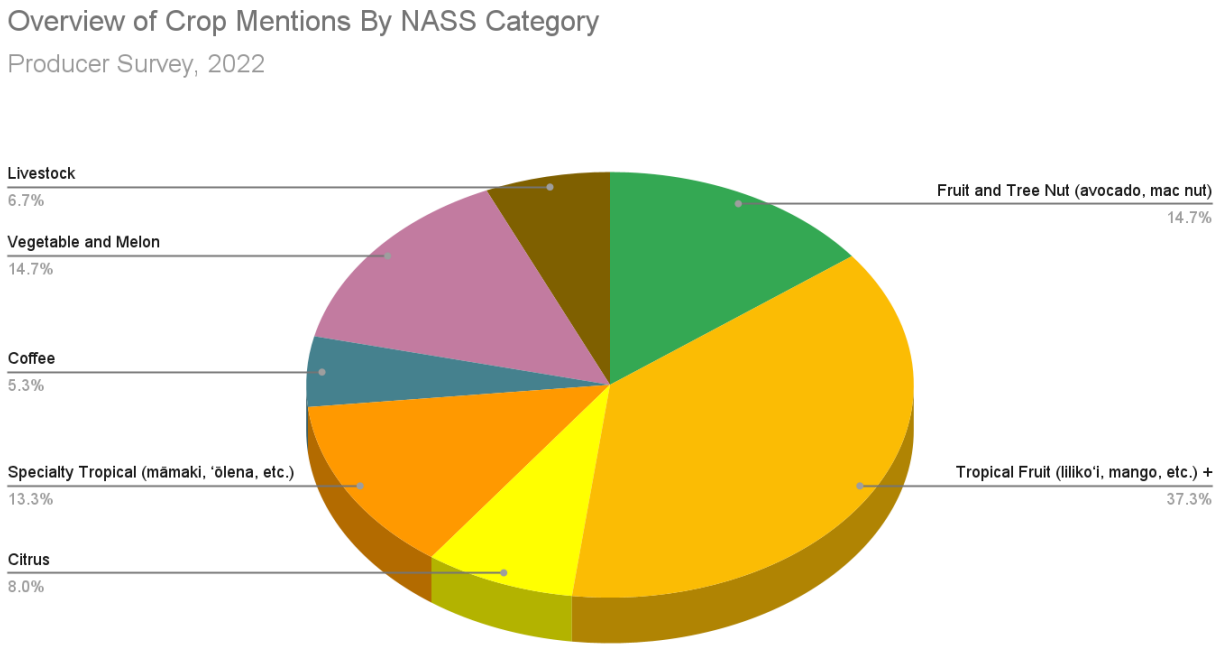
Interest by Crop

Please find a spreadsheet of findings from the set of interviews and surveys conducted for the Charette, along with some links to local market data produced by DBEDT, HDOA, and NASS here.

Categories used in this study are based on NASS categories in order to more easily understand secondary data on farms, crop production, and sales in conjunction with study data. The exception would be the Staple Crops category, which is not a NASS designation but continues to emerge as a critical crop category in local discussions around agricultural potential, food resiliency, and food production through climate change. Where relevant, data for crops within a category are highlighted (i.e., cacao) because they were prevalent in participant responses.

Some respondents listed more than one crop across various categories, for instance “Lamb, avocado, mangoes, dragonfruit.” This response has been tallied under *Livestock, poultry, and dairy*; *Fruit and tree*

nut; and *Tropical fruit*. Numbers of mentions in each category will thus exceed the total number of survey and interview participants.



Noncitrus Fruit and Tree Nut

In the **Noncitrus Fruit and Tree Nut category** (Avocado, Papaya, Mac Nut), 7 participants mentioned avocado and 4 participants mentioned mac nuts. Hawai'i State has 740 acres of avocado in production and yields 0.8 tons/acre, and 17,000 acres of mac nuts in production with yields of 3,000 lbs per acre (NASS 2022).[1]

Avocado

The majority of the avocado crop produced in the U.S. is in California (46,700 acres of production) and Florida (4,400 acres of production). Most avocado is sold as fresh market and a tiny percentage is used for processing (0.13% of total tonnage of production in the U.S.). Survey respondents indicated that avocado oil production is a potential secondary market, but noted *"the high cost of infrastructure (skinner, deseeder, drier, centrifuge), bottling plant etc.) and the low volume of culls available for oil production would make this option uneconomical. Large avocado packing houses are able to produce oil for a very low cost so it would not be practical to compete with these operations."* Equipment needs for avocado that were otherwise mentioned were for certified kitchen facilities and refrigeration, including tools to make guacamole and avocado mousse.

[1] Perroy and 2020 Land Use Map indicates Hawai'i Island alone has 21,405 acres of mac nuts in production. The discrepancy may be attributed to differences in participation in NASS survey and UHH SDAV study.

Mac Nut

According to NASS, 2021 Macadamia Nut production showed increased yields per acre and 26% increased crop value, totalling $62.7 million (see NASS 2022, NASS 2021). One interview participant noted that Hawaiʻi is a net importer of macadamia nut from S.Africa, Guatemala, and Australia, and that we consume most of the macadamia nut we produce. Another interview participant noted that there are numbers of mac nut trees in production that could be harvested, but are not because of a lack of accessible processing facilities for smaller quantities. Equipment needs mentioned included basic processing of macadamia nut for backyard farm quantities, machinery to make mac nut butter, steam pasteurization equipment, and co-packing equipment.

Tropical Fruit and Citrus, Specialty Tropical

Tropical fruit and/or citrus was the crop category most often mentioned, and was often listed as part of a diversified set of crops (including vegetables, other specialty tropical products (māmaki, mushrooms), and mac nuts). In this category, bananas (valued at $5.7 million) and ʻōlena/turmeric (valued at $1.2 million) are considered top Tropical crops for Hawaiʻi according to NASS data. A full listing of reported tropical fruit production and crop value (as well as crops in the Specialty Tropical category) can be found here.

Tropical Fruit

Tropical fruit was the most frequently mentioned crop among producers who participated in the study, with 21 participants mentioning specific and/or general fruit crop production, and 5 of those participants listing production volumes of over 1,000lbs. Among those who specified the types of fruit they produced, lilikoʻi (passionfruit) was most often mentioned, followed by ʻulu (breadfruit), maiʻa (banana), and mango.[2] Starfruit, brazilian cherry, dragonfruit, and jackfruit were others mentioned. Tropical fruit grower experts in Hawaiʻi indicate that there are any number of fruits that can be used for cottage industry and commercial products, and that there is a need for aggregation strategies that maximize small farm and backyard farm production. Ken Love, Executive Director of Hawaiʻi Tropical Fruit Growers West Hawaiʻi Chapter, sees lilikoʻi, jaboticaba, mango, starfruit, and durian as crops with high potential for value-added applications, and, based on NASS 2018 production data, calculates that production will need to increase to scale for industry needs (see Love 2022, and Swette Center 2021).

Research by the Swette Center for Sustainable Food Systems (2021) indicates that, out of 11 Hawaiʻi-based commercial buyers, 100% of buyers are interested in sourcing more lilikoʻi, with citrus and other tropical fruits also in high demand.

[2] See more detailed data for ʻulu/breadfruit and maiʻa/banana below, under Staple Starches category.

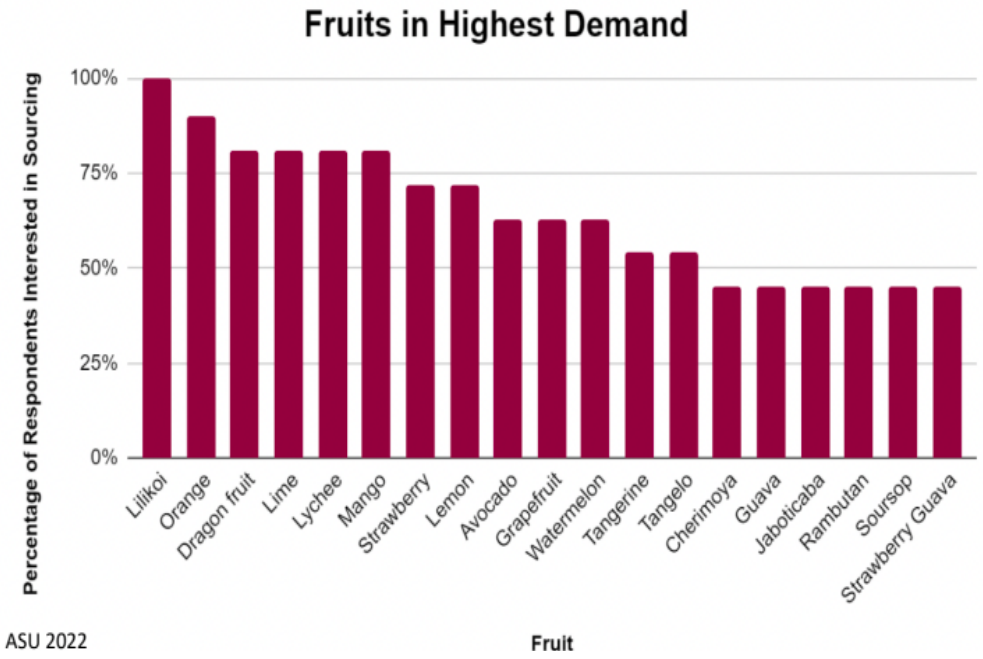


Chart Source: Hemphill, et. al. "Industrial Juicing to Advance Food Security: Pre-Feasibility study for utilizing legacy industrial fruit processing equipment in the Hawaiian Islands." Swette Center for Sustainable Food Systems, October, 2021.

12 Producers who mentioned tropical fruits in their responses showed need for commercial kitchen applications for making jams and jellies/fruit preserves, canning, and making fruit puree. 6 mentioned need for dehydrators, and one mentioned IQF (Individual Quick Freeze) equipment, HPP (High Pressure Pasteurization), and bottling equipment.

Tropical fruit (including cacao) and specialty (ʻōlena, māmaki) was also most frequently mentioned among buyers as having the most potential for sale as both local and export value-added product. Dried fruit and locally-grown spices, liquid (puree, juice, concentrate), and non-liquid (dried, powdered, granulated) fruit product were suggested for local and global export markets.

Cacao

Cacao is one of many crops under the Tropical fruit and Specialty Crop category. It was mentioned by 7 separate producers, some of whom had large numbers of trees (50 trees, 700 trees). NASS data estimates 36,700 cacao trees in production in Hawaiʻi (state), with a farm value of $415,000 (2018 crop). It is one of the higher farm valuations for tropical fruit and specialty crop, in tier with moringa and ginger. Cacao producers made mention of dehydrators, a cacao grinder, and use of commercial kitchen facilities.

During the Hawaiʻi Island Ag and Food Study, cacao was also mentioned as a crop with value-added growth potentials. Participants indicated that cacao, like coffee, requires specialty equipment and equipment like grinders that are used for cacao processing can only be used for cacao, to eliminate undesired transfer of oils to/from other products (i.e., spices, coffee, etc.).

Citrus

6 producers mentioned citrus, with 1 producer indicating production of over 1,000lbs per annum. Aside from citrus juicers, no citrus-specific equipment was mentioned.

Specialty Tropical

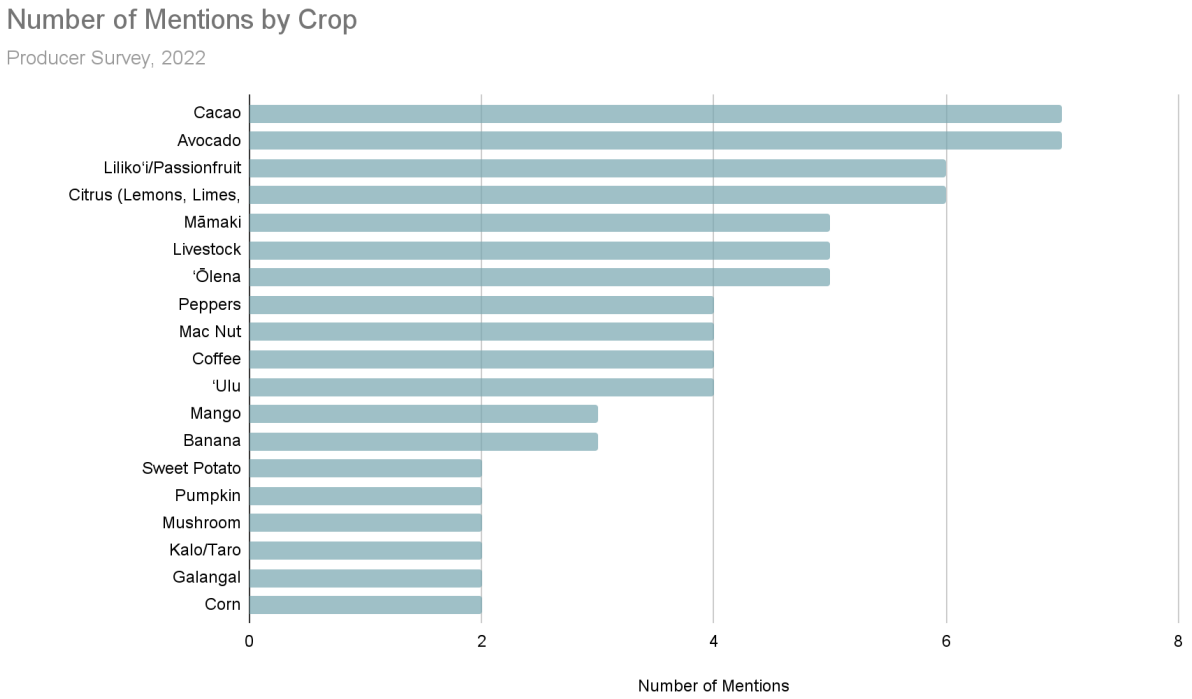
Listed under the NASS Specialty Tropical category for Hawaiʻi is Cashews, Galangal, Ginger, Māmaki, Moringa (Moringa olifera), Tea (Camellia sinensis) , Turmeric, Vanilla, and Other Tropical Specialty. 5 participants mentioned māmaki, with 1 participant producing over 1000 lbs of māmaki, and 1 listing 1000 lbs of māmaki and ʻōlena production. 5 mentioned ʻōlena, and others mentioned various spices and medicinals (noni, ʻawapuhi, etc.). High priorities for equipment among this category of producers included dehydrators and commercial kitchen usage. Hydro-distiller and copper still were among other equipment mentions. Unlike other crop groups, producers mentioned processing of crops for medicinal and cosmetic applications.

Coffee

In the Coffee category, 4 participants mentioned coffee in their response, often alongside the tropical fruit cacao. NASS data shows 6,800 acres of coffee in production across the state, with slight decreases in utilized production and farm value for 2021 ($48.4 million, down 11% from the previous season). Perroy and Collier (2020) report 6,029 acres of coffee in production on Hawaiʻi Island, with highest concentrations of production in Kona.

Coffee

Study participants with smaller numbers of trees indicated a need for general processing from coffee cherry to parchment, green bean, and even roasted, finished product. Larger coffee producers who also participated in the study indicated that transporting coffee cherry from Kona, Kaʻū, or other district farther from Hilo would be uneconomical and inefficient as the timing of processing is critical to the coffee flavor and the distance might lead to lost product. These farmers also shared that processing coffee at any stage (cherry, parchment, green bean for roast) would require specialized handling and skilled labor at the processing facility, and would require 1) a large footprint for facilities and 2) dust considerations (when processing from parchment to green bean). They also mentioned that the equipment could likely not be utilized for multiple crops, because of the transfer of oils from the bean to the machinery. Equipment that larger producers thought might add to the coffee infrastructure already on island was co-packing machinery that could produce single serve coffee packs, a growing market in Japan that has not yet been saturated/satisfied by Hawaiʻi-grown product.



*This chart represents specific crops that were mentioned by producers across interview and survey responses. Crops that were mentioned <2 times are not included here, but can be found in the spreadsheet of compiled responses. "Tropical Fruit" was also listed 9 times in the survey without specification of type of fruit, and therefore is not included here.

Vegetable and Melon

11 participants mentioned crops in the vegetable and melon category. Farm gate value for the vegetables and melons category is estimated at $64.9 million (2022), with steady increases in production and value for the past 2 years. Sweet potatoes, Chinese cabbage, leaf lettuce, green onion, and eggplant were high-volume producers for 2021, with the highest value production attributed to leaf lettuce and Chinese cabbage. More 2021 NASS report details can be found here. Market data indicates that while Hawai'i produces much of its cabbage, it imports the majority of its (oriental) squash and its lettuce needs. Linked are HDOA market analysis reports for vegetables and squash.

Vegetable

Vegetable producers who participated in the study often had a diverse listing of crops, including corn, cabbages, cucumbers, peppers, and other greens. These producers were most interested in commercial kitchen access (5) and dehydrators (4), however large-scale vegetable producers indicated desire for co-packing equipment for bagging romaine lettuce, bagging and freezing cut broccoli, and IQF (Individual Quick Freeze) applications.

Pumpkin/Squash[3]

Only 2 producers listed squash (kabocha, pumpkin) as crops available for processing. According to HDOA market analysis (here), the demand for squash continues to rise in Hawai‘i, and Hawai‘i (state) is a net importer of squash. In 2019, Hawai‘i imported 91.2% of its squash consumption needs, mostly from California. This is up from 64.6% in 2008, when Hawai‘i produced more squash. No specific equipment was mentioned by squash producers for the crop.

Livestock, Poultry, and Dairy

Cattle and Pig

5 participants in the study were producers of livestock (cattle, pig, lamb) and 1 mentioned dairy, though it is unclear whether that participant currently produced dairy products. During the Hawai‘i Island Ag and Food Systems Study (2020) as well as this current study, participants indicate that a major constraint in local meat processing is the local capacity for slaughter of animals. NASS statistics for Pacific Region cattle production here and pig here.

While slaughter continues to be a bottleneck for locally produced meat, animal producers see opportunities for the Innovation Center to support production and packing of finished meat products, including sausages, smoked meat, ground meat, and packaged meat items (shrink wrap, vacuum seal). Buyer data supports this idea, listing sausage and other processed and packaged meat products as having good potential for local and export markets. One buyer indicated that a Halal-certification for venison and goat would be key to exporting to the Middle East.

Staple Starches

For the purpose of this study, staple starches include ‘ulu (breadfruit), mai‘a (banana), kalo (taro), ‘uala (sweet potato), and pala‘ai (pumpkin). They are mentioned separately here because of the frequently indicated need for Hawai‘i to build its food resilience, and starchy crop potentials support nutrition and calorie needs for the broader Hawai‘i population daily and during emergency times. These crops are also thought to have increased *production* resilience potentials because of the existing indigenous infrastructure for native crops (both material and knowledge infrastructure) (*cf.* Lincoln, 2017) and the projected resilience of these food crops through various climate change models (*cf.* Kurashima et al., 2019). Coconut is sometimes also mentioned as a staple food for the islands and/but is not listed in recent NASS tropical fruit or nut publications for Hawai‘i.

NASS production and value statistics for ‘ulu and mai‘a can be found in the tropical fruit category (see here); NASS statistics for ‘uala and pala‘ai in the vegetable and melon category (see here). Kalo (Taro), Cassava, and other root crops are included in the NASS category of Root Crops and Tubers, but are not currently included in current Hawai‘i/Pacific Region reports. Census sales data for Guam and the

[3] See also Staple Starch category.

Northern Marianas from 2018 can be found here. In the 2020 Ag Land Use Baseline Update, Perroy and Collier indicate that Hawaiʻi Island has 67 acres of land in kalo production, compared to 546 acres on Kauaʻi and 113 on Maui. The ʻUlu Coopʻs 5-year report (2021) highlights value-added potentials of these staple crops.

The survey showed 2 mentions of kalo, with indications of ½ to 1 acre of kalo production; 4 mentions of ʻulu, with 15-20 trees; 3 mentions of banana, at an estimated 60-100lbs of production; 2 mentions of sweet potato, one mentioning 50,000 lbs; 2 mentions of pumpkin, as detailed above, and 4 mentions of coconut. Dehydrators, grinder/mills to make flour, flash freezer, and fryer were some of the equipment mentioned by producers. Buyers saw demand for coconut products including water, oil, and beauty applications. Both producers and buyers also recognized the heavy labor of processing coconut. ʻUlu (breadfruit), ʻuala (sweet potato), maiʻa (banana), and palaʻai (squash) were also mentioned by buyers as having local and export market potential.