The Feasibility of a Hilo Agricultural Hub

July 16, 2021

Prepared by

Hāmākua Institute

Contents

Acknowledgements

The Hāmākua Institute would like to thank the Hawai'i Community Foundation, Kamehemeha Schools and Meadow Gold Dairy for their generous support for the preparation of this study.

EXECUTIVE SUMMARY

The feasibility study used a process of socratic inquiry to understand agricultural value added processing needs on Hawai'i Island and identify a feasible project model for an agricultural hub to be established in Hilo that can catalyze innovation and increase small farm viability through value added agricultural growth on the island. It was conducted in conjunction with the Hawai'i Island Agriculture and Food System Study, which recommended building capacity and opportunity in processing, transportation, aggregation, storage, and distribution; what can be referred to as the "messy middle" of the island's agricultural value chains.

The proposed agricultural hub is intended to facilitate the most effective alignment of public and private interests in ways which strengthen the health of those value chains. This means lowering the barriers to cooperation throughout the system and establishing new ways for businesses and organizations involved in agricultural value chains to share facilities and support services. Co-locating key functions within the value chain with a centralized processing and storage facility can make the entire value chain more efficient and represents a substantial step towards market system improvement.

The proposed project model emerging from this study is called an Agricultural Innovation Industrial Park (AIIP), blending two concepts already in existence – Eco-Industrial Parks (EIPs) designed to facilitate industrial symbiosis, and Agricultural Innovation Centers (AICs) designed to stimulate value added growth. A unique combination of these two concepts not only offers an opportunity for creating a commercially viable model for strengthening and optimizing value chains, it establishes a systematic means of introducing and diffusing innovation throughout the agricultural market system.

The top five recommended actions from the Agriculture and Food System Study provide an appropriate starting point for the overall strategic objectives against which the AIIP project model can be assessed. These are:

1. Increase value-added processing capacity, supporting a network of certified kitchens and food hubs and establishing a centralized facility for aggregated production and shared high-volume processing;
2. Explore and support new models of aggregation, processing and distribution, particularly from small farms;
3. Increase support and efficiency of food relief transportation and distribution, identifying strategic opportunities for shared for-profit and non-profit use of equipment and facilities;
4. Increase incentives and mechanisms for cooperation to lower costs and increase opportunities for small farms; and
5. Increase collaboration amongst all stakeholders in the system using HIAP and HIFA platforms.

The AIIP project seeks to be a catalyst for getting innovations into the local marketplace by ensuring AIIP tenants are selected that offer innovative products or services to agribusinesses that improve value chain efficiency and growth opportunities. The AIIP and Hawaii Island Agriculture Partnership (HIAP) will establish an organizational structure for enabling producers and other agribusinesses to easily group and share assets, services, and supply contracts in cost and time-efficient ways. The AIIP thus becomes a hinge point that addresses multiple needs of the existing system.

Like more traditional industrial parks, the AIIP will establish anchor tenants representing important agricultural value chain functions within the market system. Potential anchor tenants start with key players in the island's agricultural and food system who have important roles to play in the AIIP. These include the Food Basket, the Hilo Food Hub and Hawaiian Earth Recycling. Other tenants will be sought to fill additional spaces at both a small and large scale, but complementing each other and optimizing efficiency of resource use and materials flows.

The AIIP will seek a landowner or land trust willing to develop a site of 30 acres or more, offering lease terms favorable enough to attract strong tenants while still earning a reasonable return on their investment through future lease revenues and capital gains.

Our recommended structure for ownership of shared facilities at the AIIP involves incorporating HIAP as a 501(c)6 non-profit business league, serving as a single legal umbrella under which its members can obtain, install and manage shared equipment or build facilities for the shared benefit of its members. Rather than purchasing, owning and operating assets on behalf of its entire membership however, HIAP will enable groups of its members to organize themselves and function as autonomous divisions, procuring and managing specific assets that are held in HIAP's name, but ring-fenced for the shared usage, control and benefit of that particular group as defined within their own negotiated agreement. Such agreements would be administered and monitored by HIAP as a neutral convener and facilitator in their shared effort, not as a controlling authority. The idea is for HIAP to serve as a neutral and open platform for multiple collaborations to occur in the sector for multiple purposes, rather than attempting to function as a unified group with all pursuing the same benefits.

Stakeholder input offered useful insights on identifying criteria for selecting a suitable site for locating the AIIP. These are listed below along with other criteria inherent in the proposed AIIP design.

- Easily accessible by highway or major road.
- Close to key logistics infrastructure including port facilities and airport.
- Unrestricted access to all public utilities including power, water and sewage.
- Zoned for agricultural or general industrial use, allowing processing of agricultural products to take place.
- A minimum of 30 acres of land to co-locate key tenants and shared facilities, with more available land preferred for potential expansion.
- Located in a designated Opportunity Zone.

Interviews with farmers, processors, aggregators and distributors revealed that co-packing equipment and high pressure pasteurization (HPP) equipment were the two most frequently mentioned equipment needs that could be included in the AIIP. Other equipment they identified included dehydrators, grinders, mills, juicers, and extractors.

Until a landowner and site can be determined, there are too many assumptions inherent in the AIIP's project plans at this stage of its planning to provide accurate cost estimates, but preliminary estimates can be made for capital costs of the AIIP total $11.3 million, including $5.8 million in landowner investment, $1.1 million combined investment by tenants and $4.4 million in federal grant funds.

INTRODUCTION

Early concepts for establishing a Hilo Agricultural Hub began when the Hawai'i Island Agriculture Partnership (HIAP) was first established. Those early conceptualizations were based on a recognized need for greater infrastructure and capacity to process more local agricultural produce using a centralized, multi-purpose, multi-crop processing hub serving small farms throughout the island. HIAP's action team and executive committee worked with the Hāmākua Institute, as facilitators of the partnership, to secure funding to conduct a feasibility study of the agricultural hub concept.

The feasibility study was conducted by the Hāmākua Institute and jointly developed with a broader, system-wide assessment - the Hawai'i Island Agriculture and Food System Study - using a participatory process that engaged stakeholders throughout the island. Participants not only helped shape the scope of the study, but jointly analyzed the data and identified recommended actions for collectively improving the system, particularly in ways which help overcome the systemic constraints to growth for the island's many small farms. This enabled the Institute and its partners to better situate the need and design for such an agricultural hub within the market eco-system it seeks to improve. This collective, market systems approach will be found throughout this report and shapes the recommendations for HIAP to proceed in developing the project concept further.

The study followed a process of socratic inquiry, starting with the broader strategic questions of where there are critical constraints in the island's agricultural value chains. As the process progressed, more detailed questions were answered about how an agricultural hub could be designed in a commercially viable way which creates long-term benefits not dependent on a continuous stream of public funding to sustain itself.

This report summarizes that journey of inquiry. It recommends a strategy for private sector led value chain development on Hawai'i Island and outlines a project concept for an agricultural hub to be established in Hilo that can catalyze innovation and stimulate small farm production growth throughout the agricultural sector on the island. Additionally, it outlines next steps for HIAP to take in developing the recommended concept through genuinely collaboratively, public-private partnerships embodied by the Next Generation Sector Partnership model it represents.

THE HAWAI'I ISLAND AGRICULTURE & FOOD SYSTEM STUDY

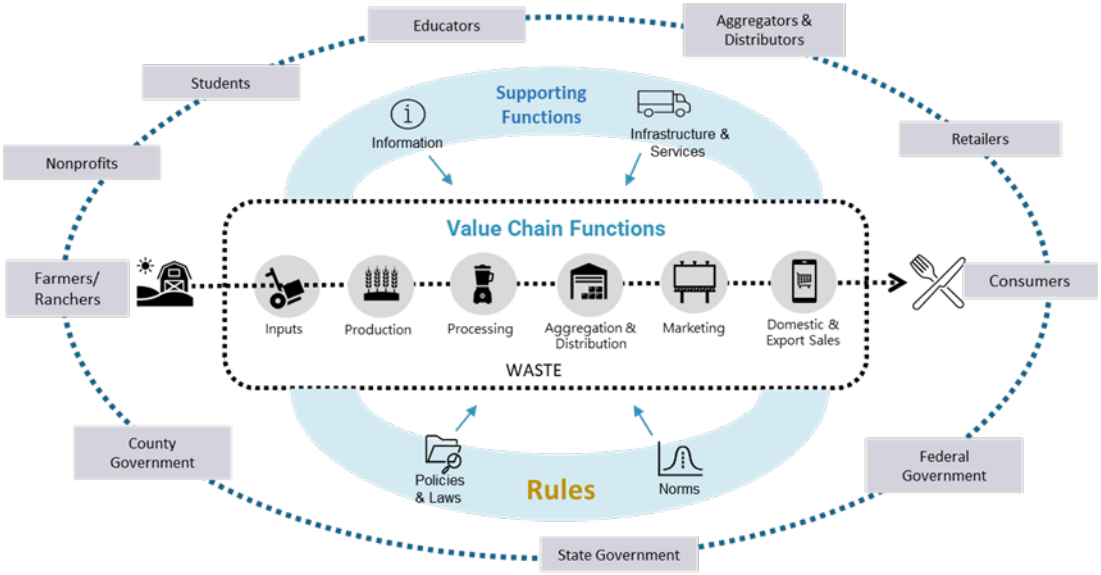
The Hawai'i Island Agriculture and Food System Study was created to broadly analyze and improve the viability, sustainability, and resilience of Hawai'i Island's agricultural market system and local food supply. To this end, the Hāmākua Institute partnered with the Hawai'i Island Agriculture Partnership (HIAP) and the Hawai'i Island Food Alliance (HIFA) to co-conduct a study that would determine pathways for positive, system-wide change.

The study sought to help stakeholders in the island's agriculture and food system better understand the scale and components of the system, where they fit, and what needs and opportunities exist to create greater benefits for a larger portion of the island's community. This section of the report provides an overview of findings and recommendations developed during the study that identify the system needs associated with value added processing and recommended actions for addressing them.

Defining and Describing the System

An agricultural market system is defined as the network of buyers, sellers, and other actors that participate in exchanging a given agricultural product or service. Participants in a market system include direct market actors such as producers, buyers, and consumers who drive economic activity in the market as well as indirect market actors such as service providers and policymakers who support and influence market performance. An agricultural market system can be specific to a product (such as coffee, papayas, or dairy) or a cross-cutting sector (finance, labor, or transportation).

The following diagram displays key components and functions of an agricultural market system. It not only follows the value chain from farmer to consumer, but recognizes the wider ecosystem of supporting functions, rules, and stakeholder interests that shape system performance. Each object in the diagram represents a set of data points gathered for the study. The system map forms the framework against which HIAP can organize baseline data, key system performance indicators, and more detailed analysis.



Hawai'i Island's Agricultural Market System

A Strategy for Value Chain Development

The system study's recommendations gave a high priority to building capacity and opportunity in processing, transportation, aggregation, storage, and distribution; what can be referred to as the "messy middle" of the island's agricultural value chains. There was recognition that shared public-private effort to increase cooperation and coordination within these value chain functions represents the most immediate and impactful means of increasing small farm viability and stimulating increased production on the island.

The top five recommended actions resulting from the study are listed below. They focus on increasing value-added processing capacity and introducing new models for aggregation, transportation, and distribution throughout the agriculture and food system.

1. Increase value-added processing capacity by supporting a network of certified kitchens and food hubs, while establishing a larger centralized facility for aggregated production, and high-volume processing;

2. Explore and support new models of aggregation, processing and distribution, particularly from small farms, through regular releases of online information and with partnerships established around food standards;

3. Increase support and efficiency of food relief transportation and distribution. Identify strategic opportunities for shared for-profit and non-profit use of equipment and facilities;

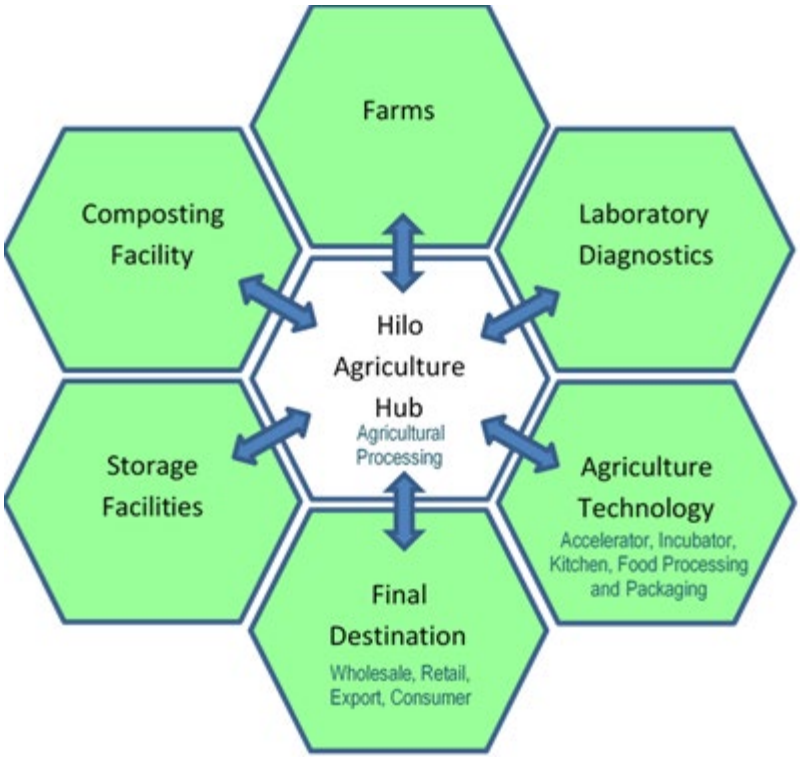
4. Increase incentives and mechanisms for cooperation to lower costs and increase opportunities for small farms; and

5. Increase collaboration among all stakeholders in the system using HIAP and HIFA platforms.

The proposed project outlined below seeks to create a framework, process, and draft plan for how HIAP members can develop more detailed solutions to recommendations above using a participatory process designed to encourage and simplify public and private collaboration.

THE PROPOSED HILO AGRICULTURE HUB

The journey of inquiry outlined below starts with HIAP's broad concept to support the island's small farms by increasing value added processing capacity and better integrating value chain functions through shared solution development. The initial concept sought to establish a new hub that would help build the capacity of other key elements in the system, such as aggregation and distribution, as well. This would help ensure there is ready throughput and end markets available for processed products. The proposed hub would seek to link with existing facilities and to establish additional value added processing capacity through increased investment as demand rises.



A centralized, multi-purpose, multi-crop processing hub was identified by HIAP as the critical component to creating a viable agricultural economy on Hawai'i Island.

While HIAP members saw potential with this initial concept to make a significant difference for island agriculture, they wondered if it could provide the envisioned service sustainably without continued subsidies. They wanted a study to identify the most appropriate plan, design, structure, equipment, and functionality of the hub before seeking further funding or investment.

The agriculture and food system study provided needed stakeholder input and analysis in identifying key challenges the hub could address as well as where and how shared interests could be amplified through its development. This report builds upon the identified actions recommended by stakeholders to propose a feasible model for developing a sustainable and commercially viable project that could introduce the desired innovations in value chain functions and simultaneously increase the capacity and volume of value added processing of agricultural products on the island.

The process from the originally proposed concept described above to the more detailed model described below follows a set of queries that started with the key questions asked of stakeholder analysis teams in the Agriculture and Food System Study relating to the need for increased value added processing capacity, what is currently available and where there is an interest in shared facilities. The Hāmākua Institute then explored those shared interests further with more specific questions related to a potential model about how it can be owned and operated, where it can be located and who can play a key role in designing and developing it further.

The recommended model outlined below does not seek to subsidize small farms into viability. It seeks to remove the systemic constraints in agricultural value chains that are holding them back and mobilize public-private cooperation to recognize them as engines of economic growth and food security on the island.

True to HIAP's Next Generation model of public-private partnership, the model of the proposed agricultural hub emerging from these queries is designed to facilitate the most effective alignment of public and private interests in ways which strengthen the health of the island's agricultural market system and improve food security at the same time. As we learned from the agriculture and food system study, this means lowering the barriers to cooperation throughout the system.

How do we do that? We start by establishing new ways for businesses and organizations involved in agricultural value chains to share facilities and support services. Co-locating key functions within the value chain with a centralized processing and storage facility can make the entire value chain more efficient and represents a substantial step towards market system improvement. But a shared facility with high pressure processing, freezing, and co-packing capacity can only be sustainable if an effective model is established for shared usage, management, and maintenance and available to a large and diverse range of producers.

The proposed project outlined below draws upon and blends two concepts already used in the continental US and globally: the concept of an eco-industrial park and the concept of an agricultural innovation center. These are defined as follows:

- Broadly, an **eco-industrial park (EIP)** is a community of manufacturing and service businesses located on a common property. Members seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues and, thus, engaging in industrial symbiosis.[1]
- The 2002 Farm Bill directed the Secretary of Agriculture to establish a program to assist in the establishment of **agriculture innovation centers** that provide:

  (1) technical assistance, consisting of engineering services, applied research, scale production, and similar services, to enable the agricultural producers to establish businesses to produce value-added agricultural commodities or products;
  (2) assistance in marketing, market development, and business planning; and
  (3) organizational, outreach, and development assistance to increase the viability, growth, and sustainability of businesses that produce value-added agricultural commodities or products.[2]

A unique combination of these two concepts offers an opportunity for agricultural development on Hawai'i Island that not only creates a commercially viable model for strengthening and optimizing value chains, it establishes a systematic means of introducing and diffusing innovation throughout the agricultural market system. For now, we refer to this blended model as an Agricultural Innovation

[1] Lowe, E. 1997. "Creating By-Product Resource Exchanges for Eco-Industrial Parks", Journal of Cleaner Production, Volume 4, Number 4.
[2] 7 USC 1632b: Agriculture Innovation Center Demonstration Program

Industrial Park (AIIP) and describe some of the key elements below. The recommended project model described below is a "strawman" for HIAP to review and revise. Going forward, a multi-stakeholder project team within HIAP will continue developing more detailed designs further using a participatory approach.

CATALYZING INNOVATION

By innovations, we mean new ideas, practices, approaches, and technologies that will enable small farms to improve production, profitability, and efficiency. Taking a systems approach to agricultural value chain development means not just trying to introduce a single innovation into the system, but rather enabling the system to be conducive to identifying, introducing, and diffusing innovations into value chains on a continuous basis. During the system study, stakeholders lamented a perceived unwillingness to embrace technology and innovation in agriculture on the island. Contributing to this challenge is the little opportunity farmers have to explore innovative solutions without risky investment or the time consuming process of applying for grants. There is a need on the island to build more market driven means of getting innovative equipment, products, and services into the marketplace.

The AIIP project seeks to be a catalyst for getting innovations into the marketplace in the following ways:

- Competitive proposals for leasing space in the AIIP will be required to identify proposed innovations for how their products or services improve value chain efficiency and growth opportunities.
- All AIIP tenants will participate in an industrial park management system that continuously seeks to optimize resource efficiencies and minimize waste, utilizing a collective process for identifying and introducing innovations that not only maximize efficiency at the AIIP, but can be shared through its networks of value chain partners throughout the island and state.
- The AIIP will seek to co-locate a broad range of agricultural inputs, services, and facilities that serve as a one-stop shop on the island. This will enable farmers to more easily discover and explore innovative new products and services and make the AIIP a useful place for farmer demonstrations and agricultural innovation fairs.
- The AIIP and HIAP will establish an organizational structure for enabling producers and other agribusinesses to easily group and share assets, services, and supply contracts in cost and time-efficient ways.

Research shows that small farms are incredibly efficient producers of food, but suffer from a number of inefficiencies related to their small scale. These include:

- **Input inefficiencies** that heighten the costs of land, labor, infrastructure, farm equipment, and soil amendments for the individual small producer;
- **Market inefficiencies** that create logistical barriers to finding and securing consistent, larger-scale markets and limit the pricing power and legislative influence of each individual farmer;

- **Structural inefficiencies** that inhibit the dynamism and effectiveness of the relationship between small farms and larger markets and between farmers and legislators;
- **Data collection and sharing inefficiencies** due to the siloing of public and private institutions and the lack of coordinated data sharing platforms; and
- **Communication inefficiencies** that stem from a history of dissociation between parties in the agricultural market system.

Cooperative efforts help to not only mitigate these kinds of inefficiencies, but also drive economic growth and socio-economic prosperity within communities. Efforts to form producer cooperatives are helping to overcome some inefficiencies of small scale farming, but new mechanisms are needed to foster cooperation between farms and businesses across value chain functions, forming supply chain partnerships that can help build better bridges between small scale producers, processors, aggregators, and distributors into larger markets.

A key innovation underpinning the AIIP project model is represented in HIAP's role in establishing and developing those new mechanisms for cooperation. Rather than organizing the partnership as an industry association, HIAP seeks to structure itself as a neutral, open platform for agricultural development that enables small scale farmers and other stakeholders to cooperate and share resources in new ways. Ways which lower some of the existing barriers to cooperation and open lines of communication between stakeholders throughout the agriculture and food system. The AIIP thus becomes a hinge point that addresses multiple needs of the existing system, and also opens new opportunities for parties to be in proximity, share resources, and work together.

ESTABLISHING AN AGRICULTURE INNOVATION INDUSTRIAL PARK (AIIP)

What was originally proposed by HIAP in 2019 and described in section three above was a broadly defined concept for a project to establish an agricultural hub in Hilo. It had not yet been developed into a designed model and approach to guide shared project development. Therefore, in this section of the report, instead of evaluating the feasibility of a project model, we are recommending a feasible project model, based upon a review of the available data.

Outlined below are the driving queries that shape the design of the proposed project model and our responses based on a broad range of data and stakeholder analysis. These queries and recommended options provide a starting point for further review and refinement by HIAP and its partners to move the initiative forward, but are not meant to be overly prescriptive or fit into an existing model.

What are the overall objectives?

The top five recommended actions of the Agriculture and Food System Study provide an appropriate starting point for the overall strategic objectives against which the project model can be assessed. These are shown again below.

1. Increase value-added processing capacity on Hawai'i Island, supporting a network of certified kitchens and food hubs and establishing a centralized facility for aggregated production and shared high-volume processing;

2. Explore and support new models of aggregation, processing and distribution, particularly from small farms, regularly utilizing online information and establishing partnerships around food standards;

3. Increase support and efficiency of food relief transportation and distribution, identifying strategic opportunities for shared for-profit and non-profit use of equipment and facilities;

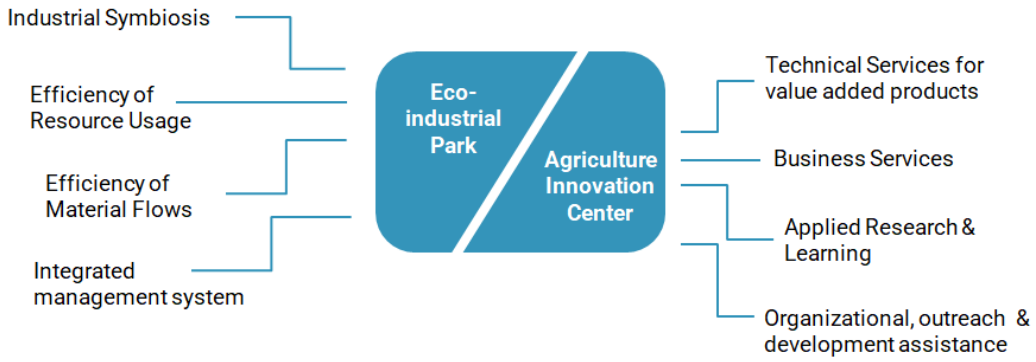
4. Increase incentives and mechanisms for cooperation to lower costs and increase opportunities for small farms; and

5. Increase collaboration amongst all stakeholders in the system using HIAP and HIFA platforms.

In line with the collective nature of this project, as the project design evolves, it will be important to revisit and revise the strategic objectives to appropriately reflect the intents of the key project stakeholders - both public and private - that are involved. This will help establish an appropriate strategic framework for evaluating AIIP's future impacts on the system.

What are the underlying concepts of the project model?

A description of the proposed AIIP starts with a blend of two existing models that offer useful concepts for application in Hawai'i - the EIP model of economic development and agricultural innovation centers designed to support growth in value-added agricultural products.



Eco-Industrial Park (EIP)

Globally, EIPs have become a favored approach to industrial development. By 2018, approximately 250 self-styled eco-industrial parks were operating or under development, a significant uptick from the start of the century when there were fewer than 50. A key benefit of EIPs is their ability to offer business advantages similar to traditional industrial parks while also using resources more efficiently, improving productivity, supporting the achievement of firms' social responsibility goals, and lowering exposure to

climate change risks.[3] Some of the key advantages of the EIP concept as they apply to the proposed AIIP are outlined below.

- **Industrial symbiosis** brings businesses together in innovative collaborations, finding ways to use the waste from one as raw materials for another. Mimicking symbiosis in nature, the idea is for co-located businesses to exchange materials, energy and information in a mutually beneficial manner that creates a more circular economy. Applying this concept to the AIIP means thoughtful selection of the co-existing businesses and organizations based there, representing a strong cross-section of agricultural value chain functions that enable multiple channels for an agricultural product to follow without having to be transported to another location.
- An advantage of industrial symbiosis relates to the **efficiency of material flows** into, between, and out of an EIP. Consider the efficiency of moving agricultural products from an aggregator to a processor to storage and a distributor or to a food bank and even for waste treatment all by fork-lift without having to load onto trucks and transport to separate locations. The subsequent reduction in carbon emissions can be significant.
- Another important feature of EIPs applicable to the AIIP is a focus on **efficient resource usage** throughout the facilities. This applies to several types of resources including:
    - ***Financial***: A blend of public and private investment in infrastructure and support functions designed to complement each other in ways that stimulate economic development.
    - ***Waste***: EIPs recognize waste as a resource and seek to optimize use of that resource among all facilities and operations involved. The efficient collection and use of food waste represents an important opportunity in the design of the AIIP.
    - ***Energy***: A key feature of EIPs involves a shared and optimized approach to energy management. The island's high energy costs have been a key constraint in processing agricultural products competitively. Sharing and diversifying energy resources is an important benefit of the AIIP's design.
    - ***Transportation***: Some EIPs establish shared logistics, shipping, and receiving facilities as well as shared parking to minimize costs. Efficient transportation demand management is another potential benefit offered by the AIIP to businesses in the value chain.
    - ***Water***: EIPs often feature shared, optimized management of water resources including stormwater, groundwater, and wastewater management.

- The only way EIPs can achieve the kind of efficiencies described above is with some form of **Integrated Management System** for fairly and effectively coordinating usage of shared facilities and optimizing operations between park tenants. Among existing EIPs, there is a diverse range of private, public, public-private, and non-profit management models in place that offer useful models, guidelines, and lessons to draw upon in designing and developing the AIIP's management system.

[3] Eco-Industrial Parks Emerge as an Effective Approach to Sustainable Growth (worldbank.org)

Agricultural Innovation Center (AIC)

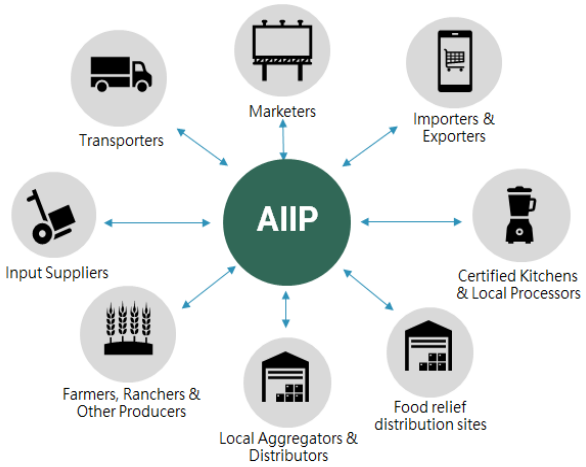
Since the 2002 Farm Bill, the USDA has maintained a program to establish and operate AICs that provide technical and business development assistance to agricultural producers seeking to engage in the marketing or the production of value added products. Under this program, they award grants for support services such as value-added product and process development, market and value chain development, facilitation of public and private investment, and access to legal advice. AICs can help participants receive product, process, and access business development support from local universities and specialists, building networks that allow producers to work with local researchers, trainers, and service providers in new ways.

USDA's AIC grant program has supported various models of implementation, but its intended support also represents what we consider a useful concept for guiding the most appropriate blend of public and private support for the project. Government support for stimulating innovation in value-added agricultural growth is ideally focused on stimulating and facilitating market connections between local agribusinesses and the full breadth of locally available expertise and services they can draw upon to grow.

Applying this concept into the design of the AIIP project, federal grants can fund incentives for attracting innovative agribusinesses processors, technical and business services, equipment suppliers, training providers and researchers, getting them to work together at the AIIP in ways where innovations can be learned and shared easily throughout the system. Government support for local organizational capacity building, outreach, and development assistance in the agricultural sector can help build up the ecosystem around agricultural value chains in ways that encourage private sector investment rather than replace it.

Who would be potential tenants?

To reach its full potential impact on the island's agriculture and food system, the AIIP will need to be able to attract a broad and diverse range of tenants across the spectrum of value chain functions and be able to effectively service, support, and process agricultural products, serving as a hub for larger scale aggregation from other businesses, hubs, and organizations around the island.

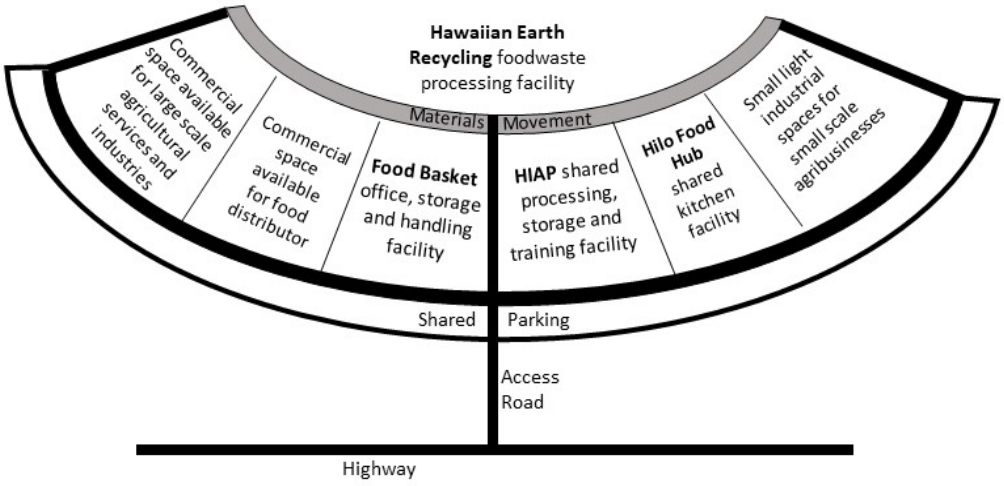


Anchor Tenants

Like more traditional industrial parks, the AIIP will need to establish anchor tenants representing important agricultural value chain functions to help attract other businesses from within the market system. Potential anchor tenants start with key players in the island's agricultural and food system who have important roles to play in the AIIP. These include the following businesses and organizations.

- **The Food Basket**: Currently located in leased premises in Hilo, the island's food bank is space constrained and seeking to upgrade and expand its facilities. They need access to more processing facilities and better logistic support for food storage and distribution. They have expressed an interest in exploring the AIIP concept to see if it might suit their needs.
- **The Hilo Food Hub:** Currently located in leased premises near the Port of Hilo, the Hilo Food Hub hires certified kitchen space to producers. They are also space constrained and seek a longer term site where they can expand their facilities and support for local producers. They have shown an interest in the possibility of taking up space in the AIIP and are willing to work with HIAP in developing plans.
- **Hawaiian Earth Recycling:** They are the largest producer of compost in the state, processing food waste into soil amendments, blends, mulching materials, and erosion control products. They operate three locations on Hawaiʻi Island in conjunction with the County of Hawaiʻi. They have been exploring ideas of establishing a larger facility on- island and are also willing to explore a possible new site that might suit their own operational needs.
- **HIAP Shared Facility.** The shared agricultural processing and storage facility proposed by HIAP represents an anchor tenant in the AIIP and a key component of the model, seeking to explore maximum efficiencies in shared investment, use, and maintenance of facilities, plant, and equipment.

Conceptual Layout of Proposed AIIP



Additional Tenants
A key goal of the AIIP is to facilitate stronger market linkages throughout the agriculture and food system on the island. Thus, the AIIP should seek to attract additional tenants among businesses operating within agricultural value chains including aggregators, input suppliers, technical and business service providers, distributors, transporters, veterinarians, importers, exporters and others who can offer a breadth and depth of services and support for small scale farms efficiently from the AIIP. The strategy is to build a growing recognition of the economic opportunities offered by the increasing number of small farms on the island as a target market for products and services tailored to their needs.

The incentives the AIIP would offer prospective tenants can include:

- The competitive advantages of strategically co-locating with suppliers and customers.
- Lower operational costs from the kinds of EIP efficiencies described above.
- Increased access and visibility of a company's products or services by users and visitors of the AIIP facilities.
- The opportunity to showcase innovative products and services in a high-profile project that will generate considerable public attention, case studies, and media coverage.
- Possible access to grant funding opportunities for developing product and service innovations that can be demonstrated and sold at the AIIP to agricultural producers.
- Possible lease holidays or discounts during periods of initial development at the AIIP.

Regardless of which part of the agricultural and food system AIIP tenants may come from, their ability to strategically fit into the AIIP's concept of industrial symbiosis and ensure they provide a complementary capacity to the functioning of AIIP operations should be an important consideration in their acceptance.

AIIP tenants should not be limited to private sector businesses however. An ideal collection of tenants would include space for government agencies, university programs, and nonprofits to make their services and support more conveniently available to farmers by co-locating with other value chain activities and utilizing shared facilities, serving as a "one-stop-shop" for farmers and saving those from remote locations valuable time.

As an example, Hawaiʻi Master Food Preservers is a non-profit organization that carries out food safety, handling and preparation training for producers throughout the island. They operate their own small kitchen facility in Kailua-Kona, but see opportunities for utilizing shared kitchen and processing facilities at the AIIP to carry out training for producers on the east side of the island on a regular basis without having to establish an additional facility for the training.

Some stakeholders have suggested the AIIP could be established as an incubator or accelerator, but we do not suggest establishing the project itself in this role to ensure it focuses on being a catalyst for attracting competitive innovative products and services into the system on a commercial basis. But the AIIP can serve as a useful location for universities and/or non-profits interested in establishing agribusiness incubators or food accelerators, lowering project costs by taking advantage of shared facilities, equipment and services available.

What would be a suitable ownership and management structure?

This is a critical question for the successful implementation of the proposed model which can make or break the project. Efforts to drive EIPs from public institutions appear to have less success than when they are more private-sector driven. An early comparison of Dutch and US EIPs attributed poorer US performance "to the fact that the US projects are initiated by local and regional governments that see the project as a way to improve the local/regional economy with access to substantial government funds. Because of this heavy government involvement, US companies are, in general, not interested in the project. The more successful Dutch projects, on the other hand, are mostly initiated by the companies themselves with financial and advisory support from the local and regional governments."[4]

Ownership

The AIIP should build upon the concepts of activated public-private partnerships represented by HIAP's Next Generation Sector Partnership model that seeks private-sector led growth strategies supported by a cast of public and non-profit organizations who are involved in that sector, working together in ways that utilize public support to stimulate and enhance private investment. How then, can that model be applied to the AIIP? By leveraging the potential returns on investment represented by the AIIP to convince a private investor, landowner or land trust to develop a suitable site. It can also be applied by convincing agribusinesses, distributors or cooperatives to explore more structured and cost-efficient means of sharing investments in plant and facilities. Government grants can then support infrastructural developments, processing plant and establish special incentives for bringing more innovative agricultural products and services into the local marketplace, complementing private investment in the AIIP and making it a more viable opportunity for prospective tenants.

Thus, ownership of the AIIP land itself should rest with a landowner willing to offer lease terms favorable enough to stimulate investment in buildings, plant and equipment by AIIP tenants and still earn a reasonable return on their investment through future lease revenues and capital gains.

For the AIIP's shared facilities, plant and equipment, several options for ownership have been considered. Public ownership is not considered ideal for the reasons stated above, but the notion of a private investor owning shared facilities posed concerns with some stakeholders, who worried that an investor of such equipment and facilities could become a price-taker who would reduce too much of the margins offered by value added processing to farmers. A cooperative model with shared ownership of shared facilities/equipment is preferred, but some farmers are wary of cooperatives, and most existent cooperatives represent producer groups rather than the kind of broad collaboration across businesses in agricultural value chain functions envisaged with the AIIP.

Our recommended structure for ownership of shared facilities at the AIIP involves HIAP itself. HIAP has yet to be incorporated and its Executive Committee is considering options of incorporating the partnership as a non-profit organization under section 501(c)3 of the Internal Revenue Code, which

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[4] Heeres, R.R., Vermeulen, W.J.V., de Walle, F.B. 2004. "Eco-Industrial park initiatives in the USA and the Netherlands: first lessons", © 2004 Published by Elsevier Ltd.

would enable it to apply for the broadest range of federal grants, but as a charitable body would limit its options for supporting business driven activities. Agricultural bodies defined under section 501(c) 5 of the code are primarily intended for producers. But if HIAP incorporates itself as a business league under section 501(c) 6 of the code, it still qualifies for tax exemption and can more effectively represent the full spectrum of interests within the island's agriculture and food system, not just the producers themselves. While this may reduce HIAPs options for directly applying for some types of federal grants, it already has several 501(c)3 partners, including the Hāmākua Institute, its current convener and fiscal agent, who can apply for federal grants on its behalf.

As a 501(c)6 business league incorporated to facilitate agriculture sector growth, HIAP can serve as a single legal umbrella under which its members can obtain, install and manage shared plant and equipment or build facilities for the shared benefit of its members. But rather than purchasing, owning and operating assets on behalf of its entire membership, HIAP can enable groups of its members to organize themselves and function as autonomous divisions within HIAP, procuring and managing specific assets or groups of assets that are held in HIAP's name, but ring-fenced for the shared usage, control and benefit of that particular group as defined within their own negotiated agreement. Such agreements would be administered and monitored by HIAP as a neutral convener and arbitrar in their shared effort, not as a controlling authority.

In this way, HIAP can lower the barriers to cooperation in the system by enabling easy organization of groups for shared investment in facilities, equipment, integrated service and supply contracts and much more without having to endure the costs and efforts of incorporating new companies or cooperatives in order to do so. The idea is for HIAP to serve as a neutral and open platform for multiple collaborations to occur in the sector for multiple purposes, rather than attempting to function as a united group with all pursuing the same benefits.

This ownership model means that HIAP would not invest in expensive plant and equipment with the hope that it finds enough demand to justify its investment and operating cost. Instead, HIAP teams can secure a critical mass of member participation and support interested in specific plant and work out a model for its shared use before it is purchased and installed. Each group can determine how their associated plant will be funded, shared and maintained according to their own interests, but within a basic set of policies and rules of engagement established by HIAP members overall.

Management

The integrated management of shared facilities and services is also critical to the success of the AIIP. The key functions of AIIP management would include:

- Being accountable for AIIP property management and coordination of service provision to tenants, particularly exploring industrial synergies in the form of common infrastructures and services.
- Playing a core leadership role in designing and monitoring key performance indicators (KPIs) for the AIIP and its intended objectives.
- Provide an interface between tenant companies and other stakeholders, acting as a facilitator, moderator and/or mediator.

UNIDO's Eco-industrial Handbook[5] identifies a range of management models in use for EIPs shown in the table below.

Associative management model	In this model, EIP tenant companies organize themselves in an association with the mandate to manage usually one and sometimes several industrial parks. In this model, there is no distinction between park leadership and management and little or no intervention from the government.
Government management model	The government ensures the management of the EIP through a dedicated team issued from a designated national, regional or municipal authority (for example trade ministry). It is often the case for special economic zones requiring high government investment. It is possible to have a government managed EIP model whereby the park operation may be subcontracted to one or several private operators (refer to EIP private management model in this case).
Mixed public-private management model	This model refers to a government managed EIP where assistance from a private contractor is required in addition to government employees. This partnership can be permanent (e. g. a government liaison officer is a permanent staff member while the private company provides the other park management positions) or temporary (e. g. as part of a capacity building process until the government can perform all park management functions itself). An NGO or foundation can be set up by a mix of tenant companies and local authorities to manage the EIP by facilitating a cooperative approach to service provision, shared between a city and private sector.
Private company or individual management model	In this model, the park management is run by a private operator or real estate agent.

Building upon the recommended private-sector led approach described above and the unique ownership structure proposed for HIAP, we recommend engaging an experienced private company to manage the AIIP, its integrated management system and HIAP's shared processing and storage facility. This would allow HIAP to focus on its function as a convener and facilitator for the sector, using its teams and committees for governance of individual projects/facilities and contracting out all of its operational functions to experienced service providers.

What would be a suitable location?

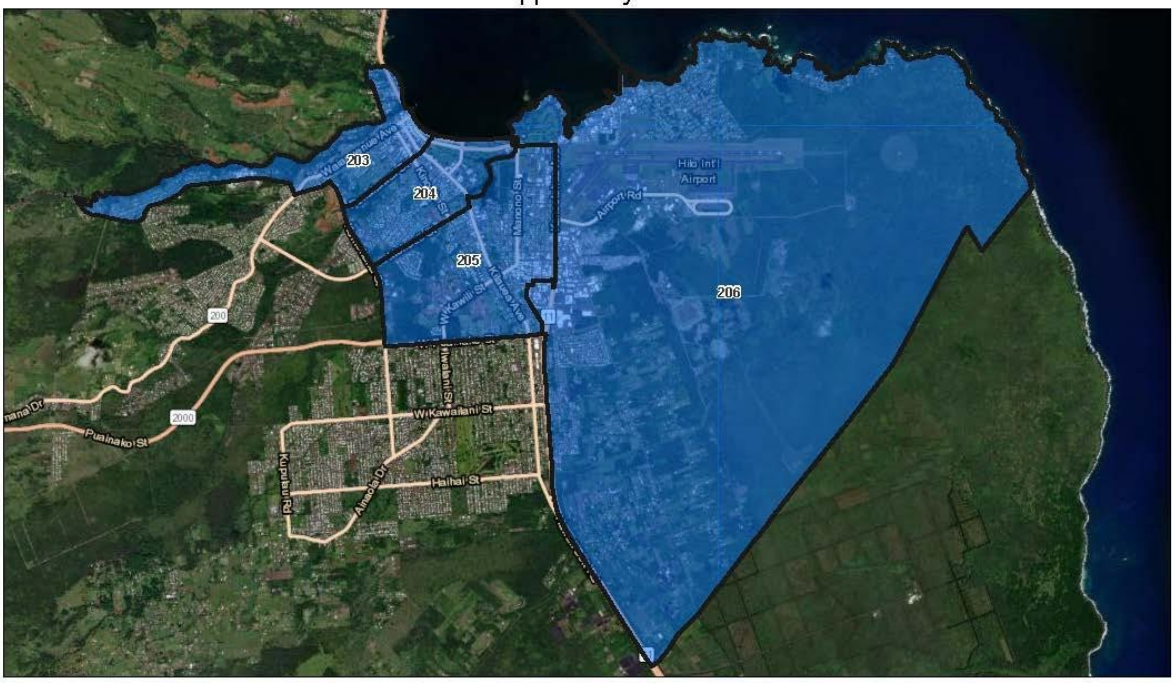
Stakeholder input from the System Study offered useful insights on identifying criteria for selecting a suitable site for locating the AIIP. These are listed below along with other criteria inherent in the AIIP design.

[5] UNIDO Eco-Industrial Park Handbook_English.pdf

- Easily accessible by highway or major road.
- Close to key logistics infrastructure including port facilities and airport.
- Unrestricted access to all public utilities including power, water and sewage.
- Zoned for agricultural or general industrial use, allowing processing of agricultural products to take place.
- A minimum of 30 acres of land to co-locate key tenants and shared facilities, with more available land preferred for potential expansion.
- Located in a designated Opportunity Zone.

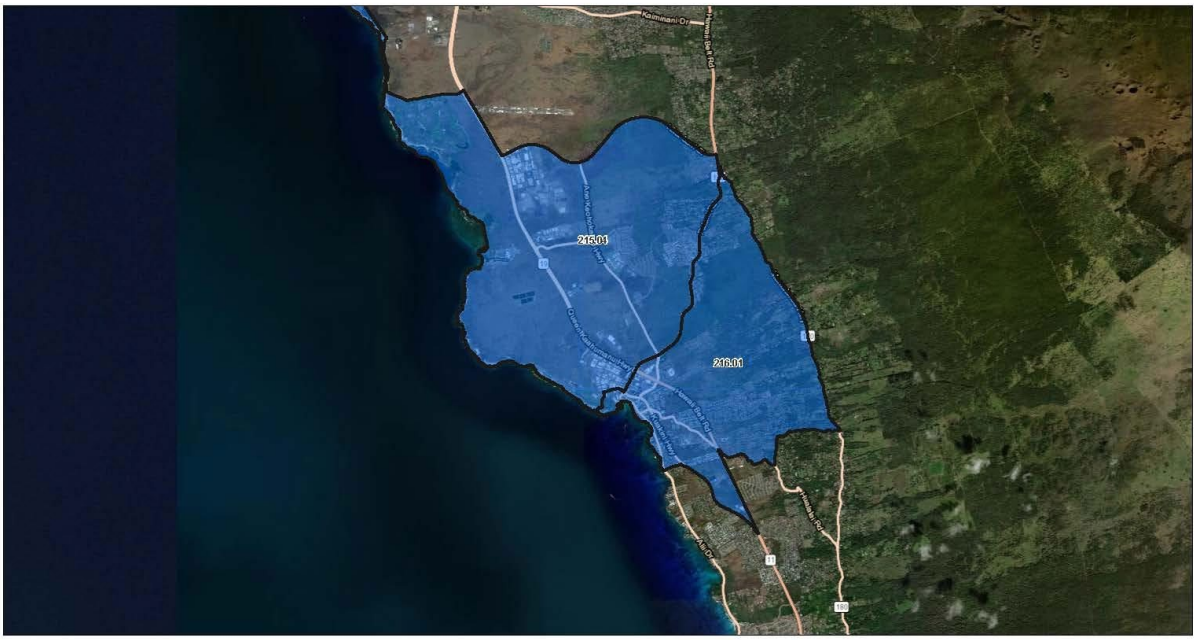
Opportunity Zones were created under the Tax Cuts and Jobs Act of 2017. They were designed as an economic development tool to spur investment and job creation in distressed areas of the United States, providing tax benefits to investors in qualified Opportunity Funds. Though they were created by the federal government, nomination of specific locations are made by each state. The Opportunity Zones nominated for Hawaiʻi Island are shown on the maps that follow.

Hilo Opportunity Zones



Source: [Hawaii Opportunity Zones | Maps of Hawaii's Opportunity Zones]

Kailua-Kona Opportunity Zones



Source: [Hawaii Opportunity Zones | Maps of Hawaii's Opportunity Zones]

Projects located in Opportunity Zones also qualify for Disaster Recovery funds set aside by the US Economic Development Administration (EDA) for recovery from the 2018 Kilauea eruption and Hurricane Lane.

Some stakeholders suggested a centralized processing facility should be located in Kailua-Kona rather than Hilo. This is a viable option and possible sites should be considered from both Hilo and Kailua-Kona as potential landowner partners are engaged. But we recommend giving a higher priority to a Hilo location to be closer to the port facilities, thus enabling the AIIP to more efficiently aggregate products for shipment off island.

What equipment and facilities should be included?

The System Study's findings indicated stakeholders viewed processing facilities as critical to agricultural viability on the island. Processing food reduces food waste, lengthens food storage capacity, and increases producer margins. It also represents a key means by which farmers can enter a broader market, both on-island and through export of product.

Currently, small processing sites, including certified kitchens that are open for use by independent producers, are lacking and unevenly distributed on-island. Many sites are not currently offering storage for producers and lack key equipment and services for smaller producers, including needed processing machinery and ancillary support services for permitting, food safety, and marketing. Moreover, there are no processing sites on-island for larger volume production that can have a more substantial impact on economic growth and contribution to island food production and security. In essence, the lack of

facilities produces a barrier to entry for small and beginning producers, and creates a false ceiling for medium and growing businesses--those without the capital to establish their own private processing facilities--limiting economic opportunity and growth.

Interviews with farmers, processors, aggregators and distributors revealed the types of processing equipment that they feel would support their growth opportunities. Co-packing equipment and high pressure pasteurization (HPP) equipment were the two most frequently mentioned equipment needs. Co-packing offers options to fill and seal packages and pouches of a wide variety of designs with pre-cut, pre-cooked, powdered, dry, viscous, and liquid products. It would enable the production of convenience produce, and take advantage of the extended growing season that Hawaiʻi enjoys to ship fresh produce for export. It would also mitigate the high labor costs associated with production through mechanization, presenting an economic benefit at the production end of the value chain. Co-packing machinery is custom designed depending on facility needs, and costs from under $100,000 up to several million dollars for an entire line of co-packing equipment. A comparisons of machinery, costs (where available) and manufacturers can be found in the Appendix of this report.

The Hiperbaric 55 HPP model has a more compact design then their larger models and is designed for smaller operations, making it a preferred choice for the AIIP

HPP machines hold, pasteurize, bottle, and package liquids using pressure instead of heat. This process enables liquid shelf stability without losing nutrients typically lost in heat pasteurization, while maintaining the taste and freshness of a product over heat pasteurization. HPP would enable Hawaiʻi products to be stored for longer and exported and sold more broadly. It would also allow products processed on-island from local produce to maintain fresher, desirable tastes and health benefits. Smaller HPP machines range in costs from $708,000 to $1.2 million (Hiperbaric), with the latter presenting a machine that can expand output with facility growth. These costs include shipping, set-up, and lifetime support, including testing batch product by company labs and facilitation of product

marketing plans. Co-packing, including bottling machinery, is a necessary component for a processing facility that includes HPP. Other equipment identified as needed for broad use by stakeholders include dehydrators,[6] grinders, mills,[7] juicers, and extractors.[8,9] Details about the output and estimated costs of these machines can be found in the Appendix.

Increasing small processing sites in each district is an important step in building economic opportunity in rural agricultural areas. During the system study, stakeholders communicated a strong desire to have at least one certified kitchen per district, making it easier to access the facilities from various farms and increasing the accessibility of facilities to more producers. Users of existing kitchens described a lack of necessary equipment, a lack of storage options, restricted and unworkable open hours, and high costs of kitchen rental at some existing facilities.

Mobile kitchens are an option that may prove a more affordable and flexible option for certified kitchen facilities across the island. The buildout of the kitchen can be optimized depending on user needs, and can also spend more or less time in a given area, depending on use and need. And, should there be increased demand, the number of units can easily be expanded and customized for areas. Mobile kitchens can be manufactured to specify how it will be powered, offering options for use in areas that may not have ready access to HELCO electrical lines or need options for use during emergencies and times of crisis. Depending on needs, mobile kitchen units can also be connected to mobile water supplies and paired with mobile refrigeration, freezers, and other mobile units, and can be built to meet local transport, building, and health code specifications. For these reasons, mobile units have become part of fleets attached to food hubs and incubator kitchens, and have begun to be incorporated as part of emergency food plans across the U.S. continent.

Paired with the AIIP, a mobile certified kitchen unit can benefit from storage, distribution, and business education provided at the park while also having broad use across the island. If based at the AIIP, the unit could also benefit from federal funding for development in opportunity zones.

What agricultural products should be produced?

There are no obvious prescriptions for what products should be produced through processing facilities on-island. The system study highlighted that the majority of farms lie within the fruit and nut category. Placing early emphasis on these product categories would allow the facility to process excess supplies of fruits and nuts, reducing a significant portion of unused agricultural product on-island. The design of

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[6] Dehydration was frequently mentioned in discussions as a means to utilize damaged and lower grade produce and add a great deal of value to starches and medicinals through the production of flours and powders, highly sought after in health and wellness markets. For these applications, milling, and co-packing would also be required.

[7] Mills were mentioned in discussions as equipment to process root flours, medicinals, cacao, and also tea (matcha). There are mills that are produced specifically for each application; some machinery could not be shared. Some co-packing equipment designs can grind products prior to packaging.

[8] Juicers/extractors were often mentioned in conjunction with the production of fruit juices and purees, especially guava, which producers maintained was at one time a highly desired export from Hawai‘i.

[9] Some costs and information associated with kitchen equipment are located in the Appendix.

facilities to allow for tropical fruit processing would help farmers to recoup costs, utilize B-grade fruit, extend the life of their fruit when there is excess crop, and offer a venue for sale when wholesale prices and shipping costs guarantee a loss on sales of whole, fresh fruit.

Data also indicated high-end products that are lightweight and high-value can offer good returns and allow for easier bulk export. Products such as tea, health products in dried and powdered form such as ʻōlena, ashwaganda, and moringa, and popular trend products such as butterfly pea, suit a high-end market, and through marketing strategies that emphasize comparative quality advantages, can support growing agricultural industry over time. Co-packing equipment that grinds, measures, and packs powders can be of great value for this industry.

Current studies are showing climate change will affect the areas and methods of food production, what products can be produced, and their quantities. In parallel, population growth will drive increasing demand for food, and increase barriers to food access and use. Understanding and preparing for not-so-distant future needs is a smart approach to designing a shared value-added processing facility.

The production end of the agricultural system will be driven by innovations that increase biodiversity and ecosystem health, lowering the need for heavy inputs and increasing the potential for production. Native plants and other resilient crops, especially those that can feed many people, will likely prove critical over time. Root and starchy crops such as kalo, maiʻa, cassava, ʻuala, and ʻulu have been assessed as foundational for local food security. The development of facilities to also manage these crops can thus support future and emergency needs.

Another advantage is that value-added applications of these crops, especially root flours and powdered medicinals, are also currently successful in higher-end health and wellness markets. Local retailers find locally-grown and produced root chips and root flours will sell at double to triple the cost of wheat and other flours and chips, and local distributors indicate cooked and ready-pac value-added products have been successful in supermarkets and box stores due to convenience. If longer preparation times for local root crops are a current barrier to consumption, ready-pac and cooked root products may support transitions to increasing local root crop consumption, and HPP processing would allow for longer storage of these products. A central value-added processing facility would benefit from paying attention to these markets while also building out for emergency, near-future, and long-term use.

Hawaiʻi Master Food Preservers, which offers food processing and food safety training across the state, indicates a variety of goods are processed in their classes, from jams and jellies to pet food and snack products. Certified kitchen facilities that allow for the processing of a diversity of products will better serve a broad community; gearing production toward a few products through equipment or marketing will likely limit the use of facilities, and the creativity and innovation of existing and new processors.

How much will it cost and how will it be funded?

As recommended above, we see a blend of public and private investment as the most appropriate means of funding the AIIP, with capital costs and risks spread across multiple stakeholders. Dividing capital costs of the AIIP between these stakeholders can be achieved as described below.

- The **landowner** can provide the investment into land and basic site infrastructure investment including access road, fencing and utilities.
- **Business tenants** can invest equity or debt financing in the buildings, facilities and plant they need to operate on their individual sites at the AIIP.
- **Federal grant funds** add additional infrastructure, including HIAP's shared processing facility and high cost equipment such as HPP and co-packing plant.

Until a landowner and site can be determined, there are too many assumptions inherent in the AIIP's project plans at this stage of its planning to provide accurate cost estimates. But to provide some preliminary estimates as a starting point, we offer some indicative cost projections below to bring the AIIP to an initial phase of operation with all anchor tenants in place.

Preliminary estimates	***$ Million***	
Landowner:		
Land	3.0	
Basic park infrastructure	2.8	
		5.8
Tenants:		
Facilities, plant & equipment		**1.1**
Federal Grant Funds:		
Shared plant & equipment	4.0	
Project design and development	0.4	
		4.4
Total		**11.3**

Landowner

The essential starting point for turning the AIIP project model into reality lies in finding a willing landowner/investor to agree to develop a suitable site. While the AIIP project model offers important benefits for the island's farmers as a social investment, this does not mean that it cannot be seen as a strong financial investment for the landowner as well. The costs and values for any particular landowner can vary widely, but generally speaking, industrial parks can be attractive investments for landowners, yielding higher rental income than commercial and residential properties. They are also considered lower risk investments as normal fluctuations in the market do not have much impact on industrial parks.[10]

[10] https://medium.com/@kgkrealty/heres-why-industrial-park-investment-is-best-16cba19e7516

With the added support of government grants, HIAP's network of partners and an innovative and highly efficient park design, it is possible that the AIIP could achieve strong tenancy levels that yield an attractive rate of return for the landowner, particularly if they seek to utilize existing undeveloped landholdings instead of purchasing land. The AIIP offers a unique opportunity for a landowner to make a significant difference in the agricultural development on the island while simultaneously enjoying a profitable return from that support.

Tenants

The AIIP's commercial tenants may be able to depend on shared facilities and plant for some of their operations, but will also likely need to invest in additional facilities and equipment to be installed in their leased premises. HIAP will be continuously exploring how under-utilized equipment can be shared with other tenants in ways which can lower costs for themselves as well.

Larger companies in the value chain that are interested in participating in the AIIP should be encouraged to invest capital in shared facilities and equipment at their own premises or in HIAP's shared facility that might be of use to all park tenants and local farmers.

Federal Grant Funds

Federal grant funding will be sought by HIAP to complement the private investment envisaged for the AIIP. Various grant funds can be applied to construction costs, plant and equipment, services and training. Many of the grants have conditions that require the federal government take a lien over any buildings and assets they fund for a period of five years. For some landowners, this conflicts with their own policies. Thus, for maximum flexibility, it is better if federal funds are used to purchase and take a lien over plant and equipment rather than land and buildings. Some federal grant programs that the AIIP may be well positioned to apply for include:

Grant Program	***Description***	***Award Ceiling***
Economic Development Administration (EDA) Disaster Recovery Grants	EDA disaster grants can be awarded to assist a wide variety of activities related to disaster recovery from the 2018 Kilauea eruption and Hurricane Lane, including economic recovery strategic planning grants, and public works construction assistance. Through this program, EDA can support both the development of disaster recovery strategies and the implementation of recovery projects identified with those strategies, including infrastructure improvements and by	No ceiling specified

	capitalizing revolving loan funds (RLFs).	
Agriculture Innovation Center Grant	The primary objective of the program is to provide grants to Agricultural Innovation Centers that will provide technical assistance to agricultural producers to market value-added agricultural products.	$1,000,000
Rural Innovation Stronger Economy (RISE) Grant Program	The RISE program offers grant assistance to create and augment high-wage jobs, accelerate the formation of new businesses, support industry clusters and maximize the use of local productive assets in eligible low-income rural areas.	$2,000,000
Value Added Producer Grant (VAPG) program	The VAPG helps agricultural producers enter into value-added activities related to the processing and/or marketing of bio-based, value-added products. Generating new products, creating and expanding marketing opportunities, and increasing producer income are the goals of this program.	Planning Grants $75,000 Working Capital Grants $250,000

CONCLUSION

Overall, designing an efficient and effective solution such as the AIIP to improve value-added processing on-island is possible, yet it will take a concerted, coordinated effort to continue defining the project's details. Simple solutions rarely address complex problems. The Agriculture and Food System Study highlighted the agricultural sector on Hawai'i Island is indeed complex and the island's many small farms are beset by an interconnected set of seemingly intractable problems. Hawai'i is scattered with a diversity of small farms growing a vast variety of crops for a vast variety of reasons, all with varying levels of market impact. Efforts to make a difference in this complex landscape are too siloed to have any major system-wide impact.

A vision of breaking down some of those silos and embracing an innovative new approach to solve the problems facing small farms seems too hard because there are many diverse interests to connect. But that is what HIAP is all about. The only hope for a genuine public-private partnership to make a difference in this complex landscape is if it involves the kind of big bold vision for a better system that can motivate partners to work together in solving problems in different ways. We feel the AIIP offers that kind of big bold vision. Our recommended model for achieving that vision is not intended to be a prescriptive, dogmatic approach. It is intended to be a starting point for further stakeholder review and refinement to reach an optimal strategy. We look forward to working with HIAP to review and refine the project model and plan further.

APPENDIX

High Pressure Processing (HPP) Equipment List

Company	JBT-Avure	Hiperbaric		Multivac
Background	JBT is one of two most prominent U.S.-based HPP companies (along with Hiperbaric). It was established in 2005 as the food preservation processing arm of Flow International, a water-jet cutting company, which had acquired ABB Pressure Systems (SE), a 1950s diamond manufacturing company-turned-food processor, in 1999.	Hiperbaric is one of the two most prominent U.S.-based HPP companies (along with HBT). It was initiated in 1999 specifically to create HPP processing machinery. Manufactured in Spain		Multivac is a German company with locations in the U.S. Named alongside Avure and Hiperbaric as leading HPP food processing equipment vendor. Company offers a suite of packaging materials and machinery for food and drug processing.
Product Type	AV-10	H55	H135	HP55
Throughput per hour kg [pounds]	585kg [1290lbs] with 3 min hold; 878 [1935] with 1 min hold	270kg [590lbs] with 3 min hold	670kg [1480lbs] with 3 min hold	
Vessel capacity Liters [U.S. Gallons]	100 L	55L [14.5]	135L [36.7]	55L
Inner vessel diameter mm [inches]	306mm [12.05]	200 [7.9]	300 [11.8]	
Max vessel pressure Bar [mPa/psi]	6,000 Bar [600mPa/87,000psi]	6,000 [600/87,000]	6,000 [600/87,000]	6,000 [600/87,000]
Vessel/Equipment size	Measures size of small SUV	L: 8[26.2ft] W: 2.8[6.8ft] H: 2.2[7.2ft]	L:10.2m[33.4ft] x W:3.2[10.6] x H:2.6[8.5]	
Electric Considerations	165kW			
Waste Considerations	Water (15%) nominal capacity	Water (15%) nominal capacity	Water (15%) nominal capacity	
Cost	$1.2 million +chiller ($80,000)	$708,000	$1,140,000	

Company	JBT-Avure	Hiperbaric		Multivac
Warranty	1 year (4-year warranty for pressure vessel and frame)	3-year warranty	3-year warranty	
Service	Free for 1 year and then at cost with purchase of service package	24/7 service for life of machine	24/7 service for life of machine	
Training	Manufactured to "plug and play"; no training necessary but can be arranged.	Included with machine cost	Included with machine cost	
Number of Intensifiers	One	One	Comes with 2 (can be run with one), expandable to up to 4.	
Expandable	No	No	Yes, to 4 intensifiers	
Other Notes	No additional offers	Offers complementary testing via certified food safety authority to check effectiveness of machine and marketing department that assists associated businesses with selling their product.	Offers complementary testing via certified food safety authority to check effectiveness of machine and marketing department that assists associated businesses with selling their product.	

Co-Packing Equipment

Company	Product Type	Description	Processing Rates
Paxiom	Vertical Form Fill Seal	Paxiom offers a complete suite of packaging solutions, from various types of filling and sealing machinery to check-weighing, labeling, cartoning, and palletizing equipment. Filling and labeling equipment hosted here. Smaller equipment sizes listed, though larger equipment is available. Economical Vertek 800/1200. The 800 processes up to 8"-wide pre-made pouches and 60 cycles per minute, while the 1200 processes up to 12"-wide pre-made pouches and 50 cycles per minute.	50-60 cycles per minute

Company	Product Type	Description	Processing Rates
Technik	Vertical Form Fill Seal	The Triapex BV is the smallest of the VFFS solutions into three and four-sided pouches. Allows for flexibility in product and can package powders, liquids, granualr product, foods, coffee, and other product.	
Technik	Vertical Form Fill Seal	The Triapex HV2 and HV3 are best for premade pillow, gusseted, and flat-bottom bags; can package a wide variety of products.	80-120 bags/hour
Viking Masek	Vertical Form Fill Seal	Various solutions for filling premade packaging. Machines are specific for products and not as flexible as other VFFS solutions; however the VFFS M400 can package liquids, powders, and solids in a variety of bag styles, operating at up to 100 bags per minute. A smaller version of this machine is the VFFS M250, which is equally fast but packages a smaller size product.	100 bags per minute
Paxiom	Horizontal Form Fill Seal	The Horizontal Form Fill and Seal machine makes, fills, and seals pouches in a single process utilizing laminated roll stock film to create gas flush, hole punch, middle capping, shaped bag, stand-up, tare-notch, vacuum station, zipper applicator, and rigid spount inserter pouches. Cuts down on package purchasing costs and can be used for foods, pharmaceuticals, household products, beverages, and liquid packaging.	
Paxiom	Pre-made Pouch Bagging	Economical Swifty Bagger Junior. Compact, smaller processor that opens, fills, and seals pre-made stand-up pouches.	900 bags/hour
Paxiom	Flow wrapping	Sleek Wrapper 40/45/65. Horizontal flow pack machines are best for candy and confectionery bars, cookies, soap bars, and coffee pods. It can package products in horizontally sealed flexible packaging up to 400mm (15.5") in width.	up to 200 bags/hour
Paxiom	Container Filling	Various solutions for filling premade rigid (plastic, cardboard, metal, glass) containers.	
Paxiom	Labeling	Automatic labeling equipment	
Technik	Bottling	The Triapex LDS is a bottling solution for any viscous liquid from 1oz to 1 gallon. Offers a variety of capping and torquing systems, and can be part of a larger Technik system that provides dosing and capping mechanisms for packaging powders, pills, and solids.	55 bottles/minute
Paxiom	End of Line Automation	Modular solutions for end-of line packaging prior to palletizing	
Technik	End of Line Packaging	Case and wrap-around packaging for palletizing	

Dehydration Technologies

Company	Product Type	Description	Processing Rates
Nyle	Heat pump	Nyle is a Maine-based lumber-drying kiln producer with a selection of kilns for food processing. Offers heat-pump drying machines, convective techniques that operate at a low temp of 80 degrees and reach 160 degrees. Dehydrates products at faster rates than standard tray dryers. Rates of processing are highly product dependent (calculated by starting moisture content of food, finished dry weight, and time), though system names (i.e., FD-10), indicate pounds per hour of water removal (i.e., 10lbs per hour).	10-675 lbs moisture extracted per hour
	Indirect Gas Fired	Nyle also offers indirect gas fired drying machines, which operate at a low temp of 80 degrees and reach 220 degrees. Dehydrates product at faster rates than standard air convection dryers.	600-1000 lbs moisture extracted per hour
Commercial Dehydrators	Air Convection	Commercial Dehydrators is based in Texas and produces air-convection-type machines suitable for SMEs. Some ovens are capable of maintaining different temperatures for 2-3 zones, potentially maximizing use as processing must be done in batches and generally for long periods of time. Auto-timers up to 24 hours. Temperature range from 85-195 degrees.	not listed; suggested calculation of rates as timing start to finish of said product and multiplying by 53.
Advanced Food Dehydrators	Air Convection	Advanced Food Dehydrators is based in Massachusetts and offers various sizes of commercial-grade air flow dehydrators with an operating temperature of 100-190 degrees. Single zone only.	
Marlen	Custom design for product	U.S.-based custom-designed air-drying equipment for industrial food processing.	
Kerone	Various	Kerone produces a wide variety of drying, heating, and cooling equipment, and maintains a suite of industrial traditional (tray-type convection, tunnel, drum, flash, heat-pump, spray, rotary, etc.) and new-type (infrared, radio-frequency, etc.) drying equipment. Main headquarters in India, with closest office operations out of Australia.	

Flash Freezing

Company	Product Type	Description	Processing Rates	Cost
Irinox	Blast chiller - Icy S	Blast chills and shock freezes foods using 4 unique cycles (hard chill, soft chill, hard freeze, soft freeze). Machine available in four different sizes (XS-L). Small size can process up to 39lbs from 194 degrees - 34 degrees per cycle.	39lbs to 34*	$15,000
	Blast chiller - Icy M	Blast chills and shock freezes foods using 4 unique cycles (hard chill, soft chill, hard freeze, soft freeze). Machine available in four different sizes (XS-L). Small size can process up to 39lbs from 194 degrees - 34 degrees per cycle.	83lbs to 34*; 77lbs (to 0*)	$25,000

Alto-Shaam	QC3-20 Worktop Blast Chiller	4 operating modes (hard chill, soft chill, freeze, and hold). Uniformly draws hot air out and chills food to FDA/HACCP code requirements. Fits 5 table pans/9 sheet pans and doubles as a workstation. Alto -shaam offers a variety of sizes of blast chillers with its largest capable of chilling/holding 480lbs of food.		$15,000 (up to $32,000 for larger sizes)
Traulsen	TBC-13	Traulsen manufactures refrigeration and workstation solutions for restaurant and commercial operations, including blast chillers. It has a suite of 6 sizes of chiller, with the smaller end fitting 13 trays and bringing 100lbs to 34 degrees in 90 minutes.	100lbs to 34*	$36,000-$37,000
Master-bilt	x	Master-bilt manufactures refrigeration and storage solutions for restaurant and commercial operations. Does not have prominent information on blast chillers.		

Juicers

Company	**Product Type**	**Description**	**Processing**
JBT-Avure	Juice Extractor	JBTC Model FTE fruit, tomato, and vegetable fruit extractor utilizes a centrifugal refiner to extract juices from a wide variety of produce and separate liquids from solids. Capable of rotation speeds up to 200 rpm. Can also produce purees and pastes.	
Zumex	Multifruit ZMF400	Low-speed belt press to extract juice from fruit and vegetables, available in 4 sizes (ZMF400, ZMF800, ZMF1600, ZMF2000). Zumex will custom design a system involving crushing, pulp removal, and pressing for products. Also offers solutions for citrus, and citrus oil pressing.	400kg/hr
Tropical Food Machinery (Brazil and Italy)	Multifruit Mini Industry 200	Designed for small-scale rural operations; run out of centers in Brazil and Italy.	200-300kg/hr

Mills

Company	Product Type	Description	Processing Rates
Pleasant Hill Grain	ABC Hansen Disc Mill (Pin Mill)	Pleasant Hill Grain is run out of Nebraska and offers a variety of commercial grade mills. The ABC Hansen Disc Mill is their only commercial Pin Mill. It offers a variety of discs (i.e. stone, steel burr, hammer mill head, hammer mill screen, pin), which increases the versatility of the machine. At 20" x 47.5" x 66.5" it is on the small end, best for shared kitchen facilities use rather than agribusiness manufacturing.	2800 RPM
Hosokawa Alpine	Fine Impact Mill UPZ	Hosokawa Alpine is based in Augsburg, Germany and offers a host of machines for the food industry. The UPZ series is recommended for native starch processing including roots and tubers, as it allows for both deglomeration and fine powder production. A range of attachments are available to customize and increase versitility of use. Hosokawa Alpine also offers specific machines for cacao and spice processing.	not available

Company	Product Type	Description	Processing Rates
Munson	Munson Pin Mills	Munson Machinery operates out of New York and offers mixing, blending, and size reduction equipment. It offers several models of pin mills differing on motor power.	300-5000 RPM
Prospect Machine	Pin Mill MK-5-B	PM is based out of Arizona and offers one style of pin mill and one universal mill.	2000-3500 RPM
Munson	Munson Hammer Mills	Munson Machinery operates out of New York and offers mixing, blending, and size reduction equipment. Features 50-250 HP and three separate models.	
Prater	Hammer Mill Suite	Prater is an Illinois-based company that manufactures a wide variety of food processing equipment that would be required for processing flours and cleaning machines.	1200-3600 RPM
Schutte	Food Grade Pilot Scale Circ-U-Flow	Schutte is a Buffalo, NY-based company that offers a variety of products for wood, feed, and food/food waste milling. Food grade equipment is more limited. Pilot scale miller for small batch production. Highest throughput to horsepower ratio; best for light, low density materials.	not available
	Food Grade Circ-U-Flow	Medium size hammer mill for production griding of agricultural products.	3600 RPM
	High Production Full Circle Hammer Mill	Low speed, high production equipment for materials that do not require initial grinding	1800 RPM

Washing Technologies

Company	**Product Type**	**Description**	**Processing Rates**
JBTC Avure	Bin Scrubber, S-Series	Cleans and scrubs up to 200 totes per hour. Utilizes 7-12 gallons of water per minute and 12 kW/hour.	Up to 200 totes/hour
JBTCAvure	Container Clean Washing System	High pressure washing system cleans totes, trays, crates, and other produce containers. Uses a blower system to reduce water use.	Up to 300 totes/hour
JBTC Avure	FreshGuard High Pressure Washer	For cleaning and scaling citrus and avocado.	
JBTC Avure	Single Pass Dryer	For efficient drying of washed fruit and vegetable products.	
Precision Food Innovations	Wash system	Precision Food Innovations (PFI) custom designs conveyor systems to meet fruit and vegetable processing needs. It's PURWash system is designed for fruits, vegetables, tubers, greens, and more.	TBD
Univerco (CANADA)	Wash systems	Univerco is based out of Canada and offers custom design of wash systems for fruit/vegetable and root crops.	TBD