Developing a Custom Agriculture System with a Focus on Fostering Community and Preserving Culture

Interactive Qualifying Project

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HOʻOKUAʻĀINA
rebuilding lives from the ground up

Michele and Dean Wilhelm

Hoʻokuaʻāina

Abstract:

Hoʻokuaʻāina, a nonprofit organization in Kailua, Oahu, is expanding their 3-acre kalo farm. Our project team assisted in the development of a custom agriculture system for a new 116-acre plot of land, with a focus on fostering community and preserving culture. Through interviews and focused research, we evaluated and synthesized the sponsor's ideas for the system, as well as gained insight into agricultural practices that have been successful around the world. Using our findings, we provided a formal write-up of system operations along with recommendations that could be applied, calculated estimated crop yields, and created an original ArcGIS StoryMap describing the intentions behind Hoʻokuaʻāina's expansion.

Acknowledgements:

Our team would like to thank the following people for their continued support through this project:

- Professors Mathews, Giapoudzi, and Traver for their help with writing and formulating ideas.
- Dean and Michele Wilhelm for their positive encouragement and the nurturing community they helped to create.
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- Kaulana, Benji, Kazu, Ari, the ASA participants, and the rest of Hoʻokuaʻāina staff and volunteers for their welcoming attitudes and reassurance throughout our time in the loʻi and beyond.
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Executive Summary:

Prior to Western contact, the Hawaiian Islands were self-sufficient and possessed a wealth of cultural and natural resources. Land was managed to ensure that everyone was provided for, whether it be food, shelter, or water. Each community member contributed to maintaining the culture of care and a sense of community on the islands. Western contact disrupted the balance of the Hawaiian Islands and ultimately led to a reliance on the mainland for food and other necessary supplies (Moloka'i Community Service Council, 2007).

Hoʻokuaʻāina, a nonprofit organization on Oahu, restored agricultural abundance to 3 acres of land while creating a prosperous kalo (taro) farm, as seen in Figure 1. In the past 200 years, the land went through many uses, including kalo farming, rice farming, and cattle grazing, and finally in the years prior to Hoʻokuaʻāina's purchase, was allowed to return to a wild state. Through the cultivation of kalo, Hoʻokuaʻāina's mission is to cultivate the life skills and values of community in the youth of Oahu through their education and mentorship programs (Hoʻokuaʻāina, 2017). The organization is in the process of expanding their operations to bring together a larger portion of the community through the purchase of a 116-acre plot of land down the street from their current farm. On this plot, Hoʻokuaʻāina plans to implement a custom agriculture system which will define the roles and interactions of participants within it.

Figure 1. Image of the farm as it currently exists at Hoʻokuaʻāina.

The goal of this project was to help Hoʻokuaʻāina synthesize necessary components for the custom agriculture system they envision. This included an analysis of community-based

agriculture approaches from across the globe to provide recommendations for Hoʻokuaʻāina's planned custom agriculture system. In addition, the team focused on critically synthesizing Dean and Michele's vision of the system on the 116-acre plot to gather their ideas and provide feedback to improve the plans for the system, as well as the creation of outreach materials to show its functionality.

The first objective was to analyze community-based farming practices worldwide. With this analysis the team produced a critical analysis in the form of a research paper that can be seen in Appendix I as a deliverable for the organization. The paper presents an in-depth analysis of published articles on community-based farming projects, as well as insights from project participants and experts in the field. The results show that successful community-based farming projects share common emphasis on conflict resolution, self-sustainability, community participation, and environmental stewardship.

The second objective aimed to collect all necessary information to fully define the custom agriculture system and create a synthesized document showing how each of the parts will function together. To complete this objective, we interviewed Hoʻokuaʻāina co-founder, Dean Wilhelm, to gather his ideas and vision for how the system will function. Using the information collected in the interview with Dean, we created three iterations of the write-up for the system and reviewed each in a roundtable discussion format with the full staff of Hoʻokuaʻāina to receive critical feedback. The team reviewed suggestions and provided our own insight to create the third and final draft of the custom write-up of the system, which was delivered to the sponsors at the end of the project. In addition, the team created a report of potential crops and their predicted yields on the plot for the organization to use as a rough starting point in their cultivation on the land. Through this report, a variety of suggestions and recommendations were provided to Hoʻokuaʻāina for future applications when implementing the custom agriculture system onto the new plot.

The third and final objective for this project was to create a StoryMap which demonstrated the operation and planned impact for the custom system, with the aim of attracting donors and new participants. The team researched and conducted interviews about the impact the organization has had on its participants, as well as historical data about the previous land use on the 116-acres. The gathered testimonials, paired with a photo of each interviewee, present an

indirect way for potential members and donors to connect to the narrated experiences and visualize the operations and impact of the organization. In addition to testimonials, the StoryMap included historical maps and sites that are located on the land and are part of Hoʻokuaʻāinaʼs efforts to protect and steward natural resources on the new plot. Using the StoryMap, the organization can easily continue to maintain and update the content as the operations in the new plot expand and the system continues to develop.

Our teamsʼ efforts to provide written reports and the StoryMap only partially complete Hoʻokuaʻāinaʼs extensive task in developing 116-acres of land into a prosperous community focused agriculture center. We hope, however, that we can support the organization in their early planning stages and contribute to the shaping of such an aspirational initiative.

Authorship:

Grace Audette was the primary author for the abstract, executive summary, and conclusion, as well as the revision of all appendices except A and H. Grace Audette, Anthony Virone, and Kaleigh Walsh were also the primary authors for the Introduction and Background and the major editors of the entire document. Jose Tamariz worked on sections of the "Models to Improve Agriculture in Hawaii" subsection of the background. Jose Tamariz was the primary author for Objective 1, including its respective Methodology, Results, Recommendations, Appendices, and its final deliverable, "Community-based Farming Practices Worldwide." Grace Audette, Anthony Virone, and Kaleigh Walsh were the primary authors for Objectives 2 and 3, including its respective Methodology, Results, Recommendations, Appendices, and its final deliverable, "The Custom Agriculture System." Kaleigh Walsh took the lead on the creation and formatting of the StoryMap, with Grace Audette and Anthony Virone assisting in the creation of content. Anthony Virone took the lead on the creation of the "Potential Crops and Yields" document.

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1 Introduction

Hawaiian culture has traditionally focused on the wellbeing and care for its people and land. Since the introduction of western farming practices, there has been a sharp decline in traditional Hawaiian style land management. These systems ensured all natural resources in the specified areas were used to maximize their potential while also ensuring they are replenishable (Moloka'i Community Service Council, 2007). There are multiple organizations working towards increasing the role of traditional Hawaiian values and practices in everyday life while focusing on the nurturing of the community by creating a welcoming environment to share life stories and struggles, and ultimately strengthening community bonds.

Our team partnered with Hoʻokuaʻāina, a non-profit organization that strives to improve the Kailua community's quality of life through farming kalo (or taro), a traditional root crop used widely in Hawaiian cuisine. At Hoʻokuaʻāina, emphasis is placed on volunteerism, utilizing traditional farming practices, promoting land stewardship, and incorporating native values (Hoʻokuaʻāina, 2017). Recently, Hoʻokuaʻāina has partnered with the Trust for Public Land to acquire 116 additional acres of land in Kailua, as seen in Figure 2 (M. Wilhelm, Personal Communications, November 2022, and Forestry Stewardship Advisory Committee, 2022). The team was tasked with developing a custom agriculture system for this newly acquired land that focuses on fostering community and preserving culture.

This system will define the relationships between Hoʻokuaʻāina, community members, and the land. To aid Hoʻokuaʻāina in their new initiative, our team assisted in the development of this system and created outreach materials to aid funding requests. Finally, the organization aspires that in the future this custom system can serve as a model for other groups to collectively build community in Hawaii.

Figure 2. Map of the Kailua Area. Ho'okua'āina's current operation is outlined in yellow. Newly acquired lands are outlined in purple. Kailua's location within Oahu is shown in the upper left corner (Trust for Public Land, 2022).

2. Background

2.1 Hoʻokuaʻāina

Hoʻokuaʻāina is a 501c3 non-profit organization based in Kailua on the island of Oahu. Since 2007, Hoʻokuaʻāina has been able to restore 7.8 acres of land to be "abundant and productive" once again (Hoʻokuaʻāina, May 2017). The organization focuses on harvesting kalo for its cultural significance (as described in section 2.1.1). Using holistic approaches to farming and incorporating community, Hoʻokuaʻāina works to "grow people through the growing of kalo" (Hoʻokuaʻāina, 2016).

Hoʻokuaʻāina has a unique approach towards agriculture, aiming to shift its focus from production towards individual wellbeing and community growth. Specifically, the organization is committed to bringing back a traditional, multi-layered food system to the Hawaiian Islands, which has four main points of focus. These include 1) minimizing environmental impacts, 2) fostering social connections, 3) supporting cultural and spiritual beliefs and traditions, and 4) increasing economic wealth for the community. Implementing these four points of focus onto the new parcel of land will produce indirect benefits in addition to food, in the form of improved wellbeing of the community (M. Wilhelm and D. Wilhelm, personal communications, November 2022).

2.2 Hawaiian Agriculture

2.2.1 Cultural Significance of Agriculture

Prior to western contact, Native Hawaiian culture historically focused on sustainable farming practices and a deep respect for ʻāina.[1] These farming practices included the cultivation of sea life, the cultivation of native crops, and hunting and gathering (Sai, 2018 and Moloka'i Community Service Council, 2007). As a result of Hawaii's abundant production, the islands became known as the land of "fat fish and kukui nut relish" (Moloka'i Community Service Council, 2007). The "fat fish" symbolized the plentiful fish from the Hawaiian waters and the "kukui nut relish", a traditional dish made from roasted kukui nuts, embodied the bountiful resources of the land. Hawaii soon became known as "ʻĀina Momona," or "Land of Plenty" (Moloka'i Community Service Council, 2007 and Gon et al., 2018).

[1] Land, ("ʻĀina," n.d.).

In the 18th century, western colonizers began to disrupt the islands' agricultural and cultural practices and Hawaii was no longer viewed as the "Land of Plenty" (Moloka'i Community Service Council, 2007). These colonizers brought western land use practices that did not align with Native Hawaiian approaches. Often productive farmland was replaced by cities and suburbs. The result was greatly diminished Hawaiian agricultural practices and the loss of culture (Lyte, 2021). Restoration of the lands and traditional land management practices are areas of increasing interest nowadays, with several organizations dedicated to this purpose. One of these organizations is Hoʻokuaʻāina and one of the practices it supports is kalo cultivation (Hoʻokuaʻāina, 2017).

The cultivation of kalo is deeply intertwined with Hawaiian traditions (Jacobs, 2011). Its cultivation requires labor intensive techniques, such as hand planting, hand harvesting, and hand preparation (Hawaiian Bishop Museum, 2013 and Albert, n.d.). Not only are these techniques traditionally Hawaiian, but there is a story about kalo's origin that describes its Hawaiian significance.

> The "stillborn child of Wākea[2] and Hoʻohōkūkalani[3] … was buried in the soil and watered by the tears of his mother until a green sprout appeared. As an expansive, heart-shaped leaf grew towards the sky, the first kalo (taro) plant took form"
> ~ The moʻolelo (story) of Hāloa (Hawaii 'Ulu Cooperative, 2017).

The plant remains a major part of Hawaiian cuisine as a primary dietary staple, and is used for traditional dishes, such as poi and laulau (Hawaiian Bishop Museum, 2013). A schematic of the different parts of kalo can be seen in Figure 3.

[2] Wākea: God of light and the heavens in Hawaiian culture (Sabalones, 2013).
[3] Hoʻohōkūkalani: Goddess and daughter of Wākea in Hawaiian mythology, also believed to be consort to her father (Sabalones, 2013).2

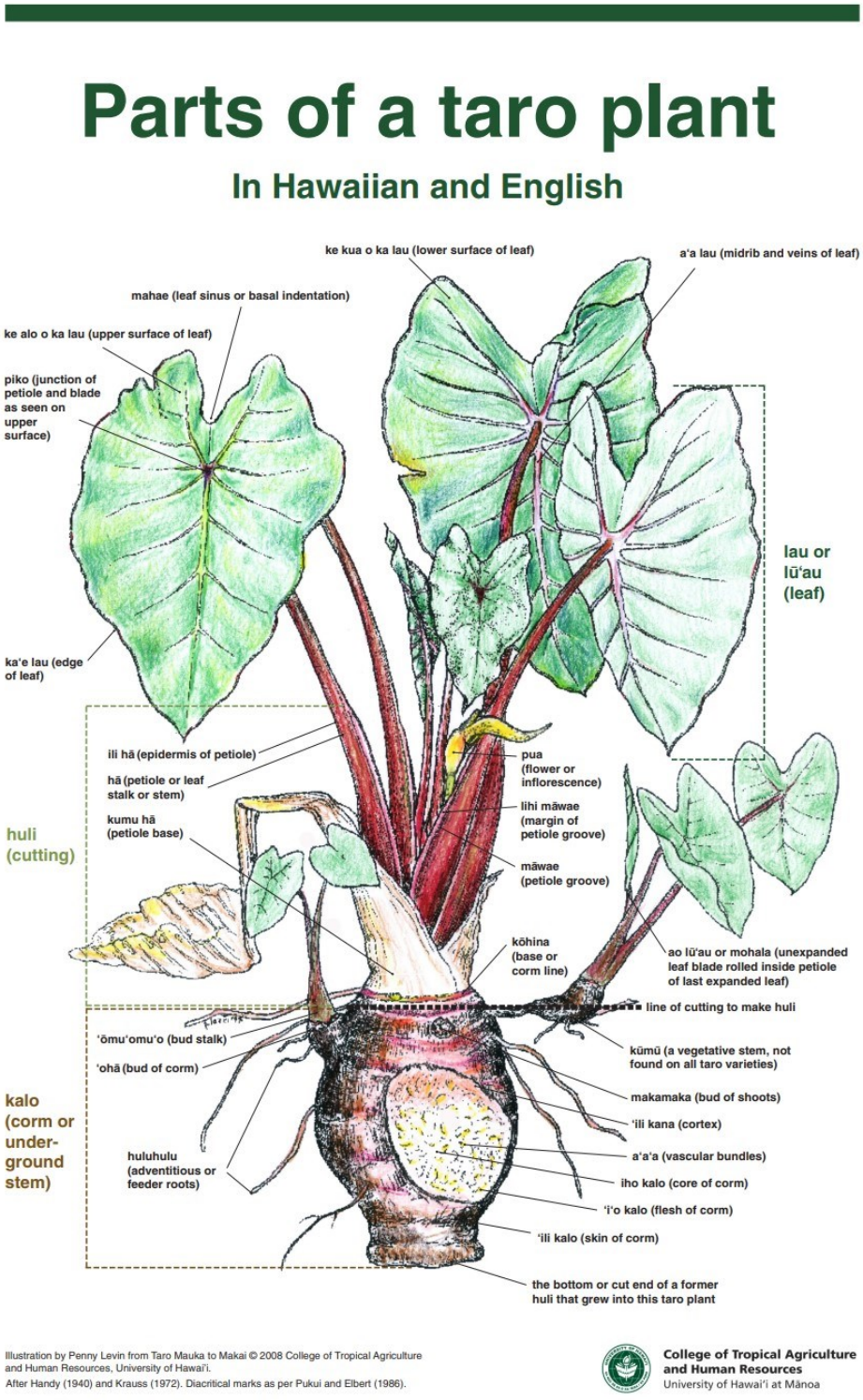


Figure 3. Parts of a Taro Plant. The image describes the different parts of the plant including the heart shaped leaves, or lau, and the corm which is the part of the plant used to make poi. The leaves and corm of the plant are edible (Penny Levin, 2008).

2.2.2 Local Food Production

Currently Hawaii relies heavily on imported foods, and imports amount to 85% to 90% of Hawaii's food. Most of this comes from the continental U.S. Despite this supply, insufficient local food production still leaves the islands vulnerable to food scarcity, a problem that becomes pronounced in times of natural disaster or other crises (Lauer, 2018 & Seedstock, n.d.).

Insufficient local food production resulted from two barriers that have gotten significantly worse since 18th century western contact: high labor costs and high land prices. Higher wages – a result of union agreements – decreased local farm profits. With lower profits, fewer Hawaiian landowners invested in agriculture (Lyte, 2021). The land also increased in value as more non-native Hawaiian people began to immigrate to the islands, and developers converted cropland to housing for both residents and the tourism industry (Rehkamp, et al. 2021). This decrease in agricultural land and consequent loss of production both decreased the supply and reduced the demand for local crops (Office of Planning Department of Business Economic Development & Tourism, n.d.).

2.3 Models to Improve Agriculture in Hawaii

This section describes models and efforts put into place throughout the world that are applicable to improving agriculture on a non-commercialized and community-centric scale. These models are important to review to learn what ideas have worked with them and which ones have not.

2.3.1 Community Supported Agriculture (CSA)

Community Supported Agriculture (CSA) is an alternative approach to western agricultural methods, where community members can contribute to a shared agricultural project to benefit from food production and the process of farming. In return, members receive a portion of profits or the crops themselves (Biodynamic Association, n.d.; Penn State Extension, 2014). Supporters can eat fresh produce sustainably and support local economies by keeping the money within the community. Recently, CSA has become more involved with subscription farming or farm shares, where members solely fund the farm for a portion of crops. CSA farms are a way for people to reconnect to the land and reject modern agricultural practices like the use of large financial power, big workforce, and excessive farming equipment (Cone, et al., 2000).

2.3.2 Community Gardens

Community gardens are plots of public land maintained by a municipality for the use of residents to grow plants, which can be vegetables, fruits, or flowers, either for need or for pleasure. The purpose of community gardens is sustainability, wellbeing, and inclusion within the community (Turner, 2011). Community members are assigned to, or can select, a section of the garden and can choose which plants to grow. Members are responsible for providing seeds and other gardening equipment. Typically, to become a member of the garden, a monthly or yearly fee is required (Center for Disease Control, n.d.). Among the benefits of community gardens are the empowerment of the participants to take ownership of their food supply and the provision of a space for people to come together and form interactions. Community gardens also help to reduce food waste, as any excess produce can be shared with those in need (Blackwood, M. January, 2023).

Figure 4. Photos of Honolulu Community Recreational Gardening Program (HCRGP). The images demonstrate the varied garden plots throughout the island of Oahu. Images courtesy of Anna Mines, Community Gardens Project Manager, City and County of Honolulu Department of Parks and Recreation.

2.3.3 The Konohiki System

The Konohiki or Ahupua‘a System is the traditional land management system of Hawaii. Konohiki – resource managers or land stewards – were appointed by Hawaiian chiefs to manage ahupua‘a: watersheds on the Hawaiian Islands. See Figure 5 for the ahupua‘a division on Oahu.

Konohiki were responsible for maximizing the potential of the land while still respecting it. To do so, the konohiki was given the “right and responsibility” to regulate land use, general maintenance, farming, and access and use of natural resources (Konohiki Restoration Project, n.d.). The Konohiki System worked in harmony with Hawaiian culture and government, until western interference disturbed its balance (‘Iole Stewardship Center, n.d.). This system is no longer utilized on the islands, but there are features from it that can be used in a custom agriculture system, such as designating one group or organization the role of the land manager to divide plots and resources.

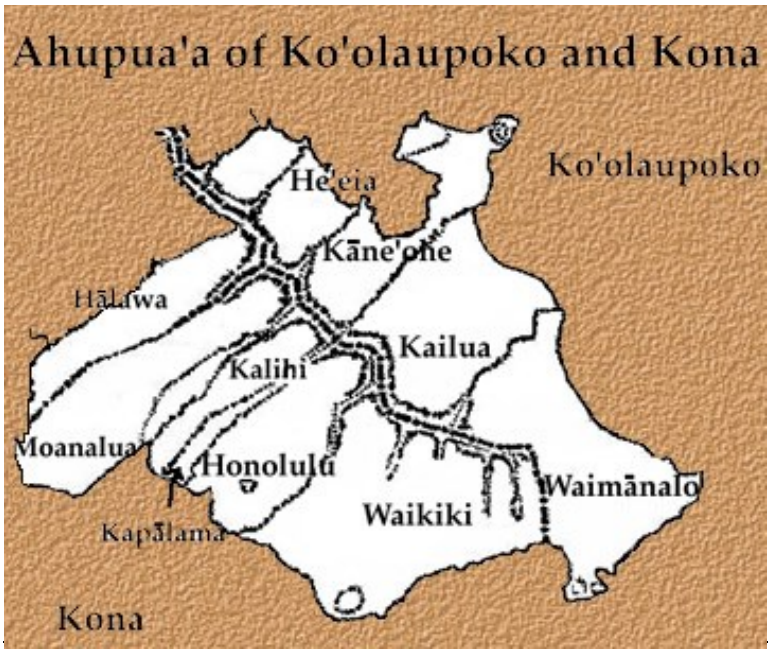


*Figure 5. Ahupua‘a Land Divisions of Oahu. The image shows the past and currently used land divisions on the island of Oahu (*Hawai'i: The Mahele*, n.d.).*

2.3.4 Community Forestry Management

Community Forest Management (CFM) is a participatory approach in which local communities have a central role in managing and conserving forest resources (Community Forestry Management, 2023). This approach recognizes the rights of communities to use and manage forests sustainably, while also ensuring the protection of the forests' ecological, social, and cultural values. CFM involves the establishment of partnerships between communities, governments, and other stakeholders to jointly manage forest resources. (Community Forestry Management, 2023). This approach can enhance community livelihoods, contribute to the

conservation of biodiversity, and mitigate climate change. Additionally, government partnerships can provide financial aid and government resources to ensure the project's success (Agarwala, & Ginsberg, 2017).

3 Methodology

The goal of this project was to develop a custom agriculture system for Hoʻokuaʻāina with a focus on fostering community and preserving culture. Specifically, Hoʻokuaʻāina is seeking recommendations to merge their vision of community-based farming with practical limitations of the real world. Hoʻokuaʻāina is also requesting outreach materials that can be shared with potential donors. To achieve this goal, our team has three objectives:

1. Analyze community-based farming practices worldwide.
2. Create a detailed write-up describing the envisioned custom agriculture system that Hoʻokuaʻāina plans on implementing on their new plot.
3. Create an ArcGIS StoryMap to describe the operation and ideology surrounding the new plot of land.

Our team collaborated with Hoʻokuaʻāina to develop the custom agriculture system for the newly acquired land and produce outreach materials for donors in the form of an ArcGIS StoryMap. This section outlines the process to obtain, analyze, and apply information to successfully meet project expectations.

3.1 **Analyze community-based farming practices worldwide**

This objective focused on analyzing multiple studies and research done on community-based farms and other models of community agriculture. Research was done on published articles from credible sources to analyze problems and challenges that can occur when starting community-based projects and what are some common factors that lead to success. To find these published articles, research was done on Google Scholar and some articles were provided by Becca Croft from Hoʻokuaʻāina. Then, after thorough reading, these were sorted as useful and not useful, depending on their relevance to the objective. The team reached out to organizations around the world to conduct interviews with experts to gain insight from people with first-hand experience. To identify these experts, we searched for successful community gardens and other projects of regenerative agriculture on Google. The email in Appendix A was used to contact them. Despite reaching out to several organizations as can be seen in Table 1, some were slow to respond, which resulted in delayed interview schedules and a few cancellations. Eventually,

interviews were arranged accordingly, and throughout the interview process, detailed notes were taken.

The team then conducted a qualitative analysis of the information obtained through the interviews and cross-referenced it with the findings from the published articles into a research paper that would aid Hoʻokuaʻāina in their planning stages of the new system. Observations in the paper focus on the challenges other organizations faced when starting their similar ventures, including membership policies, self-sustainability, participation incentives and inter community conflict resolution.

Table 1. Organizations contacted for interviews.

Name	Organization	Role	Location	Date Contacted	Scheduled Interview Date
Becca Croft	Hoʻokuaʻāina	Event Planner	Kailua, Hawaii	1/22/2023	1/26/2023
Jose Javier Guarderas	Sambito	CEO	Guayaquil, Ecuador	2/3/2023	1/30/2023
Ana Mines	City of Honolulu	Community Gardens Project Manager	Honolulu, Hawaii	1/20/2023	1/31/2023
Judith Robinson	West Side Community Garden	President of the board of directors	Manhattan, New York	2/7/2023	2/13/2023
Claudia Salem	Yo Siembro Ecuador	Owner	Cambridge Massachusetts	2/4/2023	2/14/2023
Christian Jocknick	Juntos	Owner	Ibiza	2/8/2023	2/24/2023
Susanne	Common Grounds	Representative	Berlin, Germany	1/29/2023	Response, no interview
Website Contact	City Sprouts	Representative	Cambridge, Massachusetts	2/8/2023	Response, no interview

Website Contact	Polyface Farms	Representative	Swoope, Virginia	2/17/2023	Response, no interview
Website Contact	Givaudan Foundation	N/A	Milan, Italy	1/29/2023	No response
Website Contact	Prinzessinnengarten	N/A	Berlin, Germany	1/29/2023	No response
Website Contact	Il Giardino Degli Aromi	N/A	Milan, Italy	2/7/2023	No response
Website Contact	Hortas Carioca	N/A	Rio de Janeiro, Brazil	2/7/2023	No response
Website Contact	Calthorpe Community Garden	N/A	London, England	2/7/2023	No response
Website Contact	Culpeper Community Garden	N/A	London, England	2/7/2023	No response
Website Contact	De Runde Haver	N/A	Nærum, Denmark	2/7/2023	No response

3.2 **Create a detailed write-up describing the envisioned custom agriculture system that Hoʻokuaʻāina plans on implementing on their new plot.**

To fully develop the custom agriculture system, the team focused on compiling the potential concepts for the custom agriculture from the visions of Dean and Michele Wilhelm. The team also focused on gaining insight and opinions on these concepts, both positive and negative, from the current employees at Hoʻokuaʻāina. The viewpoints of the staff were very important, since they have years of experience working at Hoʻokuaʻāina and understand its operations. This gave us insight into whether the staff believed this idea and plan was feasible, or not. Our team used interviews and roundtable discussions to create the finalized write-up of the system's functionality. The team also examined challenges Hoʻokuaʻāina may face with the creation of the custom system and provided recommendations.

To complete this objective, first our team interviewed Dean Wilhelm – Hoʻokuaʻāina's co-founder – to obtain his vision and ideas for features of the custom system. Our team used a

combination of structured and semi-structured interview questions. These questions were structured to guide the discussion through how the entire system will function and to spark ideas about specific parts of the system which Dean may not have previously thought about. Ultimately, this helped the team gather the detailed information needed to better define the system.[4] After the interview, the team created a draft write-up and a schematic to explain the system based on Dean's vision.[5] Figure 6 shows the team's first meeting with Dean Wilhelm (right most), Becca Croft (second from the right), and Michele Wilhelm (third from the right).

Figure 6. Initial meeting with Dean (far right), Becca (second from right), and Michele (third from right) to discuss project parameters. The team also interviewed Dean after this meeting.

The initial draft materials were reviewed in a roundtable discussion with Hoʻokuaʻāina staff conducted on January 25, 2023, to gain feedback and insights into alternative suggestions and collaboration for the custom system. The roundtable discussion was important for the further development of the system as the ideas and perspectives of those who will be working on the new plot are highly valued by the founders. The team brought the initial draft for participants to

[4] See Appendix B for the Dean Wilhelm's interview.
[5] See Appendix C for the initial draft write-up and schematic.

review at the roundtable and verbally described the sections within it, and then we gathered the staff's thoughts or other input on the endeavor.

Drawing from Dean Wilhelm's initial interview and the first roundtable discussion session, we created a secondary draft of the system. This write-up was used, and specific sections were examined in a second roundtable discussion[6] to gather remaining insights and opinions from Hoʻokuaʻāina staff.

We used all the information gathered from each of the discussions to create a final draft write-up of the system.[7] This eventually can be used to share the venture with the broader community. Also included in the write-up was a list of recommendations from our team, based on challenges that have been found in Objective 1 and includes potential changes that could be made to remediate these challenges. The entire write-up of the system was intended to be primarily used internally within Hoʻokuaʻāina but was created to be easily edited and distributed to other interested parties. Its purpose was to describe and illustrate the future development of the system. The infographics and visual aids included within were intended to be used for the communication of these ideas to a broader audience.

In addition, the team was tasked with incorporating specific data on the feasibility and production of certain crops for the 116-acre plot. First, the team conducted online research from multiple sources, such as Google and Google Scholar, to discover which crops thrive in Oahu's climate and soil type, as well as when the peak harvest season for each of these crops is. We organized our findings in a table consisting of the crops that are suited to the Palawai region's climate and soil condition[8], as well as which seasons each crop produces its peak harvest in Hawaii. We selected ten crops for further research and analysis based on their cultivation popularity in Hawaii (Watson, November 2020).

We consulted multiple sources to determine: the spacing of each crop from one another when planting, the average amount of produce grown by each individual plant, the average weight in pounds per fruit or vegetable, and the average time from planting to harvest. Some

[6] See Appendix D for Notes from Roundtable #2
[7] See Appendix E for the Custom Agriculture System.
[8] The soil condition of the Palawai lands is Hanalei soil. This information was given to us by Michele Wilhelm via personal communication. Information about Hanalei soil found at State of Hawaii Land Use Commission, October 2018, in References.

estimates are based on plant averages from Hawaii; however, others are from various parts of the world due to the little number of online resources specific to Hawaii. These estimates also assume fertilizer use and pesticide use when needed, due to some values coming from parts of the world with significant crop pest issues. Once this information was gathered, we began calculating the number of pounds of produce grown by each crop for each individual plot. To simplify calculations, we set an estimate average for each plot at 3,025 sqft, or 55 ft by 55 ft. We also rounded down all decimal values to keep all numbers whole and to not overestimate calculations. We then calculated the values for each type of differently managed plots. The types of differently managed plots, as envisioned by Dean Wilhelm, will be 100 plots farmed by Hoʻokuaʻāina staff and 200 plots farmed by community participants, for a total of 300 plots. All calculations described below can be seen in Appendix F.

First, for each specific crop we calculated how many plants would be planted in each plot. Since plot shape and size is likely to vary in real world conditions, as well as drainage and soil factors, the numbers produced from the calculations below are rough estimations. More accurate estimations can be made after the new plots have been laid out and specific characteristics of each plot have been evaluated. To make our calculations simpler, we imagined the plots to be a 55 ft by 55 ft square grid, containing 3,025 ft^2 boxes. Each plant can be placed in the center of one of these grids at an appropriate spacing, according to its characteristics.

The example below shows this equation in use, as well as an aerial diagram of the layout seen in Figure 8. For example, if each plant is spaced 4 ft apart in each row and each row is spaced 7 ft apart, there would be:

$$\frac{55\ ft}{4\ ft\ per\ plant} \times \frac{55\ ft}{7\ ft\ per\ row} \approx 108\ plants\ per\ plot$$

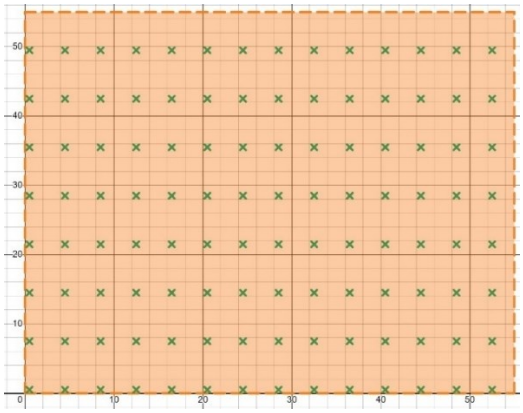


Figure 8. Aerial representation of the layout of each plot for the example above, with each box equaling 2 ft, to fit the entire plot into the image.

Next, we projected the amount of produce that could be grown in each plot. We did this by multiplying the number of plants per plot that we had already calculated by the estimated average amount of produce grown by each individual plant. Once we found the amount of produce grown in each plot, we were able to calculate the weight in pounds of the produce grown in each plot. This was calculated by multiplying the produce grown in each plot by the average weight per produce. This number is the estimated average pounds of produce grown per plot for each crop's specific time until maturity.

Finally, we used that estimate to calculate the three main parameters that we were tasked with finding: the expected yield per growing cycle for the organization-plots, the community-plots, and the total plots. To estimate the average total pounds of produce for all 100 organization plots, we multiplied the estimated average pounds of produce grown per plot by 100. We did the same calculation but multiplying by 200 and 300 to the community plots and total plots respectively. The equations used and final calculations for these crops were formatted into a report which can be found in Appendix F.

3.3 **Create an ArcGIS StoryMap to describe the operation and culture of the new plot of land.**

This objective focused on producing outreach materials based on the custom system described in the second objective for a broad audience. This material explained the custom agriculture system and the culture embraced by Hoʻokuaʻāina.

An ArcGIS StoryMap was selected as the medium to share these ideas for its user-friendly interface and variety of ways to capture the reader's attention; visuals, audio clips, text, and maps creates stories in the form of an interactive webpage (ArcGIS, n.d.). StoryMaps are easy to distribute digitally and update by the organization. Additionally, this format allowed our team to better express the abstract emotional argument of the organization and collectively communicate its culture and ideology. The StoryMap can also be used to encourage community participation in the custom system in addition to gathering interest from donors.

To create the StoryMap, our team first got to know the Hoʻokuaʻāina staff personally and participated in daily farm activities. The team worked alongside the staff in the loʻi[9] one to two times per week to "talk story,"[10] to understand the emotions and background of each participant in relation to their work at Hoʻokuaʻāina. Additionally, our team participated in morning meetings prior to starting work. Figure 9 shows the team on the edge of the loʻi after working with the staff for the first time.

Figure 9. Photo of Team after working in the loʻi. The team jumped into the muddy patches and helped with weeding and maintenance of the plots alongside the staff.

[9] Kalo patches (Kwiat, 2021)
[10] Informal conversations with staff/volunteers/Hoʻokuaʻāina community, etc., mostly about life experiences and feelings evoked through Hoʻokuaʻāina affiliation (*Talk Story*, n.d.)

The design process started with a review of some existing StoryMaps. Our team evaluated example StoryMaps from ArcGIS – including some that were produced as part of past WPI Interactive Qualifying Projects – to better understand the capability and potential of this medium. Reflecting on the way we interacted with each of these StoryMaps, our team met to brainstorm key ideas and produce an initial outline.[11] The draft outline was shared with our primary contacts at the organization, Dean Wilhelm, Michele Wilhelm, and Becca Croft, to receive initial feedback. The feedback obtained was then incorporated into the outline and StoryMap production began.

Audio and visual data was gathered during our time working in the loʻi and meeting with the staff, always with permission from the parties being recorded. Existing photographs and transcripts of previously completed interviews of individuals associated with the organization were provided by Hoʻokuaʻāina. Videos and photos were then added to the StoryMap to compile a story and supplement the narrative.[12] Additionally, the team created a screen capture video demonstrating how to update and modify the StoryMap in the ArcGIS website for Hoʻokuaʻāina's future use.

[11] See Appendix G for the StoryMap Outline Draft.
[12] See Appendix H for Quotes and Images for the StoryMap.

4. Results

4.1 **Analyze community-based farming practices worldwide.**

The result of this analysis was a comprehensive research paper found in Appendix H. Our research paper combines information from various published sources, websites, and insights gathered from interviews with experts in the community agriculture field. We sought the advice of several global organizations that share similar goals with Hoʻokuaʻāina, and their valuable inputs are included in the individual appendices listed in Table 2 under the interview summary column. During these interviews, the experts generously shared their experiences, growth, and beginnings.

Our research paper discusses effective agriculture methods that Hoʻokuaʻāina can implement. We have included stories and examples from our interviews with experts to illustrate our findings better. The final outcome of our research is a set of recommendations based on these insights and suggestions from the experts we interviewed and the analysis of the published sources and websites. These recommendations are aimed at assisting Hoʻokuaʻāina in achieving its mission more efficiently and sustainably.

Table 2.

List of people who were interviewed for this research.

Name	Organization	Role	Location	Interview Date	Interview Summary
Becca Croft	Hoʻokuaʻāina	Event Planner	Kailua, Hawaii	1/26/2023	N/A
Jose Javier Guarderas	Sambito	CEO	Guayaquil, Ecuador	1/30/2023	N/A
Ana Mines	City of Honolulu	Community Gardens Project Manager	Honolulu, Hawaii	1/31/2023	Appendix I1

Judith Robinson	West Side Community Garden	President of the board of directors	Manhattan, New York	2/13/2023	Appendix I2
Claudia Salem	Yo Siembro Ecuador	Founder	Cambridge Massachusetts	2/14/2023	Appendix I3
Christian Jochnick	Juntos	Owner	Ibiza, Spain	2/24/2023	Appendix I4

4.2 **Create a detailed write-up describing the envisioned custom agriculture system that Hoʻokuaʻāina plans on implementing on their new plot.**

To create the first draft for the custom system, the team interviewed Dean Wilhelm, co-founder of Hoʻokuaʻāina, to discover his vision for the custom system. Dean's interview as well as responses to the questions we asked, can be seen in Appendix B. Through the questions we asked, we identified the key aspects of the envisioned custom system. These were hui dynamics, crop rotations, staff roles, facilities, trainings, commitments, expectations, internal market, crop distributions, and conflict resolution. Based on this interview, we created an initial write-up to describe Dean's vision, which can be seen in Appendix C.

Once the first draft of the custom system was created, the team shared the document with the Hoʻokuaʻāina staff members via email. The team then conducted a roundtable discussion with the staff on January 25th. The staff who participated in the discussion can be seen in Appendix C. The team asked the staff what parts of the write-up were unclear and needed further clarification, but the staff believed the custom system was described clearly despite being in its early stages. This is significant since the staff members, other than Dean and Michele Wilhelm, were unfamiliar with all aspects of the custom system and this was the first time the staff had an explanation of the vision for the system. This means that our initial custom description was coherent enough to allow uninformed audiences to envision the basic premise of what the custom system will look like when it is fully functioning. The team also asked the staff to share their thoughts on the proposed architecture of the system and the rules that would be put in place. A few examples of these thoughts were:

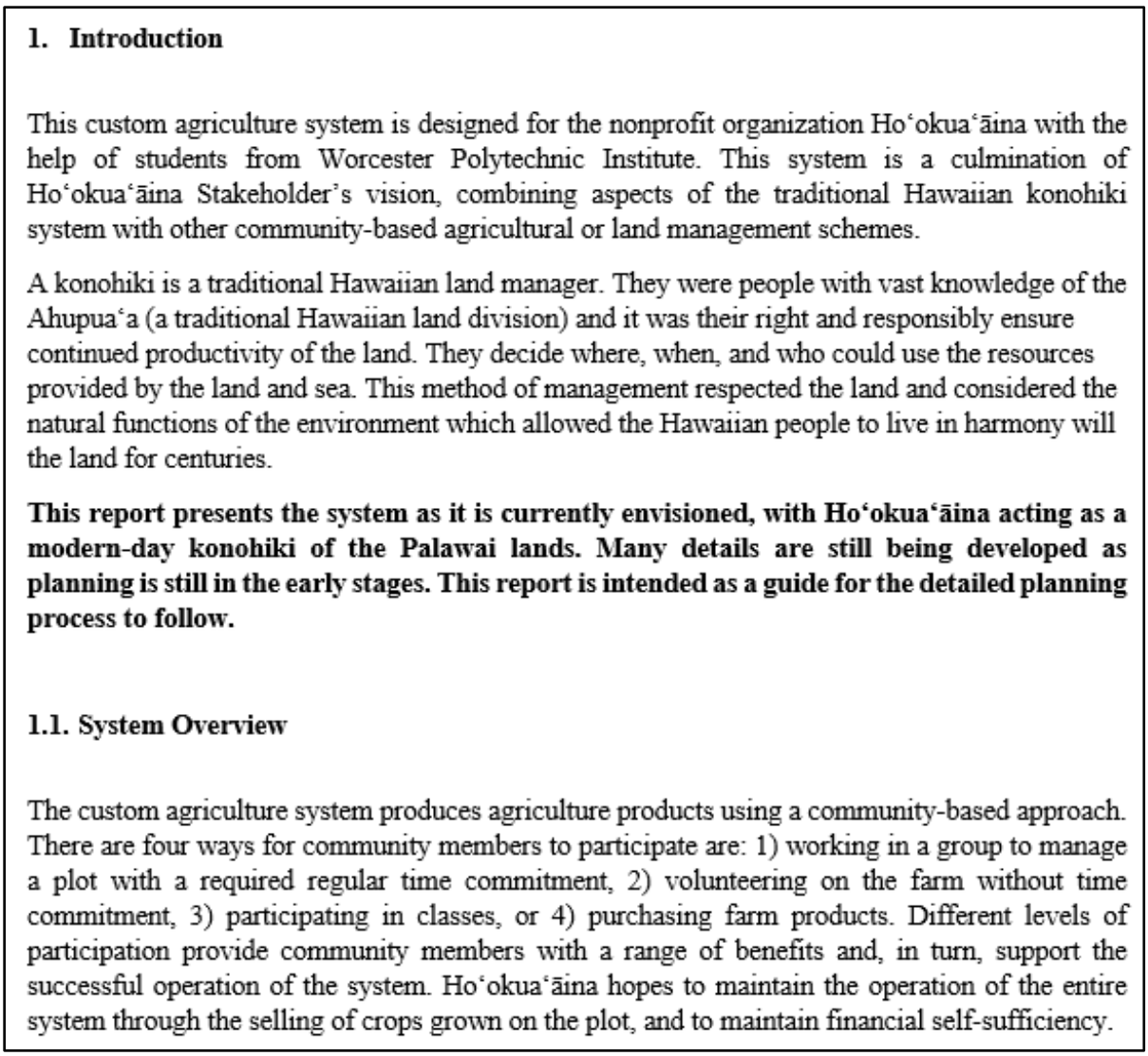
- hui members should not log their own hours.

- unfairness of all members gaining an equal amount of ‘credits’
- the idea of the internal market being unfeasible.

We recorded notes on the feedback we received and then organized staff feedback into a chart by similar topics, which can be seen in Appendix C.

The team then revised the first draft, before having a second roundtable discussion with the Hoʻokuaʻāina staff. The staff members who were present at the second discussion can be seen in Appendix D. The second iteration of the custom system write-up was organized into a paper format with sections and subsections for each component of the system. The staff reported that this iteration of the custom system write-up was easier to understand and much more detailed. Some of the insight we gained from this roundtable includes that the misconduct section needed to sound less harsh and that Hoʻokuaʻāina would like a contract signed by all hui members who are participating in the program. The team used this feedback, as well as additional feedback from Dean and Michele, to make the final version of the custom system write-up.[13] The final version of the custom system write-up is similar to the second iteration write-up in terms of format. The write-up is in the form of a paper with headers describing the main system and sub-headers containing each component of the main system. Each sub-header has a few paragraphs describing the specific component of the main system, including its purpose and how it will function. The style of this deliverable can be understood better by viewing the documents’ introduction page, which can be seen below in Figure 10.

[13] See Appendix E for the Custom Agriculture System.



1. Introduction

This custom agriculture system is designed for the nonprofit organization Hoʻokuaʻāina with the help of students from Worcester Polytechnic Institute. This system is a culmination of Hoʻokuaʻāina Stakeholder's vision, combining aspects of the traditional Hawaiian konohiki system with other community-based agricultural or land management schemes.

A konohiki is a traditional Hawaiian land manager. They were people with vast knowledge of the Ahupuaʻa (a traditional Hawaiian land division) and it was their right and responsibly ensure continued productivity of the land. They decide where, when, and who could use the resources provided by the land and sea. This method of management respected the land and considered the natural functions of the environment which allowed the Hawaiian people to live in harmony will the land for centuries.

This report presents the system as it is currently envisioned, with Hoʻokuaʻāina acting as a modern-day konohiki of the Palawai lands. Many details are still being developed as planning is still in the early stages. This report is intended as a guide for the detailed planning process to follow.

1.1. System Overview

The custom agriculture system produces agriculture products using a community-based approach. There are four ways for community members to participate are: 1) working in a group to manage a plot with a required regular time commitment, 2) volunteering on the farm without time commitment, 3) participating in classes, or 4) purchasing farm products. Different levels of participation provide community members with a range of benefits and, in turn, support the successful operation of the system. Hoʻokuaʻāina hopes to maintain the operation of the entire system through the selling of crops grown on the plot, and to maintain financial self-sufficiency.

Figure 10. Screenshot of the Introduction page of the final version of the custom system write-up. The full system write-up can be seen in Appendix E.

To supplement the custom system write-up, the team also successful researched and calculated potential crop yield estimates. We researched and analyzed numerous crops to determine which would be the most productive on the new plot. From this, we created a list of potentially productive crops, discovered their peak harvest seasons, and estimated 10 of the crops' yields.[14]

[14] See Appendix F for the Potential Crops and Yields

4.3 **Create an ArcGIS StoryMap to describe the operation and culture of the new plot of land.**

In this section we outline the information collected and condensed to fit into the StoryMap created for Hoʻokuaʻāina.[15] After reviewing other StoryMaps, such as "Stories of Albanian-Americans in Worcester" and "Hoʻohonua: Honouliuli Stream" we established an understanding of the versatility of StoryMaps, and their ability to host specific numerical data as well as less quantifiable qualitative data, such as individual stories and people's feelings surrounding an idea (Caten et al., 2021 and Kamalu, 2020). From the initial information gathered in Objective 2, the team decided that the main aspects that would benefit Hoʻokuaʻāina's outreach are a description of the custom system, a understanding of where the plot is located, and the current impact the organization has on participants and staff. As such, we determined that the StoryMap will have three sections: a custom system section to briefly explain custom system and the intention behind it; an environmental and cultural section to demonstrate the diverse benefits of the custom system for the community and the environment; and a story section to present some personal reflections of Hoʻokuaʻāina's impact from those who have worked closely with the organization.

The StoryMap was populated with photos and videos taken by Hoʻokuaʻāina staff, or by us, to create a more visual environment. The chosen visuals were important to help draw and maintain the readers' attention, and to spur a more thoughtful reflection of the impacts Hoʻokuaʻāina can have on the plot. Included alongside these visuals are references to maps of Oahu and Maunawili, with specific focus on the current plot, and the expansion down the road. Including the maps gives the reader an understanding of the plots in relation to the rest of the island, which may provide a stronger impact for the reader.

Overall, the StoryMap aimed to be an effective way for Hoʻokuaʻāina to share their ideas about the new plot with a broad audience, from potential donors to potential participants. Including the specific impacts the organization's programs have had on participants can promote a more mindful thinking of the impact the new plot could have for new participants, which is important for attracting both donors and community members. The quantitative data collected,

[15] The StoryMap Link and PDF can be found in Appendix J

such as the potential pounds of food that can be produced in a growing season, can be equally influential for donors and community members to understand how much of a difference the organization can make in the community. As a result of exploring the StoryMap, we hope donors are more interested in funding the new endeavor and community members are interested in becoming a participant in the future.

4.3.1 Custom System Section of StoryMap

The purpose of the custom system section of the StoryMap is to introduce the custom system and its functionality. We repurposed the information collected from objective 2 for this section. The information gathered in Objective 2 explored the interactions among the three main stakeholders, Hoʻokuaʻāina, community participants, and the farm itself. This information was simplified and condensed, as not to overwhelm the reader. Emphasis was placed on the opportunities for community involvement as well as the impact that the program can have on community members and Oahu itself.

In addition to specific roles within the system, the StoryMap examined the historical perspective of such a system through past examples such as the traditional Hawaiian konohiki system. Many of the aspects Hoʻokuaʻāina plans to implement combine historical context, such as having one land manager acting as the konohiki and a group working to be collectively productive. This information was shared in the StoryMap alongside the custom system to provide readers with historical context, which further exemplifies the impact it can have on the community.

This section was spilt into two sections and renamed to "Our ʻĀina" and "Our Plan" for the final draft. "Our ʻĀina" provides the historical context and "Our plan" focuses on the custom system and Hoʻokuaʻāina's plan for its implementation. These titles were chosen to make the StoryMap more inviting to the reader and to fit with Hoʻokuaʻāina's voice.

4.3.2 Environmental and Cultural Significance Section of StoryMap

The environmental and cultural significance section of the StoryMap examines the historical cultural significance of the Palawai[16] lands as well as the environmental impact the

[16] Historical name of the region of land being purchased by Hoʻokuaʻāina. The current land Hoʻokuaʻāina is on is known as Kapalai.

custom system will have on the landscape. Our team used the historical data Hoʻokuaʻāina collected for a presentation to the Legacy Land Conservation Commission[17] to apply for the remainder of the grant money needed to purchase the 116-acre plot. This included images and maps showing the lands' former agricultural use and the cultural sites on the Palawai land. We incorporated this data into the StoryMap to show the context behind the application of konohiki system components, and the historical connection behind the cultivation of kalo on the land.

Additionally, environmental factors were included in the StoryMap, including the restoration of the 116-acres to similar environmental levels as it was before the introduction of western influence, with the restoration of natural springs and the return of native wildlife. In this section, descriptions of the environmental protections Hoʻokuaʻāina plans to incorporate, including the protection of agricultural lands, watershed lands, and habitats for native species. These three protective endeavors may be highly influential while acquiring donors and participants, as the organization hopes to promote a strong influence of environmental stewardship that others will look to in the future.

This section was renamed to "Our Impact" for the final draft of the StoryMap because it shows the potential impact Hoʻokuaʻāina can have on the community and the environment. Additionally, the revised title makes the StoryMap more inviting to the reader and fits with Hoʻokuaʻāina's voice.

4.3.3 Story Section of StoryMap

The purpose of the story section of the StoryMap was to highlight the ideology and culture around Hoʻokuaʻāina for their current operations and for the new plot of land. The team spent time in the beginning of the project focusing on understanding the culture on the farm. Working alongside staff members in the loʻi was engaging to "talk story" and learn about their life stories – how their relationship with Hoʻokuaʻāina began and how it has impacted their life.

The team spent a total of seven days throughout the term in the loʻi alongside the staff getting a feel for their individual journeys and experiences. Most of this time was spent

[17] The Legacy Land Conservation Commission (LLCC) advises the Board of Land and Natural Resources and includes a yearly grant for organizations to apply to get a portion of the Land Conservation Fund, which is provided for by the State of Hawaii from real estate conveyance taxes. Hoʻokuaʻāina presented to the LLCC on February 9th, 2023 ("Legacy land conservation program," 2023).

interacting and engaging with the staff to get the best feel for what Hoʻokuaʻāina is aiming to promote – personal growth and connection to ʻāina (land). In addition to the time spent interacting with staff and volunteers, we conducted a series of brief interviews to collect testimonial from current staff and participants in Hoʻokuaʻāina's programming to include in the StoryMap.[18] These interviews focused on the impact Hoʻokuaʻāina has had on their lives, and the impact the organization will continue to make for those around them.[19] We found a wealth of similarities among the responses, as many focused on personal growth or positive changes in their lives. The testimonials were condensed in the form of short quotes and included in the StoryMap.

This section was renamed to "Our Community" for the final draft of the StoryMap because it shows some testimonials and stories from members of the community within Hoʻokuaʻāina. Additionally, the revised title makes the StoryMap more inviting to the reader and fits with Hoʻokuaʻāina's voice.

[18] See Appendix H for the Quotes and Images for the StoryMap.
[19] See Appendix K for the Impact Interview Script and Notes.

5. Recommendations

The main goal for this project was to help Hoʻokuaʻāina develop a custom agriculture system with a focus on fostering community and preserving culture. As part of this endeavor, we provided three resources for our sponsor. First, we compiled information on the functionality of similar community-based farming practices with recommendations on the applications and ideas for their custom system, including a document of potential crops and yields. In addition, the write-up of the custom system includes specific recommendations for some of the aspects that Hoʻokuaʻāina could plan on implementing. Finally, the StoryMap provides a storytelling medium that Hoʻokuaʻāina can manage independently and update as they expand their operations in the future. In this chapter, we describe recommendations for Hoʻokuaʻāina to implement and improve upon moving forward with their expansion, based on the three deliverables created.

5.1 **Recommendations from analysis of community-based farming practices worldwide.**

Based on the analysis of the published articles and the interviews with experts on the field of community farming, we identified certain aspects that Hoʻokuaʻāina can take into consideration as they plan for a successful venture. These recommendations include the following:

5.1.1 Diversifying Revenue Streams

In our interview, Claudia Salem emphasized that non-profit organizations working with community farming must diversify their sources of income to be successful. While donations can provide important support, depending solely on them is not sustainable in the long term. We recommend three more ways to generate additional income: developing more value-added products like kalo flour or kalo chips that could be sold at supermarkets, offering participation and agricultural education classes for people interested in growing crops at home, and once the organization reaches a sufficient size, Hoʻokuaʻāina can offer subscriptions for community members to purchase and collect their produce directly from the farm. These approaches could be profitable sources of revenue once the new plot is established and running smoothly. By exploring multiple revenue streams, non-profit organizations like Hoʻokuaʻāina can create a stable and sustainable financial foundation to support their mission of community farming.

5.1.2 Leveraging Events and Gatherings to Build Community at Hoʻokuaʻāina

In the interview with Judith Robinson, she discussed the success of the West Side Community Garden and how it has attracted many participants. She attributed some of this success to the garden's well-planned events, which are actively promoted and draw the attention of individuals who may be interested in participating or contributing to the garden's efforts. We recommend Hoʻokuaʻāina offers events and activities that appeal to a wide range of people, such as workshops, lectures, and community gatherings. These activities cultivate a sense of belonging and a spirit of collaboration among its participants and visitors. Additionally, these events can help to raise awareness of Hoʻokuaʻāina's mission and goals.

5.1.3 Establish an internal government structure

Based on the analysis and interviews with experts in the field of community-based farming, it became clear that successful projects have established government structures that keep things running smoothly and also have internal rules and policies that must be followed by the participants. These government structures are responsible for making decisions that impact the land and participants involved. We recommend establishing an internal government structure to oversee the operations and make important decisions. Additionally, we recommend creating a comprehensive set of rules and organizational policies in collaboration with this governing body to establish a framework for effective and respectful participation.

5.1.4 Connect with a network of experts in the field of community-based farming

The team will provide a list of contacts that were interviewed during the research process. These individuals possess valuable knowledge and experience and have demonstrated a willingness to share their insights with others. We recommend staying in touch with these experts so that Hoʻokuaʻāina can continue to benefit from their expertise and advice in the future, while also sharing its own experiences and lessons. Furthermore, by cultivating long-term relationships with community-based farming professionals, Hoʻokuaʻāina can build a strong network of support that can help ensure the success of future projects for all parties involved.

5.2 **Recommendations on the form and implementation of the custom agricultural system**

Through discussions with Dean Wilhelm and the Hoʻokuaʻāina staff, we developed a write-up of the custom system as it is currently conceived. It was apparent that the endeavor was

in its very early stages, and therefore, much of the information included within our system plan allows room for flexibility. Here, we present recommendations based on four main subcategories examined within the final write-up of the system: 1) Land Use and Management, 2) Konohiki System, 3) Volunteers and Community Members Subsystem, and 4) Crop Management.

5.2.1 Land Use and Management

Based on numerous discussions with Dean and Michele Wilhelm and Hoʻokuaʻāina staff members, we propose two recommendations regarding the land use and management of the new piece of land. First, since a key goal of Hoʻokuaʻāina in their new custom system is to be financially self-sustaining, as seen in the Custom System Write Up, we believe that the organization should create a detailed plan on the development of plots, and which will be managed to create a source of income in the beginning of the development process. This can help fund the organization while land clearing, prepping, and construction is ongoing. It will also serve as an example of how each loʻi should look and be worked on to future participants.

Second, we recommend that there is a structured plan in planting priority, as crops that need a significant amount of time to mature should be planted early in the process of developing the land. A few examples of this would be prioritizing planting fruit-producing trees, such as bananas, cacao, and mangoes, since they usually need several years before they are mature enough to begin producing fruits. This will allow initial participants to gain the benefits of fruit from trees earlier on, rather than having to take care of the tree at its earlier stages when it produces no fruit.

5.2.2 Konohiki System

After getting an initial understanding of the intended dynamics between the hui and Hoʻokuaʻāina staff, the team has proposed recommendations to alleviate tedious staff work, improve organization and record-keeping, and mitigate altercations. One recommendation to reduce the amount of work for staff is to create an app that can be used to keep track of hui participants. Some hui participant activities this app may track are hours spent in the loʻi, trainings completed, farm volunteer hours, and what type of equipment each member is approved to use. An app would be an effective way to store this information and be able to easily update and maintain it. We also recommend designating a staff member who is solely responsible for maintaining records of all participants, volunteers, and visitors brought by hui members. This

will help reduce confusion between staff members and reduce the risk of logging inaccurate or inconsistent information.

As our team conducted the roundtable discussion, the importance of efficient communication between hui members and the staff was brought to our attention. The team believes that an email system between the hui point person and the staff would be the most efficient way to share information. The email system may take the form of a group alias that can send mass emails of information to a large group of people. This would also be an effective way to log all communication between the hui point-person and staff. This is important especially if a problem or conflict were to arise in the future, and all communications consisting of warnings or infractions would be easily accessible along with their sent date and time. Additionally, like the approach used by Honolulu Community Gardens (A. Mines, personal communication), having a community area where announcements are posted regularly on a bulletin board may be helpful for those who are less technologically inclined.

To avoid conflicts between hui members and staff regarding miscommunication about expectations, the team strongly encourages Hoʻokuaʻāina to create a written contract that all hui members must sign. This contract will clearly outline all expectations and rules for each member. A few examples of what this contract may include are:

- 40 hours of volunteer farm work per year outside of personal loʻi work.
- Loʻi must be weeded and maintained up to Hoʻokuaʻāina's standards.
- Participants may not work on other hui loʻi unless given permission.

This will also be helpful by giving reasoning for removing a person from the program if they are not honoring the contract which they signed prior to joining.

The team also recommends that Hoʻokuaʻāina creates a written application process plan to share with potential participants. This will help outline all steps that each applicant will go through. We also recommend that a written portion of the application process is created and asked to be filled out. This will help gather information about each applicant and whether they could be a good fit for the program or not. Specifically, having a short essay section of the application (250-500 words) about the applicants' reasoning and interest in joining the endeavor would be helpful in getting a general understanding of their perspective on the program.

5.2.3 Volunteers and Community Members Subsystem

Although it was expressed to us by the Hoʻokuaʻāina staff that they believe they will get enough public exposure through word of mouth, the team advises that Hoʻokuaʻāina supplements this form of public outreach with other practices. We recommend having a monthly ‘community day’ on the new plot, where Hoʻokuaʻāina can share their work and progress with a larger portion of the community who are not currently involved in the program. We would recommend advertising this event online and on online community pages. This would grant Hoʻokuaʻāina greater exposure to the community and allow potential participants to see their work first-hand. Along with this, the team recommends that Hoʻokuaʻāina continues to have their normal weekly volunteer days to still engage volunteers who are not interested in joining the custom system program.

5.2.4 Crop Management

To ensure all hui and loʻi are being productive, the team recommends Hoʻokuaʻāina create and update a list with estimated harvest times for each hui and organization loʻi and the crops grown currently and previously. The harvest time data can be estimated based on the date the crops were planted, which will be provided by the hui. This can be important to maintain to ensure any contracts will be fulfilled on time. We believe the best place to store this list would be in the app previously introduced in section 5.2.2. Having this in the same app as the hui participant activities would make it easier for staff to learn to use and keep all resources more organized.

The team also believes that hui participants need to be compensated fairly. To do this, we believe an expert should be consulted or asked to create the internal market system. This will ensure that the internal market system, including the credit structure, will be financially feasible and equitable for all participants. Without a specialist, we feel it will be hard to anticipate all issues that may arise or mathematically figure out the number of credits each hui should get based on the amount of food present in the market at a given time.

5.3 Recommendations on the use and maintenance of the ArcGIS StoryMap

Through the creation and development of the StoryMap the team began to understand some of its potential future applications and uses. It is an effective way for interested parties to get an understanding of what is going to be or is being accomplished in the new plot.

We recommend that Hoʻokuaʻāina continues to update and add to the StoryMap as a whole and add new information and perspectives as the new land is developed. This may include adding testimonials and new imagery to communicate how the project develops over time. In addition, including any layout plans or landscape architecture designs into the part of the StoryMap that focuses on explaining the custom system will greatly improve how effectively the StoryMap shows expected changes over time, which increases the potential impact of the StoryMap. Lastly, as the land is cleared and the custom agriculture system is implemented, adding specific data about community impact will show the audience the continued development of the land. This data may include how many people are becoming involved, how many people participate in community days, how many people buy from the market, how many pounds of food is produced, and how much food is donated or sold. Including this data can strengthen the argument surrounding the impact of the custom agriculture system and the StoryMap overall.

In addition, we recommend that Hoʻokuaʻāina pays $100 a year for the additional premium StoryMap account which grants the account holder access to more features. These features include access to media features such as image gallery, audio clips, website embeds, and timelines which can help to organize the StoryMap and create a more compelling story for the viewer. In addition, the premium account gives access to customization and editing tools for images, maps, themes, and layouts which can create a more coherent StoryMap and improve visibility for viewers. Lastly, the premium account can give access to detailed analytics to improve the StoryMap based on viewership, which can help Hoʻokuaʻāina promote the custom system to a broader audience. Paying for the premium ArcGIS StoryMap account can give access to new features that will enable Hoʻokuaʻāina to reach more people and tell a more compelling story.

6. Conclusion

Our team worked closely with the founders and staff of Hoʻokuaʻāina to help create a custom agriculture system that will be implemented on their new, 116-acre, plot of land. Our findings and recommendations have been established through research, interviews, and authentic, hand-on experience on the farm. Our research allowed us to identify common challenges that occur within a few different agricultural models from around the world. From these findings, we created a list of recommendations for Hoʻokuaʻāina to consider when implementing their custom agriculture system. The custom system itself was created through interviews with Dean Wilhelm as well as recommendations from things we learned and input from other Hoʻokuaʻāina staff. Using information from the custom agriculture system and insights from our experiences on the farm, we created an ArcGIS StoryMap to show the functionality of the custom system, as well as background information, and information describing the system's impact for the community and the environment. The StoryMap can be used to gain interest from donors, as well as community members.

It is our hope that Hoʻokuaʻāina can utilize and continue to update the StoryMap to show their continual progress in the development of the custom agriculture system. Our project is only a small part of Hoʻokuaʻāina's larger endeavor. We are thankful for this opportunity, and we wish everyone at Hoʻokuaʻāina continued success and prosperity.

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Appendix A – Email to Outside Organizations

Hello (contact or organization name),

I am a student from Worcester Polytechnic Institute and currently am in Hawaii doing a research project for an organization called Hoʻokuaʻāina, which is dedicated to planting a crop called Kalo. They are a non-profit organization that works with volunteers from the nearby communities of Kailua, a city on Oahu, Hawaii. Most of the volunteers are young people who have personal, family, and/or mental health problems. Other volunteers also go there to connect with nature and practice ancient traditions.

Throughout the history of Hoʻokuaʻāina, all of their volunteers have been able to connect with the land and create a family with the community that participates in this project. Recently, the organization had the opportunity to expand their operations from 3.8 acres to 116 acres on nearby land, and they are in the process of purchasing it. In this new area, the idea of participation is different from the previous one, as they will implement a new agriculture system that will have Kalo as well as other fruits and vegetables.

My team and I are working to help the organization decipher how this system will work. Although they are just beginning with this new operation, part of this help involves my research into community agriculture and regenerative agriculture projects around the world. This research aims to answer the following questions and more: How has this agriculture project been successful? What challenges has it faced along the way to get where they are? How involved is the community in this project? What was the most important reason for the founders to start this project?

Best,

Jose Tamariz.

Appendix B: Dean Wilhelm's Interview

This interview's purpose was to gain an understanding of Dean Wilhelm's vision for the custom agriculture system. We sought technical information about the operation of the custom system; however, we also received a substantial amount of data about the feelings and experiences that Dean Wilhelm would like the participants to experience while being a part of the program. We provided our reasoning behind each of the questions asked prior to asking them to Dean. It is ***not*** *a completely semi-structured interview format. The initial interview took place on January 14th, 2023, and follow-up questions were asked on January 19th, 2023.*

Interview Script:

"We are very excited to be here working on this project with you. We want to ask a few questions to understand your vision for the custom agriculture system. We understand you may not know the answers to the questions we are about to ask. Feel free to let us know if you are unsure or if you would like our team to assist in determining how to proceed with any of the aspects of the system.

With your permission we might also quote your responses, but if you prefer to remain anonymous then we will not reveal your name. You do not need to answer questions if you do not want to, and you can leave the interview at any time."

Initial Questions:

- What amount of participation do you expect from the community?
- What support will you provide to the community, such as training, etc.?
- Do you plan on having any community centered buildings (clubhouse, community center etc.?)
- Do participants need to provide any monetary fees to be involved (membership fees, dues etc.)?
- Are there different land options (acres etc.) for people to farm?
- Will there be a specific system for members to use to trade crops with each other? Or will it be at the participants' discretion?
- How will participants decide who to work with? Will there be options for people to work by themselves (on a potentially smaller plot) if wanted?
- How do you resolve team conflict? Could then people switch teams? How will that affect community interaction?
- Is there any information you think is critical to the development of the custom system that we did not touch upon?

Follow-Up Questions:

- What will happen if there are less plots than interested people?
- Is there a time limit for members to participate in a Hui?

- What training specifically will be provided?
- How does the vetting process work specifically?
- How often do people get credits?
- Do credits ever expire?
- How often will the market be available? Will it be like a farmers' market?
- Will there be preorder slips?
- Any other information we should know after today's questions?

Initial Questions January 14th, 2022:

Q: What amount of participation do you expect from the community?

- Want to create a space where people are a part, people won't be getting paid, balance between having them commit to the point where it's not work, but something that they have a stake in 'kuliana'
- It's like a respite space, decompress, refresh.
- Kuliana – responsibility, two edges, responsibility to do, and responsibility and the privilege to do.
- The mindset of responsibility can sometimes be a burden/weight.
- Privilege to do this work and be a part of the community.
- Hui – club, group org, everyone is contributing positively to the
- It's a balance between life and work.
- Each hui, about 4 people minimum, in charge of a specific patch, 3000 sq ft, size of. 1 person is the point person, between org and hui
- Flowing water on each patch, fallow a crop, rotate crops out
- Truck crops, corn, sweet potatoes, kale, lettuce cabbage,
- Crop rotate with things, and rotate with kalo
- Hui responsible Weeded out well, planted well, harvesting it. Have some choices outside of kalo what they want to care for
- The org will provide everything, seeds equipment etc.
- Goal is to create a culture "hu'ukpa" – culture of welcome
- The people come and steward their area, put up trellises etc.
- No investment needed at all
- Have to log 40 hours a year outside of your patch, which is 8 5 hour days on the year, contribute outside their patch, in order to participate
- Not just their kalo patch, have to look with big eyes to see the whole
- Part of clearing etc.

Q: What support will you provide to the community, such as training, etc.?

- Clear the area for them, manage the grass, they only have to care for the
- Major vetting process, essence, and form
- Essence is their heart, dialing into the values, and their mindset
- Form is their skills and how capable they are

- The most important is the essence
- Want people who want the essence, and want to contribute, and not just take
- Want to work on a collective
- Want to start off with people who have been in the program before (Rachel)
- Set up clear guidelines and expectations, how to carry yourself, how it works, and the mindset, the agreed to expectations.
- There will be classes etc. and people will learn how to work and will learn with each other to learn to get better, no matter how long it takes you. Its in your best interest to be as efficient as possible, and to bring in volunteers and
- Lots of word-of-mouth sharing
- May run thru the credits faster than others and will likely shop at the farmers markets first (internal market within org that needs to be sold)
- Building a culture of aloha
- The work of it when you know how to work shouldn't be too overwhelming.
- Giving people the privilege to be here with 0 investment coming in

Q: Do you plan on having any community centered buildings (clubhouse, community center etc.?)

- Food hub, kitchen, pickling, drying. having pigs and chickens for meat and eggs
- Forestry, orchards, fruit trees and Hawaiian medicinal plants
- Reforesting in native species for whatever is food
- Looking to develop 10-12 modest (900 sq ft) staff housing, can be a part of their living wage, will be a part of the security, will really be able to connect to the land 15-20 staff down the road
- A center which is the main hub, a certified kitchen, a market, main office, could be an event space, have an indoor center
- Building the housing first, then the big hub,
- First clearing the land, and planting the trees upfront, and build facilities for staff, and finally hub

Q: Do participants need to provide any monetary fees to be involved (membership fees, dues etc.)?

- No, aloha ʻāina club.
- Don't need to pay to start, just a time commitment/contribute w/ sweat equity to your lo'i.
- Don't have to buy your own land or anything.
- Care for the area and contribute to the culture of the community, and be proactive and realize you're a part of the culture, welcome people in, teach others

Q: Are there different land options (acres etc.) for people to farm?

- 1 acre is 43000 ft, and looking to put in 3000 patches, close to 10 patches per acre, give or take, of the 50 acres that could be converted into lo'i, if 30 were converted into lo'i, is 300 patches that can be farmed,

- 200 patches, 100 is for street revenue, and the other 200 is for the community, the hui of 800 people, not including the orchards, will bring in a lot of revenue.
- Have the best farmers market in all of Hawaii
- Each person will only be able to be a part of 1 hui
- The credits are distributed amongst the hui,
- Different grades of food, 1 grade will be for the stores, 2 grade – people will be able to buy credits at a lower cost, and the 3 will be donated.
- Creating an economy of Waiwai (wealth). Nobody can use this to create wealth, no selling, personal profit etc.
- Can only use the excess crops to share and eat personally.

Q: Will there be a specific system for members to use to trade crops with each other? Or will it be at the participants discretion?

- This may change in the future.
- You don't get to take home everything you grow, it'll be managed.
- It'll have expectations and criteria.
- To create equity of return, so conflicts are less likely to arise
- Give a general mindset of what can be produced
- Half of crops go back to Hoʻokuaʻāina, and the other half goes to the hui, but you get the value of the kalo, which is the monetary cost of the kalo
- Internal credit system, with an internal market
- Twice a week have a market to sell, the org goes to local markets, so everyone gets the same amount regardless of how everyone is productive, everyone gets the same amount
- The whole place belongs to all of us, but nobody owns anything
- Almost a bartering system, using credits instead, and you trade your labor (and crops produced) for other crops and meat etc.
- Some patches will be for more money crops
- The goal is to scale and to produce enough and sell enough so they the org can be sustainable without grants etc....

Q: How will participants decide who to work with? Will there be options for people to work by themselves (on a potentially smaller plot) if wanted?

- There will be a vetting process, and there will be a point person
- Everyone is going to have to go through the culturation process, and have to come and volunteer for a rime to see if they fit in
- Have to be committed to solving problems, everyone has to contribute to work together
- No rankings, konohiki system, the org will serve as the konohiki
- One person could manage this by themselves, but really want more people involved
- Something happens, someone gets sick, or someone has other life occurrences and can't give as much time commitment, which there should be 4 able bodied people

- Natural affinities outside of their own plots, and can become a leader for some of the other places, like avocadoes etc....
- Don't join if you don't want to do it
- A person may come to volunteer for a while before they be a part of a hui.

Q: How do you resolve team conflict? Could then people switch teams? How will that affect community interaction?

- Kapu system, once you break a promise/rule, you are expelled from the system, usually.
- Always giving grace to people, can make exceptions.
- The requirements will be clear, and
- Will be a clause for themselves, can be removed at any time if they feel they wanted to
- If you're not vibing in the way, they will get you out of the organization
- People think in community things in Hawaiian days that it was perfect.
    - There are always things or people who didn't want to follow the rules
    - Have clear boundaries, parameters, and expectations
    - Potentially chances for people to come back if they are kicked out
    - Everyone needs to love up to the standards

Q: Is there any information you think is critical to the development of the custom system that we did not touch upon?

- Become a refuge and a place of sanctuary for Hawaii
- A subculture withing the vulture
- Stewarding the environment
- No financial transactions
- Will have to be conservative in the internal market,
- Will start off slowly to see how much they produce and will have to build the markets.
- Must order the food in advance with this system internally.
- A big component is to give away some of the food to elderly and homeless people

Secondary Questions January 19th, 2022:

Q: What will happen if there are less plots than interested people?

- Waitlist
    - People will be let in once there are openings, people won't be rotated out just cause there is a waitlist
    - They want to have as many people active as possible
- Make them volunteers
- Turn organization plots into more community plots

Q: Is there a time limit for members to participate in a Hui?

- You're not locked in for life
- Hui is responsible for finding replacements if part of the hui leaves
- Won't kick people out based on how long they have been there even if there is a waitlist
    - If you're vibing with the land they don't want to kick you out

Q: What training specifically will be provided?

- A lot of trainings regularly (basic training – safety, how to use tools, how to work efficiently, how to set people up for success)
- How to do certain things like how to make poi, how to ferment foods, how to make compost, chocolate making, pickling, how to make imu, etc... - for people in the hui (small classes) and based on capacity people who are not a part of the organization can join
- The sky is the limit
- Participants can also teach classes if they want

Q: How does the vetting process work specifically?

- Vetting process will (hopefully) be an organic process. The first people that will be vetted will be regular volunteers.
- They will be proactive in seeking Hawaiian families that would like to participate.
- The core of volunteers will be from the Kailua area.

Q: How often do people get credits?

- Paycheck
    - Everyone gets the same amount of credits
    - Credits given based on circumstance
        - Credits will be given to participants based on how much is available on the market
        - "You eat what you get" Dean – Hawaiian phrase
        - Not sure exactly at what time periods credits will be distributed yet

Q: Do credits ever expire?

- A system will have to be figured out, people will not be able to horde credits.
- Maybe something like you can only use your credits within a year...?

Q: How often will the market be available? Will it be like a farmers' market?

- TBD
    - Maybe like 2 days a week
    - Making poi every week.
    - For anyone to come

        - Certain times are for participants (participants get first dibs for example), and then after that time anyone is allowed to come and purchase produce

Q: Will there be preorder slips?

    - Maybe get a box per week like a subscription farming kind of thing like imperfect produce box. Partially a subscription farm for people that want that

Q: Any other information we should know after today's questions?

- All hours will be recorded by Hoʻokuaʻāina.
- People will have to be flexible with what they grow, Hoʻokuaʻāina will say what needs to be grown and the hope is that people will take responsibility for that and take one of the crops that is needed to be grown.
- Hope to have the best farmers market in all of Hawaii.
- A lot of the tending to the trees (not actual farm plots) will be by the staff.
- "The quality of the people will determine the quality of what we do." (mostly how he said it)
- The selling of animal products will be done internally so that inspections and certifications won't have to be done on the same level to commercially produce
- Work hard like a for profit company but don't take a profit at the end give it back to the people

Appendix C: Initial Draft Write-Up and Notes from Roundtable #1

The purpose of this Roundtable Discussion was to explain to Hoʻokuaʻāina staff the vision for the custom system, obtained from the Interview in Appendix B. To aid in this discussion, we first created a draft Write-Up and Schematic based on our initial interview with Dean Wilhelm to aid the staffs' comprehension of Dean's vision, which is seen below. We then asked if the staff understood all portions of the custom system and what input or feedback they had. The following two pages with schematic, table, and sections were given to participants to help guide the discussion.

Roundtable Participants on Wednesday January 25, 2023 (not including Grace, Anthony, and Kaleigh):

Michele Wilhelm, Dean Wilhelm, Becca Croft, Cassie (Kauʻi) Nichols (Over Zoom), Benji Ah Sing, Kazu Akiona-Banan, Ari Lunow-Luke, Vance Kaleohano Farrant

Roundtable Discussion Overview and Agenda:

1. Explanation of meeting agenda/operation
2. Explanation of the system
3. Guided Discussion

For each of the topics below, we will discuss things people are unsure, confused, dislike, like, etc. about each of the proposed roles for each group.

- Staff and Organizational roles (pg. 2)
- Hui roles (pg. 2)
- Community/volunteer roles (pg. 2)
- Scale and community culture (pg. 3)
- Crop distributions (pg. 3)
- Internal credit system (pg. 3)

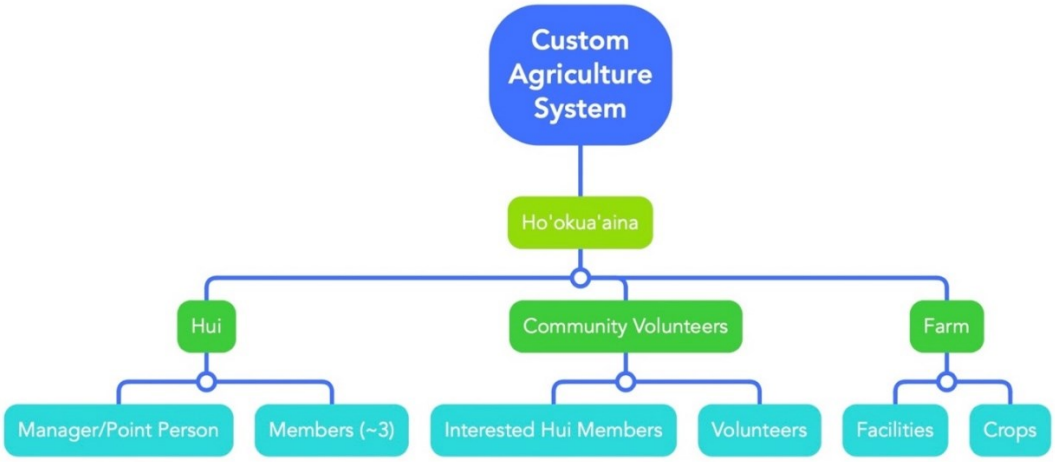

Figure 1. Schematic of Organizational Distribution within Custom System. The schematic shows the organization, Hoʻokuaʻāina at the top of the system, managing the Hui, the Community Volunteers, and the Farm. Within each of the three things being managed, the diagram splits into two subsets of each.

Staff and Organizational Roles:

- Divide and assign plots
- Provide training/classes
- Provide equipment (food processing)
- Approve/vet members
- Provide and maintain facilities (land, buildings etc.)
- Mediate conflicts / have a final say in conflicts
- Maintain records of all participants and volunteers (hours worked etc.)
- Provide staff benefits (wages / some housing)
- Manage crop rotations and crop selection
- Facilitate internal / external crop distribution (farmers market/contracts/subscription farming)

Hui Group Roles:

Manager:

- Report to organization (Can be the point person for the organization)
- Ensure hui is productive
- Manage group dynamics / group distributions (member replacements etc.)

Individuals:

- Participate in farm activities outside plot for a # of hrs./yr. (“required hours”)
- Report/record required hours outside of individual plots.
- Report/record outside volunteers brought in to help with the plot.
- Maintain their plot (grow crops, weed out the plots, etc...)
- Gain holistic benefits.

Community Volunteer Roles:

Interested Hui Participants:

- Volunteer on plot for a time.
- Are connected to ideology + Hoʻokuaʻāina
- Believe in the program.
- Complete vetting process (interviews etc.)

Community Volunteers:

- Volunteer on occasion to help with farm operations.

Scale and Community Culture:

- Roughly 10 plots per acre
- Estimate roughly 30 acres could be plots, with 300 total plots
- EX: 200 plots would be designated to community plots (at 4 people per plot, 800 people would be total)

o Would 4 people over the course of a year (plus family members and other personal connected volunteers), not putting in a full-time commitment, be able to maintain a plot of ~3000 sqft and the required outside service hours?

o Would the organization be able to maintain community and the same culture on a higher population level?

▪ What is the max amount of people you think there could be while maintaining the culture. (More or Less?)

Crop Distribution

Internal Crop Distribution:

- Amount of all crops produced on 1 hui managed plot, roughly half of it the crops would be taken by the organization to cover operation costs and huis would have options to:
    - o Take all leftover crops for (dibs on your personal consumption from their plot won first).
    - o Take the credits worth of the leftover crops.
    - o Take some percentage of a and b. - Crops/products will be available for purchase at centralized "hub" (Most likely farmers markets, where members of the hui will be able to purchase at an earlier time than public)
- Any excess from internal market would be sold/donated to public (most likely through farmers markets)

External Crop Distribution:

- Distribute to farmers markets/stores for organization to cover operation costs.
- Members will know where crops are distributed to, so they will be more likely to purchase crops from the organization because of where they came from.
- Will have contracts to stores (Wholefoods, supermarkets, etc.) which will be prioritized rather than internal farmer's market.

Internal Credit System:

- Given to each hui to assign internally. o Ex: 1 Credit = $1
- Credits are given to huis based on plot distributions (I.e. the production of every hui-managed plot) and divided equally among every hui.
- Most likely distributed similarly to a paycheck, will be able to use the credits to purchase goods from the farmer's markets

Notes from Discussion:

During the discussion the group focused on discussing the staff roles and responsibilities as well as the community member roles and responsibilities. Topics varied from tracking volunteers, crop lists, equity and equality in the credit system, the mindset and culture being kindled and created, privileges of participants, the Konohiki System, and other topics. Notes were collected as the discussion took place, and were later used to create a finalized draft of the system, as seen in Appendix E.

Staff roles (pg. 2)

- Having volunteers in huis to log their own hours is kind of a red flag
- Trial and error thing, want to have trusting relationship on that point
- Need a system for volunteers to log hours
- Your hui is in charge of keeping your own plot up, can be up to the huis, and can take longer or shorter than others, you have the freedom to manage your plot the way you want
- Maybe 40 hours a year, 8 Saturdays a year being a community workday, have people sign up for days in advance, and for people can sign up and one of the staff leads them out and is tracks, or those hui members will lead
- Be doing things that are part of a collective efforts, and staff will be managing them outside the lo'i hours, not going to micromanage the hours they put into their plot, it's the results that are really being looked for
- Have a set list of crops that are grown otherwhere, based on a set of crops being demanded by the market,
- Hours vs effort, harder to track effort rather than hours
- Having a good tracking system is key to keep people having a good mindset and effort
- Every hui will get the same amount of credit, not based on the return of the crop
- Michele doesn't see the current credit/internal market idea working
- TBD what would be a fair thing amount,
- Know the crop amounts will never be the same, but wants everyone to have the same thing, to be fair for everyone
- How you manage and how hard you work on your patch will determine your results and outcome
- Won't know off the bat what will grow well, eggplant, cabbages, etc., corn is seasonal
- Will have to be someone internally who manages the market and credit system, its looked at as a collective, from a competitive thing to a collective group, for everyone
- Needs to be a shift in mindset, to help rather than hinder, and to make sure everyone is pulling their own weight
- Someone who needs food more is maybe going to put more effort into that
- Cassie is pushing for a different viewpoint
- Some people have more freedom to work so can put into more effort
- It doesn't sit right that everyone gets the same amount

- No monetary amount, its all kind of internal credits
- Not trying to help people survive on this system, trying to build community, cant control nor try to mitigate for equity purposes
- Trying to attract people for more community, trying to get people to fit for the ano
- Anyone who has a competitive mindset or a mindset not of growth is not able to be a part of it
- Being with people of like minds
- Joining a club, instead of working, not to be approached from a working standpoint
- Becoming an ambassador for aloha ʻāina and create that culture
- Want to be clear on expectations etc.
- One of the roles is to observe
- Ano and culture!!!!
  EQUAL Vs EQUITABLE
- Huis are going to want huis, it's a club, everyone's going to want to help each other
- Looking for younger people
- Tricky thing about young people as they don't have a lot of money, want to be a part of something bigger than themselves, if you have a job, and you need to farm, its hard to figure those balances out
- For young people to really be invested, or people who are really wealthy, this idea of how things are being distributed is going to be very important,
- Nobody is going to want to cross social boundaries – young people
- Proactive vs reactive
- Facilitate
- If people are here for the wrong reason, they will know them
- Will be like a club, aloha ʻāina club, instead of surfing you come to farm, weeding or gardening, for people who are drawn to this to be part of their social wellbeing, doesn't want to be like a job, needs kuliana and want to do it themselves
- Not based on a return, like food etc.
- Other sweat in the game is 40 hours a year, is minimal effort, doing collective work
- Have to be careful in the articulation, sounds communistic
- When you give food away the return is beyond what money can get you
- Barter mindset
- Don't want to be stuck because of the value, want to being back aloha
- Want to train to pivot, its going to be hard to find the people who want to shift this mindset
- Reciprocating relationship

Community/volunteer roles (pg. 2)

- Having the opportunity to see people work together in the ʻāina can be a snippet of the vetting process, their intentions etc.
- Volunteering first, then growing from there
- See work ethic, ano etc.…
- By working alongside people

- Here in Hawaii there are aspects of ano and also by application kind of thing, sucks to have to do both
- TONGA – Polynesian roots, feeling of working together
- Not going to get a feel from the application
- How we do internship, can be a shorter period of time, people apply for internship and they come out for a Saturday to be vetted for a couple of weeks
- Going to be a lot of relationship building, pele ʻāina
- A time of volunteering will be required, and people as a staff, to see how people react
- Ultimately is a social club

Random Notes:

- Konohiki didn't really work after western contact etc.
- It started to break down when diseases came through
- Konohiki mindset is still semblance of it in some places
- Was a middle level alii who had a responsibility to steward the ahupuaʻa
- If he didn't steward the resources well he was killed
- Wasn't the expert in everything, but was a facilitator to ensure the expertise would be utilized
- Got to teach how to get along how to teach grace, everyone is part of that, everyone is held accountable
- 4 people for a lo'i is realistic to take care of it while still having time to meet other things, and 40 required hours
- Depends on techniques and styles etc., will influence efficiency, but it can be possible for 4 people
- As long as the vetting process is good, the culture should be good
- Will have examples of people who worked well, be a promoter, ambassador mindset
- All about inclusivity making people feel welcome
- Want people with a contributing mindset
- Once you have people as models, everything builds
- Have a partner with habilitation, drug rehabilitation center, self sustaining, people who went through the program stepped into staff positions, the vibe was set into stone because everyone went through the program, and people imagine who they could be
- Felt like they had a stake in it, they had something to work towards, and were invested in how the program was running, it was inspiring
- Whether its ASA or apprenticeship or internship, and the time that was invested can still grow with the staff and the community
- The people who come really want to be there
- Staff will probably grow organically as well, and not everyone works out
- Participants who come through can come into to join a hui
- Could run it with 8 people, have part time internships, in terms or workforce
- Complexity of what is being created
- Another system that can be just as effective, open membership to people to volunteer, credits to volunteer hours, anyone other than other community days, and people don't have commitment as much, and others can just come other times, small fee, of

membership, something small, as an entry point, can contribute separately, can contribute to more than one lo'i

- Wants to be a commitment, and no willy-nilly, if it's too loose its harder to track how people have commitment
- No man should profit off the work off of another man
- More about privilege than the rights
- Case by case for outside groups to come in and help out with patches
- Providing an opportunity, don't need the community, its just what their mission is for
- The more that can be produces, the more that everyone can get, if we work harder everyone gets more out of it

Appendix D: Notes from Roundtable #2

The team held the final roundtable discussion on February 15, 2023, to address the last-minute questions we had, and to gather any final ideas from the staff. Our team focused on clarifying information from the Misconduct section and the Volunteer section based on things that were not overly defined thus far. The format and content of the write up presented at this round table discussion was similar to the final product. See Appendix E for the final product.

Participants in Attendance on Wednesday February 15, 2023: (Not including Grace, Anthony, and Kaleigh)

- Michele Wilhelm, Dean Wilhelm, Becca Croft, Cassie (Kauʻi) Nichols (Over Zoom), Benji Ah Sing, Kazu Akiona-Banan, Ari Lunow-Luke, Vance Kaleohano Farrant

General Notes:

- Part of aloha ʻāina is learning how to engage the land
- People don't understand what a work ethic is, a lot of it will be teaching.

Notes from the Misconduct Section:

- Change the title of the misconduct sections, seems too harsh of a word
- There should be a trial period, and people can leave at any time
- There are no failures, the org will do everything possible to support their success and set them up for success
- STIRVE for excellence but do so with grace, do so with the mindset of cultivating and nurturing, won't settle for less than excellence, but still have grace
- Hoʻokuaʻāina is looking to cultivate a culture of Waiwai
- Parameters are there so people know what they are signing up for. Parameters are necessary and gives Hoʻokuaʻāina the authority to do what's needed
- Have a contract, lay it all out very clear, "if this, then that," then they have to sign it. If you show up late etc. without an excuse, you get kicked out. Never done that but it's clear in the contract that they can do it if they need to. Will assess every situation for specific reasoning etc.

Notes from Volunteer section:

- Not every plot is owned by the org. that's how we set them up for success, if we notice that the weeds are growing a lot and asking them if they needed help, and we have some groups coming in would you mind if we did the weeding for you, sounds like the plan, these are the dates and what we'll be doing etc.… ok great
- Win win situation
- Its all about relationships and communication
- Pelina - vital to how this place functions, and the culture they're trying to create

Appendix E: Custom Agriculture System

This appendix contains The Custom Agriculture System *write up for Objective 2. The document outlines the operation of the system as it is currently understood. Many details are still being developed as planning is still in the early stages. This report is intended as a guide for the detailed planning process to follow.*

The Custom Agriculture System

Grace Audette, Anthony Virone, and Kaleigh Walsh

March 4, 2023

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1. Introduction

This custom agriculture system is designed for the nonprofit organization Hoʻokuaʻāina with the help of students from Worcester Polytechnic Institute. This system is a culmination of Hoʻokuaʻāina Stakeholder's vision, combining aspects of the traditional Hawaiian konohiki system with other community-based agricultural or land management schemes.

A konohiki is a traditional Hawaiian land manager. They were people with vast knowledge of the Ahupuaʻa (a traditional Hawaiian land division) and it was their right and responsibly ensure continued productivity of the land. They decide where, when, and who could use the resources provided by the land and sea. This method of management respected the land and considered the natural functions of the environment which allowed the Hawaiian people to live in harmony will the land for centuries.

This report presents the system as it is currently envisioned, with Hoʻokuaʻāina acting as a modern-day konohiki of the Palawai lands. Many details are still being developed as planning is still in the early stages. This report is intended as a guide for the detailed planning process to follow.

1.1. System Overview

The custom agriculture system produces agriculture products using a community-based approach. There are four ways for community members to participate are: 1) working in a group to manage a plot with a required regular time commitment, 2) volunteering on the farm without time commitment, 3) participating in classes, or 4) purchasing farm products. Different levels of participation provide community members with a range of benefits and, in turn, support the successful operation of the system. Hoʻokuaʻāina hopes to maintain the operation of the entire system through the selling of crops grown on the plot, and to maintain financial self-sufficiency.

1.2. Location

This system is designed for use on the Palawai lands located in Hawaii on the Island of Oahu. Specifically, this system is intended for the 116-acre plot recently acquired by Hoʻokuaʻāina, seen in purple in Figure 1. Hoʻokuaʻāina's current farm in the ili of Kapalai, seen in yellow, will continue operation as is and be incorporated into the system as organization managed land (see 2.1 "Organization Managed Lands").

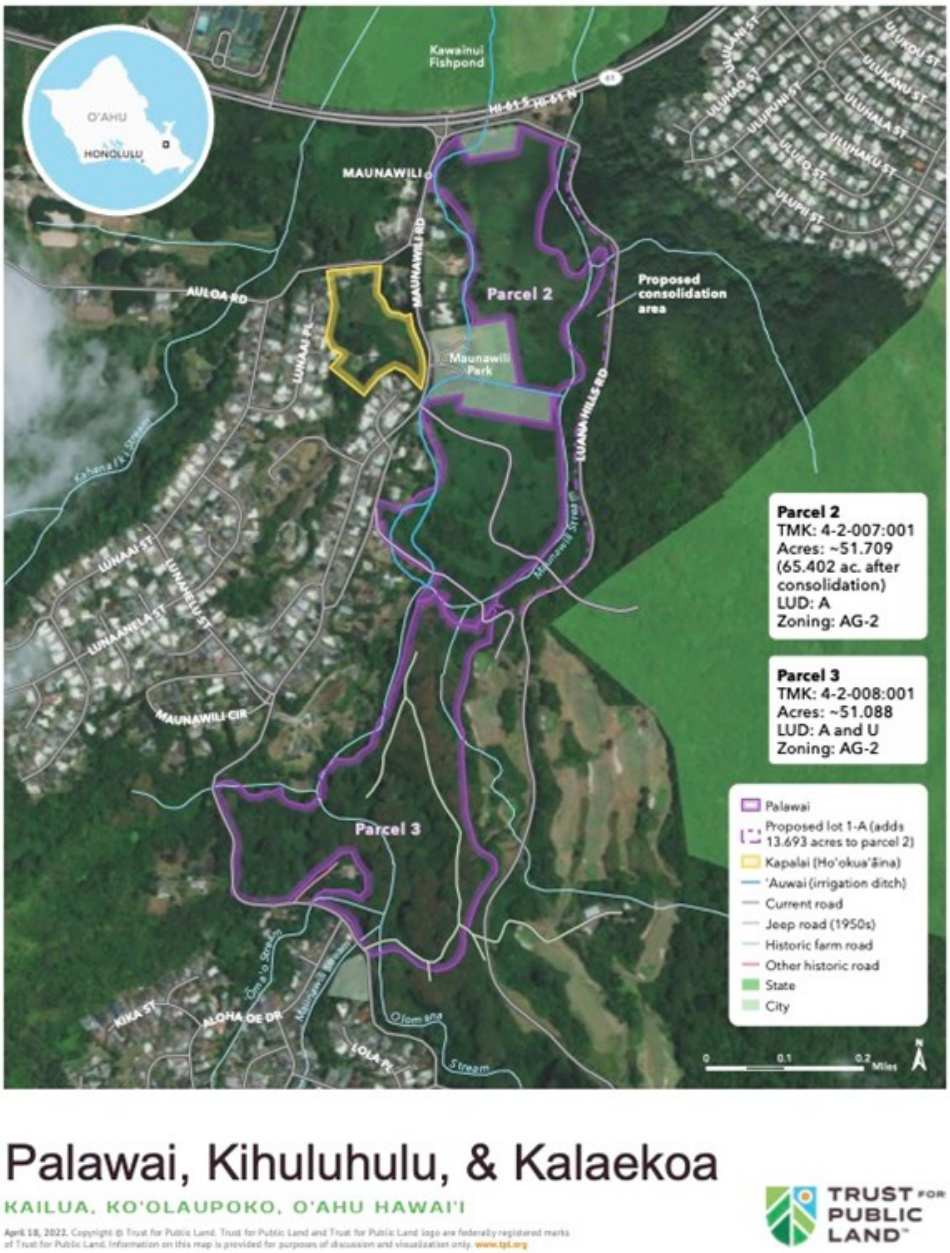

Figure 1. Map showing the Palawai lands (purple) and Kapalai (yellow). These lands are located in Kailua, HI (top left).

2. Land Use and Management

Land use decisions will be guided by US laws, local knowledge, and environmental expertise. Ultimately, Hoʻokuaʻāina management staff will make all final decisions regarding land use on

the property. Land uses fall into two broader categories: organization-managed lands and hui plots. Land management practices will vary for each category.

2.1. Organization Managed Lands

Lands that are managed solely by Hoʻokuaʻāina are defined as "organization managed lands." It is the responsibility of Hoʻokuaʻāina to ensure productivity of the land in its various assigned land uses. Organization cofounder, Dean Wilhelm, suggested potential uses for this land including farming plots, orchards, livestock, community buildings, administrative buildings, staff housing, access and parking, and farmers' market area.

The division of land for these purposes has yet to be discussed in detail, except for the farming plots. Dean Wilhelm estimates that 30 acres will be allocated to 3000 square foot farming plots. The farming plots will be rectangular in nature with slight variations as needed to accommodate land characteristics. These plots will then be placed in a grid format with adequate spacing between plots to ensure each plot is accessible. Under these conditions it is estimated that 300 farming plots will fit in the 30 acres. Initially, the plan is for 100 of the farming plots to be allocated as organization-managed lands and 200 plots to be allocated as hui (groups of 4-6 participants) plots (see 2.2 "Hui Plots"). These numbers are estimates in the early stages of the system's development and are likely to change over time. The intention behind this ratio is to ensure the organization can cover operational cost from the sale of 100% of crops from the organization-managed plots. This ratio may need to be adjusted in the future if the organization finds costs are not covered.

2.2. Hui Plots

Hui plots are managed by the assigned hui (see 3. Hui Subsystem). The group must ensure that their plot is productive and well maintained. As such, participants must carry out all farming operations for their plot including planting, weeding, fertilizing, and harvesting.

3. Konohiki System

The Konohiki System is the one method for community participation on the farm. This method provides the most support to the organization and the most benefits to members; it also has the most requirements for participation. In this subsystem, hui farm their plots and contribute hours outside their plots in exchange for a portion of the crop produced on their plots, access to organization facilities and programs, and the opportunity to forge stronger connections with community and the land.

3.1. Facilities and Services

Each participant will have access to facilities and services as part of the program. The purpose of these facilities and services is to improve the participant experience. Hoʻokuaʻāina will provide and maintain the facilities for members of the Hui Subsystem.

The kitchen and community building will service as gathering spaces and promote community interaction. Theses building will also be used to hold classes and trainings. Adequate parking area onsite will ensure that hui can easily access the space without parking along the main highway, causing traffic and infringing on the lands of nearby property owners. Restrooms and showers are for the comfort of hui members and allow members to clean off before entering other facilities, which will contribute to the overall cleanliness of the farm.

Hoʻokuaʻāina will provide the following services for members in the Hui Subsystem:

- Relevant trainings (safety, equipment use, farming techniques, etc.)
- Educational classes (cooking, pickling, chocolate making, etc.)
- Farming equipment (gloves, shovels, buckets, seeds, etc.)
- Food processing equipment (cooking utensils, etc.)

Training and classes provide members the opportunity to learn new skills and connect with the community. Some trainings and classes will be required by members to complete certain tasks or use certain equipment on the farm. Hoʻokuaʻāina will maintain a list of required training and classes for each task or piece of equipment. Hoʻokuaʻāina will also maintain a list of members who have completed the required trainings and classes need. Without the required training and classes or equivalent personal experience, members will not be able to perform restricted tasks or use restricted equipment for the safety of the member and those around them. Hoʻokuaʻāina staff have the final say in determining if member has adequate experience to claim “equivalent personal experience.”

Providing access to farming and food processing equipment facilitates member participation and sets members up for success on hui plots. Equipment will be available at central location such as a tool shed or kitchen pantry. Unrestricted equipment will be available to use on an honor system. Restricted equipment will need to be checked out by a qualified member. It is then the member’s responsibility to monitor the equipment for check-out to return to ensure the equipment is used and stored safely. Hoʻokuaʻāina is responsible for maintenance of all organization-owned equipment. Hui members will be allowed to use their own equipment if preferred.

3.2. Hui Group Dynamics

Each hui is solely responsible for their internal group dynamics. Hui must choose how to divide the work for their hui plot, the crops produced, and the credits distributed (see 5.3 Credit System) amongst members. This may be equally or unequally split among hui members based on their preference. Hui are allowed to invite family, friends, or other willing individuals to assist them with their hui plot. Hoʻokuaʻāina requests that records of the volunteers' names and date visited be maintained and shared with the organization.

Each hui must also select a point person, or manager, from one of the four members to handle interactions with Hoʻokuaʻāina staff. The point person is responsible for reporting data to the staff about their crops such as the number of crops planted and yields when harvested. The frequency and format of these communication has not yet been determined.

3.3. Participation Requirements

Applicants do not need farming experience to qualify. Hoʻokuaʻāina is looking for people who identify with the organization's mission. Hoʻokuaʻāina mission is not just to cultivate crops, but to cultivate a culture of waiwai.[20] People who are looking to forge strong bonds with the community and aloha ʻāina[21] are ideal for the program.

To join the Konohiki System the potential member must first complete the application process. Hoʻokuaʻāina staff are responsible for reviewing applicants to the Hui Subsystem. Applicants will be able to able apply as fully formed groups, partially formed groups, or individuals. When groups apply together each member will be reviewed separately.

The application process will consist of two primary comments: a formal written application and trial period. The written application will gather basic information from applicants. Promising applicants will then be invited to complete a trial period. During this trial period, the applicant will be required to volunteer for a certain number of hours. See section 4.1 for more on volunteering. The trial period will allow Hoʻokuaʻāina staff and the applicant to determine if the applicant is a good fit for the program. Applicants are approved after the trial period at Hoʻokuaʻāina's discretion.

[20] Wealth or abundance that can not always be measured in dollars.
[21] Love and respect the land.

Approved applicants will then be allowed to form a hui with other approved applicants. If approved applicants do not have a complete group, approved applicants will be provided a method to locate fellow approved applicants to form groups. This could take the form of a public list of contact information for approved applicants looking for other members. Alternatively, staff could provide recommendations to approved applicants based on knowledge of other recently accepted applicants.

Once the hui is formed, the hui must report its members, identity, and provide contact info for, the point person, and submit a signed contract for each member to Hoʻokuaʻāina. The contract will clearly outline hui expectations and allow Hoʻokuaʻāina to act if needed (see 3.4 Expectations and Support).

The hui can then be assigned to a plot and will enter a trial period. The trial period will last 3 months and will allow hui members the chance to experience the program before committing to it. Upon completion of the trial period, candidates will touch base with Hoʻokuaʻāina staff to discuss continuing with the program. If approved, the hui will be allowed to continue with the program. Hoʻokuaʻāina reserves the right to revoke membership at any point for reasons discussed in 3.4 "Expectations and Support."

To remain in the program, each hui member is required to complete at least forty volunteer hours per year outside their hui plot on organization managed lands. The purpose of volunteer hours is to encourage hui member to connect and interact with the Hoʻokuaʻāina community. As such, each participant will be able to complete this requirement with a variety of tasks of their choosing on the farm. These tasks may include tending to crops, tree pruning, land clearing, livestock tending, poi production, or teaching classes.

The volunteer hours must be logged by members and approved by a Hoʻokuaʻāina staff. Hoʻokuaʻāina will maintain records volunteer hours for each hui member to track requirement completion.

3.4. Expectations and Support

Participants are expected to act with respect while on the property. A code of conduct will be created and all participants will be required to adhere by it. Hoʻokuaʻāina staff will strive to maintain a safe and welcoming environment on the farm. Hoʻokuaʻāina staff will make note of any observations or reports of unacceptable behavior on the property. Unacceptable behavior

includes but is not limited to selling or stealing crops; consistent disinterest in the program; rude, aggressive, or disrespectful behavior; vandalism, damaging property, or breaking other US laws on organization property. Hoʻokuaʻāina reserves the right the remove an entire hui or individual members of a hui if they conduct themselves in an unacceptable manner.

Hui are expected to participate in earnest and strive for excellence. This means hui should put forth their best effort to maintain their hui plot. Hoʻokuaʻāina understands that certain circumstances may hinder a hui's ability to maintain their plot and will offer grace when lack of plot maintenance is due to: 1) a lack of experience and the hui has shown a sincere effort to learn and improve, 2) a natural disaster such as a flood or drought, 3) unforeseen events in which a temporary absence is required by a hui member. Other situations may qualify for grace. Final decisions will be made by Hoʻokuaʻāina when determining if hui will receive grace.

Hoʻokuaʻāina will do everything possible to support participants and set them up for success. The point person for any hui need only to reach out Hoʻokuaʻāina staff should they feel in need of help. Hoʻokuaʻāina is ready and willing to provide volunteers to assist on hui plots. Should any hui want volunteer assistance they can make a request to Hoʻokuaʻāina staff. Alternatively, Hoʻokuaʻāina staff may offer assistance if they recognize a need (e.g. overgrown weeds, absence of a hui member). Hoʻokuaʻāina reserves the right to remove an entire hui or individual hui members on a case-to-case basis if they repeatedly are unable to maintain their plot, recognizing that the hui program may simply not be a good fit for a particular group or participant.

Hoʻokuaʻāina requests for any hui or hui members leaving the program to notify Hoʻokuaʻāina staff.

If a member is removed or leaves for any reason, the remaining hui members are responsible for finding a new member. There may be a waitlist of people interested in joining that the hui can reference. While looking for a new member, the hui will be allowed to remain on their plot and may request assistance if needed. The new members will be required to complete the application process prior to joining the hui (see 3.3 Participation Requirements).

4. Volunteer and Community Member Subsystem

The Volunteer and Community Member Subsystem provides additional opportunities for community members to receive some benefits from the system and support the organization with fewer requirements.

4.1. Volunteers

Volunteers from the community and around the globe will be able to come and assist Hoʻokuaʻāina staff with farm activities on organization-managed lands. This may include weekly community volunteer days, or specific sign-ups for farm-related tasks. With the permission of hui, volunteers may also be permitted to work on hui plots. If Hoʻokuaʻāina wishes have volunteers work on the hui plots, Hoʻokuaʻāina staff will contact the point person for the hui to obtain permission. Without permission Hoʻokuaʻāina will not allow volunteers on hui plots.

Consistent time commitment is not needed to be a volunteer. However, volunteers must show dedication and appreciation for the ʻāina and for their fellow volunteers, Hoʻokuaʻāina staff, and hui members.

4.2. Community Members

Community members that wish to support Hoʻokuaʻāina but do not have time to volunteer or join a hui will be able to visit a farmer's market held by Hoʻokuaʻāina or buy Hoʻokuaʻāina produce in stores (see 5.5 External Market). Community members will also be able to participate in classes and workshops offered to hui for a small fee.

5. Crop Management

5.1. Allowable Crops

Hui will have to select crops for hui plots from a list of acceptable crops. An up-to-date list of crops will be provided by Hoʻokuaʻāina. Each point person for their hui should check with the organization to make sure they have the most up-to-date list. Potential crops available for selection are provided in *Potential Crops and Yields*. These crops may be further restricted by Hoʻokuaʻāina to ensure that the organization obtains the quantities needed for contracts (see 5.3 Distribution).

5.2. Acceptable Farming Practices

Hoʻokuaʻāina will encourage participants to use farming practices that enhance biodiversity and reduce harms to the local ecology and human health. Use of chemical pesticides, herbicides, fertilizers, and other non-natural farming products will not be permitted on organization

property. If in doubt about a farming practice, hui members are encouraged to check with Hoʻokuaʻāina staff.

5.3. Distribution

Hoʻokuaʻāina manages the distribution of all agricultural products produced on organization managed lands and hui plots. Hoʻokuaʻāina will sell a portion of the total products produced to cover the organization's operating costs. The remaining products will be 'sold' to participants in the 'internal market' with 'credits'. The internal market and credit system will be described further in Section 5.4.

5.4. Credit System

Given that this project is in the early stages, this system has yet to be fully developed. Hoʻokuaʻāina will fully articulate this system later, however, below is the current vision for how the credit system will function.

Every hui will receive the same number of 'credits' which can then be distributed amongst participants at each hui point person's discretion. A 'credit' will be a currency that is only transactional within the Hoʻokuaʻāina internal market and may not be redeemed for any other currency. These credits will also have an expiration date that will be decided upon at a later date.

The internal market system will consist of all produce and farm related goods that Hoʻokuaʻāina does not sell to cover operation costs. For example: if Hoʻokuaʻāina needs to sell 50% of crops and goods to cover operation costs, the other 50% of crops and goods would be 'sold' to participants in the internal market for credits. The quantity of crops and goods in the internal market may vary based on Hoʻokuaʻāina contract fulfillments and yields during that time period.

Appendix F: Potential Crops and Yields

This appendix contains the Potential Crops and Yields *document. It has information regarding peak harvest seasons of crops that can be grown in the Palawai region. It also goes through the series of calculations used to estimate the yields of certain types of crops for each individual plot, community-run plots, organization-run plots, and all the plots combined.*

Potential Crops and Yields

HOʻOKUAʻĀINA

rebuilding lives from the ground up

WPI

Grace Audette, Anthony Virone, and Kaleigh Walsh

March 4, 2023

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Introduction:

This document identifies some, but not all, potential crops that may be cultivated on the Palawai lands where Hoʻokuaʻāina will implement their custom system. These crops are known to thrive in the Hawaiian environment and should be well suited for the area and climate of the Palawai lands. The peak harvest season for each of these crops can be seen on page 3. The peak harvest season does not indicate that the crops can only be harvested at that time, it just specifies when the best harvest will take place.

Ten of these crops have been selected, based on their popularity, for further analysis to discover their specific farming information and potential yields. Research has been completed to determine the proper spacing when planting, time until harvest, average produce per plant, and average weight of individual produce. Some estimates are based on plant averages from Hawaii; however, others are from various parts of the world due to the little number of online resources specific to Hawaii. These estimates also assume fertilizer use and pesticide use when needed, due to some values coming from parts of the world with significant crop pest issues. All calculations are based off this research, but must only be interpreted as estimations and predictions, as all plants perform differently in varying environments.

The plot size and shape used for these calculations was a 3,025 sqft square plot (55 ft x 55 ft), to simplify calculations. All crops do not assume water channels are dug into the 3,025 sqft plot, except for kalo which is specific dimensions of water channels and layout in its section. Since plot shape and size is likely to vary in real world conditions, as well as drainage and soil factors, the numbers produced from the calculations using this plot size and shape are rough estimations. References consulted to generate these estimations are located at the end of this appendix.

Peak Harvest Season for All Crops:

Table 1.
Crops suited for Hawaii and their peak harvest seasons.

Crop	Type of plant	Spring Peak	Summer Peak	Fall Peak	Winter Peak
Avocados (multiple varieties)	Tree				
Cabbage	Plant				
Carrots	Root				
Celery	Plant				
Corn	Plant				
Cucumbers	Plant				
Eggplant	Plant				
Ginger	Root				
Hawaiian Chili Peppers	Plant				
Hearts of Palm	Tree				
Kabocha Squash	Bush				
Kalo (Taro)	Root				
Kula Onions	Bulb				
Limes	Tree				
Luau (kalo leaf)	Root				
Lychees	Tree				
Maiʻa (Banana)	Tree				
Mangoes	Tree				
Melons (Cantaloupes, Honeydew, Watermelon)	Plant				
Ohiʻa ʻai	Tree				
Okinawan Spinach	Plant				
Oranges	Tree				
Papayas	Tree				
Pineapples	Plant				
Okinawan Potato	Root				
Radishes	Root				
Rambutans	Tree				
Strawberries	Bush				
Starfruit	Tree				
Summer Squash (Zucchini, Cocozelle, Summer Crookneck, White Scallop)	Bush				
Tangerines	Tree				
Tomatoes	Plant				
Ulu (Breadfruit)	Tree				

Created using the data provided in multiple sources which may be seen in the references page.

Cabbage:

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square lo‘i

Spacing:

Each cabbage plant is spaced 1 foot apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

3 months

Total Plants:

$$\frac{3{,}025\ sqft}{1\ sqft\ per\ cabbage\ plant} = 3{,}025\ cabbage\ plants$$

3,000 cabbage plants per plot

Total Produce Grown:

$Each\ cabbage\ plant\ produces\ an\ average\ of\ 1\ cabbage$

$3{,}025\ cabbage\ plants\ per\ plot \times 1\ cabbage = 3{,}025\ cabbages$

3,025 cabbages per plot

Total Produce Weight (in lbs):

$Each\ cabbage\ weighs\ approximately\ 1.5\ lbs$

$3{,}025\ cabbages\ per\ plot \times 1.5\ lbs\ each = 4{,}537\ lbs\ of\ cabbage\ per\ plot$

4,537 lbs of cabbage per plot

If all 100 Organization plots Produced Cabbage:

$100\ plots \times 4{,}537\ lbs\ of\ cabbage\ per\ plot = 453{,}700\ lbs\ of\ cabbage$

453,700 lbs of cabbage per 100 plots

If all 200 Community plots Produced Cabbage:

$200\ plots \times 4{,}537\ lbs\ of\ cabbage\ per\ plot = 907{,}400\ lbs\ of\ cabbage$

907,400 lbs of cabbage per 200 plots

If all 300 Total plots Produced Cabbage:

$453{,}700\ lbs\ of\ cabbage + 907{,}400\ lbs\ of\ cabbage = 1{,}361{,}100\ lbs\ of\ cabbage$

1,361,100 lbs of cabbage per 300 plots

Carrot:

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each carrot plant is spaced 3 inches apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

2 months

Total Plants:

$$\frac{55\ ft}{0.25\ ft\ per\ carrot\ plant} = 220\ carrot\ plants\ per\ row$$

$$220\ carrot\ plants\ per\ row \times 55\ rows = 12{,}100\ carrot\ plants$$

12,100 carrot plants per plot

Total Produce Grown:

$$Each\ carrot\ plant\ produces\ an\ average\ of\ 1\ carrot$$

$$12{,}100\ carrot\ plants\ per\ plot \times 1\ carrot\ = 12{,}100\ carrots$$

12,100 carrots per plot

Total Produce Weight (in lbs):

$$Each\ carrot\ weighs\ approximately\ 0.2\ lbs$$

$$12{,}100\ carrots\ per\ plot \times 0.2\ lbs\ each = 2{,}420\ lbs\ of\ carrot\ per\ plot$$

2,420 lbs of carrot per plot

If all 100 Organization plots Produced Carrot:

$$100\ plots \times 2{,}420\ lbs\ of\ carrot\ per\ plot = 242{,}000\ lbs\ of\ carrot$$

242,000 lbs of carrot per 100 plots

If all 200 Community plots Produced Carrot:

$$200\ plots \times 2{,}420\ lbs\ of\ carrot\ per\ plot = 484{,}000\ lbs\ of\ carrot$$

484,000 lbs of carrot per 200 plots

If all 300 Total plots Produced Carrot:

$$242{,}000\ lbs\ of\ carrot + 484{,}000\ lbs\ of\ carrot = 726{,}000\ lbs\ of\ carrot$$

726,000 lbs of carrot per 300 plots

Cucumber (Trellised):

Peak Harvest Seasons:

Spring – Summer – Fall

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each cucumber plant is spaced 1 foot apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

2 months

Total Plants:

$$\frac{3{,}025\ sqft}{1\ sqft\ per\ cucumber\ plant} = 3{,}025\ cucumber\ plants$$

3,025 cucumber plants per plot

Total Produce Grown:

$Each\ cucumber\ plant\ produces\ an\ average\ of\ 10\ cucumbers$

$3{,}025\ cucumbers\ plants\ per\ plot \times 10\ cucumbers = 30{,}250\ cucumbers$

30,250 cucumbers per plot

Total Produce Weight (in lbs):

$Each\ cucumber\ weighs\ approximately\ 0.8\ lbs$

$30{,}250\ cucumbers\ per\ plot \times 0.8\ lbs\ each = 24{,}200\ lbs\ of\ cucumber\ per\ plot$

24,200 lbs of cucumber per plot

If all 100 Organization plots Produced Cucumber:

$100\ plots \times 24{,}200\ lbs\ of\ cucumber\ per\ plot = 2{,}420{,}000\ lbs\ of\ cucumber$

2,420,000 lbs of cucumber per 100 plots

If all 200 Community plots Produced Cucumber:

$200\ plots \times 24{,}200\ lbs\ of\ cucumber\ per\ plot = 4{,}840{,}000\ lbs\ of\ cucumber$

4,840,000 lbs of cucumber per 200 plots

If all 300 Total plots Produced Cucumber:

$2{,}420{,}000\ lbs\ of\ cucumber + 4{,}840{,}000\ lbs\ of\ cucumber = 7{,}260{,}000\ lbs\ of\ cucumber$

7,260,000 lbs of cucumber per 300 plots

Eggplant:

Peak Harvest Seasons:

Spring – Summer

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each eggplant plant is spaced 2 feet apart from each other.

Each row is 4 feet apart.

Harvest time from Sow to Harvesting:

4 months

Total Plants:

$$\frac{3{,}025\ sqft}{2\ sqft\ per\ eggplant\ plant} = 1{,}512\ eggplant\ plants$$

$$\frac{1{,}512\ eggplant\ plants}{2\ (for\ the\ rows\ being\ 4\ feet\ apart)} = 756$$

756 eggplant plants per plot

Total Produce Grown:

$Each\ eggplant\ plant\ produces\ an\ average\ of\ 5\ eggplants$

$756\ eggplant\ plants\ per\ plot \times 5\ eggplant = 3{,}780\ eggplants$

3,780 eggplants per plot

Total Produce Weight (in lbs):

$Each\ eggplant\ weighs\ approximately\ 1\ lb$

$3{,}780\ eggplants\ per\ plot \times 1\ lb\ each = 3{,}780\ lbs\ of\ eggplant\ per\ plot$

3,780 lbs of eggplants per plot

If all 100 Organization plots Produced Eggplant:

$100\ plots \times 3{,}780\ lbs\ of\ eggplant\ per\ plot = 378{,}000\ \ lbs\ of\ eggplant$

378,000 lbs of eggplant per 100 plots

If all 200 Community plots Produced Eggplant:

$200\ plots \times 3{,}780\ lbs\ of\ eggplant\ per\ plot = 756{,}000\ lbs\ of\ eggplant$

756,000 lbs of eggplant per 200 plots

If all 300 Total plots Produced Eggplant:

$378{,}000\ lbs\ of\ eggplant + 756{,}000\ lbs\ of\ eggplant = 1{,}134{,}000\ lbs\ of\ eggplant$

1,134,000 lbs of eggplant per 300 plots

Kalo:

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

The kalo section will assume the plot is designed to cultivate kalo (2 ft waterways on perimeter and channels, 5-foot mounds to allow for two rows of kalo) for a total 15 rows (51 ft long).

Spacing:

Each kalo plant is spaced 2 feet apart from each other.

Harvest time from Sow to Harvesting:

1 year

Total Plants:

$$\frac{1887\ sqft}{2\ ft\ per\ plant} = 943\ kalo\ plants$$

943 kalo plants per plot

Total Produce Grown:

$Each\ kalo\ plant\ produces\ an\ average\ of\ 4\ kalo\ tubers$

$943\ kalo\ plants\ per\ plot \times 4\ kalo\ tubers = 3{,}772\ kalo\ tubers$

3,772 kalo tubers per plot

Total Produce Weight (in lbs):

$Each\ kalo\ weighs\ approximately\ 1.5\ lbs$

$3{,}772\ kalo\ tubers\ per\ plot \times 1.5\ lbs\ each = 5{,}658\ lbs\ of\ kalo\ per\ plot$

5,658 lbs of kalo per plot

If all 100 Organization plots Produced Kalo:

$100\ plots \times 5{,}658\ lbs\ of\ kalo\ per\ plot = 565{,}800\ lbs\ of\ kalo$

565,800 lbs of kalo per 100 plots

If all 200 Community plots Produced Kalo:

$200\ plots \times 5{,}658\ lbs\ of\ kalo\ per\ plot = 1{,}131{,}600\ lbs\ of\ kalo$

1,131,600 lbs of kalo per 200 plots

If all 300 Total plots Produced Kalo:

$565{,}800\ lbs\ of\ kalo + 1{,}131{,}600\ lbs\ of\ kalo = 1{,}697{,}400\ lbs\ of\ kalo$

1,697,400 lbs of kalo per 300 plots

Onion:

Peak Harvest Seasons:

Spring – Summer – Fall

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each onion plant is spaced 6 inches apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

4 months

Total Plants:

$$\frac{3{,}025\ sqft}{0.5\ sqft\ per\ onion\ plant \times 1\ sqft\ per\ row} = 6{,}050\ onion\ plants$$

6,050 onion plants per plot

Total Produce Grown:

$Each\ onion\ plant\ produces\ an\ average\ of\ 1\ onion$

$6{,}050\ onion\ plants\ per\ plot \times 1\ onion = 6{,}050\ onions$

6,050 onions per plot

Total Produce Weight (in lbs):

$Each\ onion\ weighs\ approximately\ 0.5\ lbs$

$6{,}050\ onions\ per\ plot \times 0.5\ lbs\ each = 3{,}025\ lbs\ of\ onion\ per\ plot$

3,025 lbs of onion per plot

If all 100 Organization plot Produced Onion:

$100\ plots \times 3{,}025\ lbs\ of\ onion\ per\ plot = 302{,}500\ lbs\ of\ onion$

302,500 lbs of onion per 100 plot

If all 200 Community plot Produced Onion:

$200\ plots \times 3{,}025\ lbs\ of\ onion\ per\ plot = 605{,}000\ lbs\ of\ onion$

605,000 lbs of onion per 200 plot

If all 300 Total plot Produced Onion:

$302{,}500\ lbs\ of\ onion + 605{,}000\ lbs\ of\ onion = 907{,}500\ lbs\ of\ onion$

907,500 lbs of onion per 300 plot

Pineapple:

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each pineapple plant is spaced 2 feet apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

18 months

Total Plants:

$$\frac{3{,}025\ sqft}{2\ sqft\ per\ pineapple\ plant} = 1{,}512\ pineapple\ plants$$

1,512 pineapple plants per plot

Total Produce Grown:

$Each\ pineapple\ plant\ produces\ an\ average\ of\ 1\ pineapple$

$1{,}512\ pineapple\ plants\ per\ plot \times 1\ pineapple = 1{,}512\ pineapples$

1,512 pineapple per plot

Total Produce Weight (in lbs):

$Each\ pineapple\ weighs\ approximately\ 3\ lbs$

$1{,}512\ pineapples\ per\ plot \times 3\ lbs\ each = 4{,}536\ lbs\ of\ pineapples\ per\ plot$

4,536 lbs of pineapple per plot

If all 100 Organization plots Produced Pineapple:

$100\ plots \times 4{,}536\ lbs\ of\ pineapples\ per\ plot = 453{,}600\ lbs\ of\ pineapples$

453,600 lbs of pineapple per 100 plots

If all 200 Community plots Produced Pineapple:

$200\ plots \times 4{,}536\ lbs\ of\ pineapples\ per\ plot = 907{,}200\ lbs\ of\ pineapples$

907,200 lbs of pineapple per 200 plots

If all 300 Total plots Produced Pineapple:

$453{,}600\ lbs\ of\ pineapple + 907{,}200\ lbs\ of\ pineapple = 1{,}360{,}800\ lbs\ of\ pineapple$

1,360,800 lbs of pineapple per 300 plots

Potato:

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each potato plant is spaced 1 foot apart from each other.

Each row is 3 feet apart.

Harvest time from Sow to Harvesting:

3 months

Total Plants:

$$\frac{3{,}025\ sqft}{1\ sqft\ per\ potato\ plant \times 3\ sqft\ per\ row} = 1{,}008\ potato\ plants$$

1,008 potato plants per plot

Total Produce Grown:

$Each\ potato\ plant\ produces\ an\ average\ of\ 7\ potatoes$

$1{,}008\ potato\ plants\ per\ plot \times 7\ potatoes = 7{,}056\ potato$es

7,056 potato per plot

Total Produce Weight (in lbs):

$Each\ potato\ weighs\ approximately\ 0.5\ lbs$

$7{,}056\ potato\ per\ plot \times 0.5\ lbs\ each = 3{,}528\ lbs\ of\ potato\ per\ plot$

3,528 lbs of potato per plot

If all 100 Organization plots Produced Potato:

$100\ plots \times 3{,}528\ lbs\ of\ potato\ per\ plot = 352{,}800\ lbs\ of\ potato$

352,800 lbs of potato per 100 plots

If all 200 Community plots Produced Potato:

$200\ plots \times 3{,}528\ lbs\ of\ potato\ per\ plot = 705{,}600\ lbs\ of\ potato$

705,600 lbs of potato per 200 plots

If all 300 Total plots Produced Potato:

$352{,}800\ lbs\ of\ potato + 705{,}600\ lbs\ of\ potato = 1{,}058{,}400\ lbs\ of\ potato$

1,058,400 lbs of potato per 300 plots

Tomato (Trellised):

Peak Harvest Seasons:

Spring – Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each tomato plant is spaced 2 feet apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

3 months

Total Plants:

$$\frac{3{,}025\ sqft}{2\ sqft\ per\ tomato\ plant} = 1{,}512\ tomato\ plants$$

1,512 tomato plants per plot

Total Produce Grown:

$Each\ tomato\ plant\ produces\ an\ average\ of\ 18\ tomatoes$

$1{,}512\ tomato\ plants\ per\ plot \times 18\ tomatoes = 27{,}216\ tomatoes$

27,216 tomatoes per plot

Total Produce Weight (in lbs):

$Each\ tomato\ weighs\ approximately\ 0.9\ lbs$

$27{,}216\ tomatoes\ per\ plot \times 0.9\ lbs\ each = 24{,}494\ lbs\ of\ tomato\ per\ plot$

24,494 lbs of tomato per plot

If all 100 Organization plots Produced Tomato:

$100\ plots \times 24{,}494\ lbs\ of\ tomato\ per\ plot = 2{,}449{,}400\ lbs\ of\ tomato$

2,449,400 lbs of tomato per 100 plots

If all 200 Community plots Produced Tomato:

$200\ plots \times 24{,}494\ lbs\ of\ tomato\ per\ plot = 4{,}898{,}800\ lbs\ of\ tomato$

4,898,800 lbs of tomato per 200 plots

If all 300 Total plots Produced Tomato:

$2{,}449{,}400\ lbs\ of\ tomato + 4{,}898{,}800\ lbs\ of\ tomato = 7{,}348{,}200\ lbs\ of\ tomato$

7,348,200 lbs of tomato per 300 plots

Zucchini:

Peak Harvest Seasons:

Summer – Fall – Winter

Plot Size and Shape:

3,025 sqft square plot

Spacing:

Each zucchini plant is spaced 2 feet apart from each other.

Each row is 1 foot apart.

Harvest time from Sow to Harvesting:

50 days

Total Plants:

$$\frac{3{,}025\ sqft}{2\ sqft\ per\ zucchini\ plant} = 1{,}512\ zucchini\ plants$$

1,512 zucchini plants per plot

Total Produce Grown:

$Each\ zucchini\ plant\ produces\ an\ average\ of\ 6\ zucchinis$

$1{,}512\ zucchini\ plants\ per\ plot \times 6\ zucchinis = 9{,}072\ zucchinis$

9,072 zucchinis per plot

Total Produce Weight (in lbs):

$Each\ zucchini\ weighs\ approximately\ 0.4\ lbs$

$9{,}072\ zucchinis\ per\ plot \times 0.4\ lbs\ each = 3{,}628\ lbs\ of\ zucchini\ per\ plot$

3,628 lbs of zucchini per plot

If all 100 Organization plots Produced Zucchini:

$100\ plots \times 3{,}628\ lbs\ of\ zucchini\ per\ plot = 362{,}800\ \ lbs\ of\ zucchini$

362,800 lbs of zucchini per 100 plots

If all 200 Community plots Produced Zucchini:

$200\ plots \times 3{,}628\ lbs\ of\ zucchini\ per\ plot = 725{,}600\ lbs\ of\ zucchini$

725,600 lbs of zucchini per 200 plots

If all 300 Total plots Produced Zucchini:

$362{,}800\ lbs\ of\ zucchini + 725{,}600\ lbs\ of\ zucchini = 1{,}088{,}400\ lbs\ of\ zucchini$

1,088,400 lbs of zucchini per 300 plots

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Appendix G: StoryMap Outline Draft

OUTLINE:

What is the purpose?

- Get people to understand the feelings surrounding the culture at Hoʻokuaʻāina
- Explaining the new endeavor on the plot
- Show where the new plot is

Who is the intended audience?

- Potential donors
- Potential participants

What are the key takeaways?

- Understanding or getting an idea about the ‘vibes’ surrounding Hoʻokuaʻāina

What content will it include?

- Maps, where the plot is, in relation to Oahu, Maunawili, etc.
- People’s stories – why they came, why they are looking forward to growing the organization
- Numbers surrounding crop production, and which crops can grow
- How the system will work (broadly)
- History about the Ahupuaʻa and Konohiki systems and how those are being implemented into the new plot

Any data that supports your story?

- Maps
- Crop Data
- Images (Cassie has those), videos, audio files
- Vance’s essays and interviews

Two Page Story Map (No tabs so it's not super like a website)

- Have two tabs, one for the stories and feelings, and one for the custom system, etc.

Story Section

- Main page would be the stories etc.,
- Begin with what the story is aiming to get you to feel -> to understand the richness of the program and the land etc.
- Begin with a broader story, and how everyone is interconnected through Hoʻokuaʻāina.
- Move through and put people's stories in and the impact the place has had and the impact that the new plot can have for a broader group of community members
    - Have everyone incorporate where participants came from (on a map) and incorporate that into the larger picture of how everyone is connected through the organization.
    - Have a visual on the map showing the interconnections.
- End off this section with moving towards the new plot, and how it can connect to an even greater audience (YOU can be a part of this too!!!)
    - Will connect to second thread -> which is the new system aspect.

New System Aspect

- Describe how the system will work (broadly)
- Work through each of the three branches of the diagram made for the other day (Hoʻokuaʻāina, and the farm itself)
    - Hoʻokuaʻāina and the staff management, and have information and history about the Konohiki and ahupuaʻa system and how it's being evolved
        - this lends itself good for having a map of the ahupuaʻa around the island and zooming in on their land specifically.
        - Briefly mention community participants' involvement.
    - Move towards the impact that the program will have.
- Have numbers like plots, crops that can be grown, approximate/estimated crop growth/yields.
    - Create a picture with the math (easy to digest diagram/visual aid)
    - Have imagery with the types of crops that can grow.
    - Includes maps of the plot
    - Also include community services that can/may be provided (education, farmers market, etc.)
- End with the impact of how this many people can produce to grow food and themselves.

Appendix H: Quotes and Images for the StoryMap

This appendix includes all the 11 participants or staff from Hoʻokuaʻāina that were interviewed as part of the impact interviews (see Appendix K for Impact Interview Script and Notes). Some of these quotes and images were included in the StoryMap. Each of the quotes were gathered in personal conversations. Most participants' names will be first name only, as to be a more personal level for the StoryMap.

Benji Ah Sing – (From Kailua, Oahu)

"It is so special to us that an organization like Hoʻokuaʻāina has been in our backyards since we were babies. Were fortunate enough to found it and have the people in the organization speaking to our lives, and shaping and molding us to the people we are today."

"It became so much more than a volunteer day for me because of the way people carried themselves, and the values we hold ourselves to, as well."

"We are an inclusive space, and everyone is welcome here."

"We foster wellbeing, we invest in the lives of the people who come here, whether they're volunteers, interns or apprenticeship students."

"I see Palawai as a catalyst to see the world change."

Ari Lunow-Luke – (From Kailua, Oahu)

"Spaces like this are really rare here…the work that we do here makes people aware of the land and culture and have a deeper connection to stewarding the land."

"Palawai is so exciting to help us to create those deeper connections to place, and to ʻāina. It's so exciting that a place like this will exist in our backyards."

Kazu Akiona-Banan – (From Kailua, Oahu)

"I was born and raised with a lot of the same values, and coming here resynchronized my values that I grew up with and synchronized my connection to the ʻāina... It allowed me to connect the dots and find myself."

"Coming here, people get the sense of aloha and welcoming and community, and they also get the sense of aloha ʻāina and the importance of that, and it's resonated in them in ways that makes them want to steward the land."

Vance Kaleohano Farrant – (From Kahaluu, Oahu)

"The impact of Hoʻokuaʻāina comes in three broad categories: First, *Hoʻolako* – to provide for people, from the physical programs to providing a space for people to meditate. This also includes food for people. Second is *Hoʻike* – to show and make known knowledge and to change people's perspective. Hoʻokuaʻāina changes the way youth see the future and themselves. They help people change their perspectives of success. Third *Hoʻoulu*, which is to grow. Hoʻokuaʻāina moves people to the point of change and personal growth, whether it is physical or mentally."

Jade: (from Punaluu, Oahu)

"It's hard work, definitely a lot of hard work, but just the people and the staff just make it worthwhile. They make you feel so loved and nurtured. And it's like you're feeding the community. It feels amazing!"

"They really teach you patience. It teaches you to look back and just be thankful for everything."

"I want to help as best I can and just help feed everyone and bring back what it should have been."

"I feel like we just got to work together, and I feel like if we can do that, we can do anything."

Lilinoi: (from Kailua, Enchanted Lake specifically)

"This place is whatever you make it to be for yourself."

"Spiritually, this place has given me the opportunity to be able to connect to my Hawaiian culture, my ancestry here. Hawaiians are very spiritual people, and so [Hoʻokuaʻāina] found that spirituality and everything. And in the kalo, and in the Hāloa, our first Hawaiian was made from kalo. So being here in this space, being in nature, really helps me with my emotional regulation and spirituality."

Rain: (from Kailua)

"I'd like to think of this place as a second home almost, with a really big support system, not just in school, but also in life… If we're going through personal things, or just if something happened, we all have each other's back."

"You have to stay on track, put in the work, but at the same time you have a strong support system pushing you and just being outside is transformative."

Justice: (in Kaneohe now)

"The biggest impact I got was having all my friends here and the community I am in now."

River: (in Waikiki-ish area)

"It's been a way to escape from the busy life and being able to connect with the earth. Being connected to another culture has been super valuable, and I've seen how it helped me relax and become grounded."

"I think anyone would get value from [the new plot] and would benefit from it, even if they don't think like, oh, that's not my thing, farming is not my thing. I feel like the reward in the end would bring a lot more than what it seems to be if you're seeing it as farming, and just changing your perspective and value on life."

Victor: (lives in Kahaluu, Oahu)

"I've made so many friends here who I consider being the closest to outside of my family."

"The whole goal is to make the whole island sustainable again, and getting more community to do that would make the goal so much easier."

Becca Croft: (lives in Honolulu)

“If I hadn’t found this place, the only people I would have been friends with were other outsiders [people not from Hawaii]… I think having spaces like this, [where] people need to give and not just take and having opportunities like this makes them feel like part of a community.”

“It’s the first time since diving into this whole realm of sustainability, I’ve felt like there’s a solution, or an initiative that really does hit those social, ecological, and economic principles, it needs to be looked at and it’s all happening right now. We have some work to do, and this is a step in a positive direction.”

Appendix I: Community-based Farming Practices Worldwide

This appendix contains the critical analysis from objective 1.

Community-based Farming Practices Worldwide

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Table of Contents

Introduction

To aid Hoʻokuaʻāina in their new expansion, we analyzed various community agriculture and conservation models to gain a deeper understanding of agricultural practices. Through our research, we identified crucial insights into the successes and failures of these models. We applied these lessons learned to recommendations provided to our sponsor for future use. The information for this objective was gathered through analysis of published articles and interviews with individuals with experience in the field of study. All examples included in this analysis share the same concepts of community participation, agroecology, and self-sustainability.

Community Agriculture Models

Community agriculture models are agricultural systems that involve interactions with members of local communities. These models prioritize the health of the environment, the well-being of participants, and the provision of healthy, fresh, and locally produced food. Community agriculture models can be an effective way to promote healthy eating, reduce carbon footprints, and support local economies while fostering a sense of community and connection to the land. In this section, we analyze community gardens, community supported agriculture (CSA), regenerative agriculture, and community forestry management.

Community Supported Agriculture

Community Supported Agriculture (CSA) is an alternative method to traditional western agriculture, which involves community members contributing to a shared farming project to benefit from the process of farming and food production. In exchange, members receive a share of the crops or profits (Biodynamic Association, n.d.; Penn State Extension, 2014). This enables supporters to consume fresh produce in a sustainable way while also boosting the local economy by keeping money within the community. Recently, CSA has evolved to include subscription farming or farm shares, where members fund the farm for a portion of the crops. CSA farms offer a way for individuals to reconnect with the land and reject modern farming practices that rely on significant financial resources, large workforces, and excessive equipment (Cone et al., 2000).

While community supported agriculture programs offer many benefits, there are some barriers that participants may face. Affordability can be a challenge for households with limited financial resources, as CSA farmers may face high costs and charge high prices for their farm shares. Transportation can also be an issue, as pick-up locations may be difficult to access for some members. Additionally, since CSAs often target higher-income demographics, low-income households may not have the same access to these programs (Biodynamic Association, n.d). However, strategies such as income-based payment plans, partnerships with local food banks, and increased outreach to low-income communities can help to increase access to CSA programs for all members of the community regardless of income level.

Despite these barriers, the benefits of CSA programs are numerous. Participants have access to fresh, healthy, and locally produced fruits and vegetables grown using sustainable farming practices. The programs also help to build a sense of community by connecting members with local farmers and other participants. CSA programs also offer environmental benefits by reducing the carbon footprint associated with food transportation and promoting sustainable farming practices (Forbes et al. , 2008). Economic benefits include supporting local farmers and keeping money within the local economy. Additionally, CSA programs provide educational opportunities, allowing members to learn about sustainable farming practices and the local food system.

CSA provides a range of ways for community members to be involved in the local food system. Participation in a CSA program can range from purchasing a share of the harvest to volunteering on the farm or participating in community events. Members can also participate in decision-making processes related to the farm, such as deciding which crops to grow or providing feedback on the quality of the produce (Hinrichs, 2000). Community members can also be involved in promoting the CSA program through word of mouth, social media, or other forms of outreach. This not only increases participation in the program but also helps to build community support for local agriculture. Overall, CSA programs provide multiple avenues for community members to engage in sustainable agriculture and support local food systems.

Community-supported agriculture (CSA) is a highly beneficial method of financial support that Hoʻokuaʻāina should consider in their new system. A suggestion is to create a subscription for supporters of the organization so that they can receive fresh crops at home like a CSA farm once the new plot is established and there is a variety of crops. By adopting this approach, the sponsors can foster a direct connection with consumers and provide them with access to fresh and locally grown produce. In addition, this method can also benefit the environment by supporting sustainable farming practices. By joining a CSA program, consumers can support Hoʻokuaʻāina's mission to support native practices and plants while also contributing to the health and wellbeing of their local community.

Community Gardens

Community gardens are plots of land that are available for use by local residents for the purpose of growing plants such as vegetables, fruits, or flowers. These gardens are usually located in urban areas but can also be found in low-income communities outside of cities. Community gardens are typically maintained by organizations rather than local governments, and their purpose is to promote sustainability, wellbeing, and community inclusion (Turner, 2011). Participants are assigned or can choose a section of the garden to cultivate and are responsible for providing their own seeds and gardening equipment. A monthly or yearly fee is sometimes required to become a member of the garden (Center for Disease Control, n.d.). Community gardens offer several benefits, including the opportunity for participants to take ownership of their food supply, socialize and form connections with other members of the community (Blackwood, 2023).

There are some barriers to community gardens, however. Some of these are lack of funding, inadequate access to land, lack of community support, and limited organizational capacity. Community gardens require resources to establish and maintain, including tools, water, soil, and seeds. A lack of funding can make it difficult to get a community garden started or to keep it going. Finding suitable land for a community garden can be challenging, especially in urban areas where land is at a premium. Land ownership and land-use policies can also create barriers to access. For community gardens to be successful, they need support from community members, including volunteers, donors, and other stakeholders. Without this support, community gardens may struggle to survive. Successful community gardens require strong organizational capacity, including effective leadership, clear communication, and coordinated planning. Without these factors, community gardens may be less successful in achieving their goals (Diaz et al., 2018).

To learn more about some of the challenges that community gardens face, we interviewed Ana Mines, who is the Community Gardens Project Manager for the City of Honolulu. Ms. Mines explained that the city has 11 urban-focused community gardens that are managed by volunteers. Most of the gardens were started in the 1970s and the city only provides water and

minor repairs. There are many challenges with the gardens, including outdated regulations, bureaucracy, and the need for more leadership within each garden. However, the gardens are highly valued by the community and are a place for education and community building. People participate in the gardens for many reasons, including social service, physical activity, and food security. While these gardens are not currently set up to address food insecurity directly, they do have participants who rely on them to supplement their food at home. The city does not finance the gardens, but they provide the land. Additionally, some gardens ask for dues from participants to pay for repairs and garden maintenance. All gardens have an internal system of governance, typically consisting of a president and other members with various positions, who oversee the maintenance and address any issues that arise. In the event that an issue cannot be resolved within the garden, the city or local authorities may step in to provide further assistance (Ana Mines, personal communication: Appendix I1).

The City of Honolulu's Community Gardens, seen in figure 1, provide a valuable lesson on the significance of effective communication among garden members. Ms. Mines emphasized that regular communication between members and the city authorities can prevent conflicts from escalating. This valuable insight can be applied in Hoʻokuaʻāina's new plot, where it is crucial to ensure that there is clear and open communication from the members of each hui to Dean and Michele. By encouraging communication and fostering a culture of transparency, potential issues can be addressed promptly, and conflicts can be resolved before they escalate.

Figure 1. City of Honolulu Community Gardens. Picture provided by Ana Mines.

Another viewpoint was provided by Judith Robinson, who is the president of the board of directors at West Side Community Garden in New York City - the entrance of the garden is seen in figure 2. West Side Community Garden in Manhattan is a non-profit organization that was started in the mid-1970s when people from the neighborhood took over an abandoned plot of land that had been left as rubble. The garden is run entirely by volunteers and has around 300 members who pay a small fee ($15 per year) to be a participant and with this membership they can get on a waiting list for a vegetable plot. The garden has two types of plots, vegetable plots for people to farm their crops and take home and flower plots for people who just want to enjoy nature (they are not allowed to pick any flowers). The garden is open to the public, and its mission is to provide a green space where people can relax and connect with nature. While the garden may have supported food insecurity in the past, the objective of urban renewal was the

top priority, and now most people who join the garden are looking for a connection with nature, while the vegetable garden participants primarily want fresh food produced with their own hands and effort, which gives them a sense of completion. The financing for the garden comes from a variety of sources, including member dues, grants, private donations, and fundraising events. (Judith Robinson, personal communication: Appendix I2).

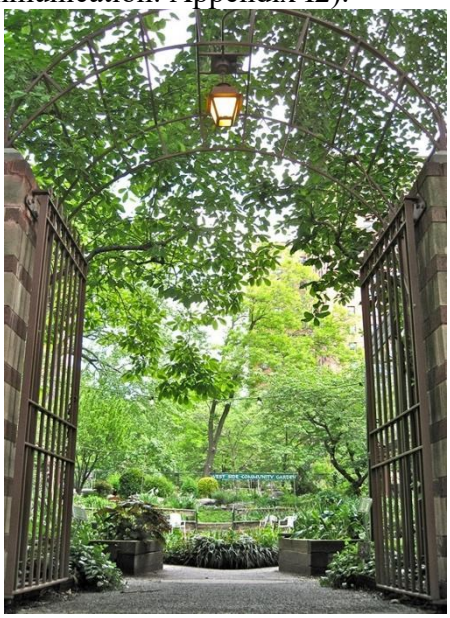

Figure 2. West Side Community Garden gates. Picture by Alexa Palmerini.

While the setting of this garden is significantly different from Hoʻokuaʻāina, this interview provided insight into issues that are prevalent in most gardens, like conflict resolution and garden expansion. Ms. Mines and Ms. Robinson both described similar conflict resolution policies that are important to take into account. As garden participants are people, conflict is inevitable. The City of Honolulu Gardens and West Side Community Garden both have policies to expel members, however, both Ms. Mines and Ms. Robinson reported that they have never gotten to that point. Some common conflicts that arise in both are overgrowth of weeds or plants, lack of maintenance or use by the assigned person, and a long waitlist. The two have different ways of solving conflict, however, both of which could serve as suggestions for Hoʻokuaʻāina to reflect on and consider. Ms. Mines reported that as the city of Honolulu is a local government, there is a lot of bureaucracy and things can take a long time. Gardens have an officer, who is a member that was voted for by the internal government and regularly checks the garden to make sure things are going well. When an infraction is committed by a member, that member is notified by the officer and then has two weeks to solve it. At the end of the two-week period, there is a second notification attempt, and after that a revocation letter is sent by the city to the plot owner with which the plot owner can appeal within two weeks of receiving the letter. The West Side Community Garden manages conflict in a very different manner, as they are an organization that can make decisions with less bureaucracy or state oversight and with a shorter timeline. In their case, the vegetable and flower plots have separate committees formed from members who are elected by other members where they can take decisions about the plots and solve conflicts. If a problem needs a stronger solution, then they pass it on to the board of directors where they can vote on the issue and solve it.

Based on what we learned about conflict resolution in community gardens, we think that Hoʻokuaʻāina could benefit by establishing an internal government for making important

decisions like the one that the West Side Community Garden has. A set of rules for participation and individual responsibilities will be important for the success of the new plot, and these rules should be created with the help of other people. While Dean and Michelle ultimately have the final say, they can benefit from the input of a council consisting of participants and community members who can provide their perspectives and suggest alternative courses of action.

Regenerative Agriculture

Conventional agriculture is a farming method that relies heavily on mechanization, synthetic inputs such as chemicals, and monoculture cropping systems to maximize yield and profit. However, this approach can have negative impacts on soil health and long-term sustainability. The use of synthetic inputs can deplete soil nutrients and lead to soil degradation, which can ultimately reduce crop productivity and decrease the resilience of agricultural systems over time. (Stony Brook University, n.d.) Regenerative agriculture is a holistic approach to farming that aims to regenerate soil health, biodiversity, and ecosystem function by focusing on processes such as crop rotation, cover cropping, reduced tillage, and other practices that promote soil health and biodiversity, rather than relying solely on inputs such as fertilizers and pesticides. The goal of regenerative agriculture is to build soil health, increase biodiversity, and improve the resiliency of agroecosystems in a sustainable manner, while also addressing issues of social justice and equity in agriculture (Newton et al., 2020).

Regenerative agriculture practices, such as minimizing soil disturbance, maximizing soil cover, and integrating livestock. Minimizing soil disturbance involves reducing the amount of physical disruption to the soil. Maximizing soil cover involves keeping the soil covered with plants or other organic materials as much as possible. Integrating livestock involves incorporating grazing animals into crop production systems. These practices have been shown to improve soil health. These practices increase soil organic matter, improve soil structure, and reduce erosion. Additionally, regenerative agriculture has the potential to sequester large amounts of carbon in the soil, reducing greenhouse gas emissions and mitigating climate change. By focusing on increasing plant diversity and creating habitats, regenerative agriculture also supports a wide range of plant and animal species, including beneficial insects and pollinators. This practice further offers benefits such as improved water retention, reduced runoff and erosion, and water conservation through soil cover and reduced tillage. As regenerative agriculture practices reduce input costs over the long term and increase yields, they can help to improve farmers' economic viability (White, 2020). Overall, these successes illustrate the potential of regenerative agriculture to address many of the pressing challenges facing agriculture and the environment today.

Hoʻokuaʻāina is currently implementing similar practices, however, there is always room for improvement and learning. In comparison, Polyface Farms is a leading example of a regenerative farming system that employs various practices, including rotational grazing, cover cropping, and composting, to improve soil health, enhance biodiversity, and reduce reliance on external inputs. The farm's innovative techniques and practices have gotten significant attention and admiration within the farming community, making it an excellent model for other farmers and organizations to follow (Simpson, 2010). Joel Salatin, the owner of Polyface Farms, is known for his innovative farming inventions that include pastured poultry - a method of raising chickens for meat and eggs that involves keeping them on pasture and rotating them to new areas frequently - and pigaerators - is a type of rotational grazing system that allows pigs to forage on fresh grass and other vegetation while also tilling and fertilizing the soil. What is truly

remarkable about Salatin's work is that he has not patented or copyrighted any of these inventions. His goal is to share his knowledge and promote sustainable farming practices, rather than to profit from his ideas. Salatin hopes that his concepts will become household words and that they will inspire others to take up sustainable farming practices. By openly sharing his methods, Salatin is helping to create a culture of collaboration and knowledge-sharing within the farming community, which has the potential to transform the way we approach agriculture and food production (Polyface farms, n.d). Polyface Farms is a unique business that sets itself apart by not having sales targets. Despite being a for-profit enterprise, the farm operates in a manner similar to that of a non-profit organization. Unlike other businesses, Polyface Farms does not prioritize production quantity, and instead focuses on sustainable and ethical farming practices (Polyface Farms, n.d).

Juntos, a regenerative agriculture project in Ibiza seen in figure 3, is the brainchild of Christian Jochnick, who purchased land to support biodiversity in the area. Jochnick's philosophy is that large-scale agriculture is unsustainable and instead advocates for small-scale farming as a way to produce organic and chemical-free produce. Juntos is not only a farm but also a platform that provides resources and markets for small-scale farmers to sell their products under the Juntos brand. The project aims to demonstrate that regenerative agriculture can be profitable and sustainable while raising awareness that buying regenerative products supports community and ecosystem resilience. By investing in distribution, product transformation, and marketing, Juntos hopes to incentivize and make it easier for farmers to start up and diversify their revenue streams. The ultimate goal is to show governments that supporting small-scale agriculture projects will increase the potential of the food supply chain and strengthen local economies (Christian Jochnick, personal communication: Appendix I4).

Figure 3. Shirt with logo from Juntos. Picture from Juntos website.

By exploring more regenerative agriculture practices, Hoʻokuaʻāina can foster and nourish the soil of their new plot. These practices include cover cropping on lands not utilized for the Huis, composting on a larger scale than currently done, and rotational grazing with other animals that will be introduced to the new plot. These techniques have the potential to restore soil health, increase organic matter, and enhance soil fertility. For instance, by incorporating cover crops, the soil can become more resilient and absorb more water, which can help reduce

erosion and improve the soil's water-holding capacity. Composting can increase the soil's nutrient content, thereby enhancing plant growth and crop yields. Introducing rotational grazing with livestock can help in the restoration of the land, as livestock's waste can act as natural fertilizer and improve soil health.

Community Forestry Management

Community forestry management (CFM) is a community-based approach to forest management that strengthens communities' capacity to build vibrant local economies, while protecting and enhancing their local forest ecosystems (California Department of Forestry and Fire Protection, n.d.). CFM lets local communities use and manage forestry resources to promote sustainable land use practices while meeting the needs of the community.

In Sub-Saharan Africa, there are a number of CFM projects that focus on conservation efforts to preserve forests and help local communities become self-sustainable. In general, community forest conservation projects happen mostly in countries of low resources where communities that live outside of cities need to farm their own crops to survive due to the dangers of food insecurity (Duguma et al, 2018). The government is usually involved in these programs because they provide legal assistance and facilitate access by the communities to take care of the lands and not let industries or poachers illegally consume from these forests. As the local communities around the area are familiar with the land and need it to survive, they have a bigger motivation to take care of it for future generations and therefore use resources in a sustainable manner for income generation. (Duguma et al, 2018).

There are numerous studies on community forest management (CFM) programs implemented worldwide but the evidence base for their effectiveness is limited due to a variety of methodological issues. However, some common factors have been identified in successful CFM programs, such as strong governance structures, secure tenure rights, and support from external organizations and governments (Bowler et al., 2010). These elements contribute to the successful implementation and long-term sustainability of CFM programs, which can provide a range of benefits, including enhanced biodiversity conservation, carbon sequestration, and sustainable livelihoods for local communities. Government support is very important in these projects because they can provide financial and technical support to CFM initiatives, which can help to strengthen their capacity for sustainable forest management and increase their economic viability. The government also ensures that CFM initiatives are incorporated into broader policy frameworks and are not viewed as isolated, niche programs. This can help to scale up successful CFM initiatives and increase their impact on broader environmental and social goals (Bowler et al., 2010).

Although not directly related to Hoʻokuaʻāina, community forestry management (CFM) initiatives can provide valuable lessons that are applicable to community-based agriculture. CFM programs demonstrate the importance of having a strong governance structure that establishes clear rules and guidelines for managing land, ensuring active participation and engagement from all members of the community. These programs also underscore the critical role that government support plays in the success of community-based initiatives, particularly through providing technical and financial assistance when needed (Bowler et al., 2010).

The COVID-19 pandemic has further emphasized the significance of Hawaii's agricultural lands for the sustainability of the islands. As such, it is imperative to address the challenges facing the industry, including limited land availability, water availability and sustainability, and the impact of climate change. Hawaii has a pressing need for sustainable farming practices, and the potential for new export markets and increased demand for locally

grown food present opportunities for transformative changes in the agricultural sector. By taking cues from successful CFM programs, Hawaii's agricultural industry can thrive with active community involvement and strong government support (University of Hawai‘i at Hilo, 2020)

Self-sustainability

An essential aspect of community agriculture projects is economic self-sustainability through value-added products. These initiatives strive to produce food and resources for local communities or markets, and as such, should be able to meet the project’s needs without relying on external funding to ensure their long-term viability. The experts we interviewed highlighted the importance of creating value-added products for increased revenue to the organization. Christian Jochnick from Juntos, a self-sustaining regenerative agriculture project located in Ibiza, highlights the importance of using events and value-added product creation to commercialize regenerative agriculture practices. This can make them more accessible to consumers and more profitable for the organization. By modifying a raw crop, it gives a higher market value and a longer shelf life (Colorado Farm To Market, 2021). With more revenue creation from value-added products, community agriculture projects can establish themselves in the market and increase their financial resilience, thereby ensuring their sustainability and continued impact on the community (Christian Jochnick, personal communication: Appendix I4).

One project that embodies the principles of self-sustainability is the Asociación de Mujeres Waorani de la Amazonia Ecuatoriana (AMWAE) (United Nations Development Programme, 2016). According to Claudia Salem, the founder of Yo Siembro Ecuador, the Waoranis are a nomadic indigenous community in the Ecuadorian Amazon that initiated contact with the western world recently (around the 1950s). The women from the community formed the first women's association in the country, with the mission to help women become self-sustaining and independent. The association has about 150 female members who each represent a household. Traditionally the Waoranis have been a community that relied on hunting and a local plant-based diet for sustenance, and on the native palm called chambira to make crafts like handbags, tablecloths, and table placemats. In the early 2000s, the Waorani communities were negatively impacted by petroleum exploitation activities in the Ecuadorian Amazon, as companies introduced roads and villages with commercial buildings (such as supermarkets, bars, and stores). The men from the community started to integrate into the western world and they began separating from their families and started abandoning their ancient traditions. The women, who used to gather chambira leaves to make crafts from parts of the forest close to their communities, needed to travel farther and farther away to get the materials they needed, and slowly their traditions started to disappear. But a group of women from the community, organized to look for alternative ways to sustain their community and get their families back together (Claudia Salem, personal communication: Appendix I3).

The Waorani women initially sought funding from various sources, including the government and nonprofits, but relying solely on donations to sustain the entire community proved to be a challenge. As an alternative, the Ecuadorian Ministry of Environment helped the women cultivate cacao for the production of organic chocolate, which generated income that was reinvested back into the community for education, healthcare, and further agricultural projects. Younger women in the community were also provided with education on culture, family economics, and traditional weaving seen in figure 4. The Waorani women received additional help from Claudia Salem through Yo Siembro Ecuador, who introduced their crafts to the Ecuadorian consumer market and facilitated the cultivation of chambira within their community.

As a result of their resourcefulness and hard work, the Waorani community is now self-sustainable and able to invest in new projects with the money they generate. Self-sustainability is a crucial aspect of success for any organization, and the Waorani women have proven that with determination and the right support, positive change can be achieved.

Figure 4. Waorani woman weaving with Chambira leaves.

The Waoranis provide a perfect example of self-sustainability and the importance of generating income through value-added products. Depending solely on funding from donors can be challenging, and diversifying income streams can help ensure long-term success. Hoʻokuaʻāina can learn from the Waoranis by exploring options for developing more value-added products that utilize the crops they grow, in addition to selling the kalo itself and poi. Now that the organization is expanding and exploring new forms of agriculture and new crops, they should also be working to identify new, and better value-added products. By doing so, they can generate more income and continue to maintain their organization for years to come.

Reasons for Community Participation

The most important factor of community farming is community participation. In all the published articles and interviews we analyzed, the authors and experts emphasize the importance of having a good relationship with the participants of the projects. A critical factor in fostering a good relationship with the community members is the provision of incentives. Incentives can be in the form of resources or personal benefits that motivate community members to participate actively in the project. Providing incentives can help to create a sense of ownership and responsibility among the community members towards the project. But in order to create this sense of ownership and responsibility community members must first understand the project. A key challenge of community farming is developing a strong understanding and connection to agriculture in the community (Claudia Salem, personal communication: Appendix I3).

In Ecuador, the government has implemented several projects for community gardening and agriculture to help food insecurity in the low-income communities. Claudia Salem informed us that she has collaborated with the Ecuadorian Environment Ministry in Guayaquil and Quito to educate low-income communities about these initiatives. Two noteworthy projects emerged from these collaborations. The first project was established in the Monte Sinai area of Guayaquil, a hazardous neighborhood with government-provided housing for the city's poorest residents. The government established a community garden to teach locals how to grow their own food,

decrease reliance on government aid, and increase self-sufficiency. The project launched just before the Covid-19 pandemic, and its leaders faced several challenges, including robberies by non-participating community members, lack of interest, and difficulty educating the participants. Despite these challenges, the project was successful in combating food insecurity among low-income participants who have limited education levels, and many were able to overcome these obstacles with success. The second project took place in the south of Quito, where the municipality supported low-income families living in government housing to create gardens in their backyards. The project faced challenges with self-sustainability, but its leaders helped participants to sell their produce at a local supermarket, increasing their income and improving their economic resilience. Both of these initiatives were successful in empowering low-income participants through active participation. They were able to combat food insecurity, improve their diet, and achieve a greater sense of ownership and responsibility towards their own food production (Claudia Salem, personal communication: Appendix I3).

In the U.S., while many community gardens may not have been specifically created to support food insecurity, they have been shown to improve community bonds and promote overall health. Judith Robinson of the West Side Community Garden spoke with us about her personal experience with the mental health benefits that come from participating in community gardening. For example, she pointed out that working with soil and plants can be therapeutic and provide a sense of calmness and relaxation. Cultivating and cooking her own food gives her a sense of independence and accomplishment, boosting self-esteem and confidence. Moreover, community gardening creates a sense of belonging and social connectedness, which are essential for mental well-being. Through her involvement with the community garden, Judith has formed meaningful relationships with other community members who share her passion for gardening and healthy living. These connections provide a support system during challenging times and contribute to a sense of community and belonging. Judith's experience highlights the potential benefits of engaging in community-based activities for mental health and well-being, emphasizing the importance of cultivating connections with others in our communities (Judith Robinson, personal communication: Appendix I2).

Community farming projects attract people for a variety of reasons, but food insecurity and personal benefits are the two primary motivators. However, sustaining participants' engagement in these initiatives requires offering them a tangible incentive. According to the experts interviewed for this research, providing a physical resource in exchange for their contribution is crucial to keep them coming back. Without a tangible benefit, participants are unlikely to remain engaged in the long run. Hoʻokuaʻāina is expecting to give a tangible benefit to its participants but the details of this need to be very well thought of in order for the organization to ensure long term sustainability,

Conclusion

In conclusion, community-based farming practices offer a promising path towards sustainable and equitable agricultural development, with numerous benefits that include social and environmental sustainability, local knowledge and participation, and equitable distribution. These farming practices have the potential to improve food security, reduce poverty, and protect biodiversity, while also fostering social cohesion and empowering low-income communities. The successful community-based farming initiatives from various parts of the world highlighted in this paper demonstrate the diverse ways in which aspects of these systems can be adapted to suit Hoʻokuaʻāina. Nevertheless, community-based farming practices face several challenges,

including insufficient policy support, limited access to resources and markets, and the impact of climate change. To address these challenges, there is a need for greater recognition of the value of community-based farming practices and the implementation of supportive policies. Overall, community-based farming practices can significantly contribute to sustainable agricultural development, highlighting the importance of supporting and scaling up these initiatives to create a more sustainable food system in Hawaii.

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Appendix I1：

Below is the summary of our interview with Ms. Ana Mines about community gardens in Honolulu, which took place in person on 1/31/2023.

Ana Mines Interview Summary

Ana Mines is the Community Gardens Project Manager who works for the City of Honolulu in Hawaii. The city has 11 urban-focused community gardens that are managed by volunteers. Most of the gardens were started in the 1970s and the city only provides water and minor repairs. Each garden has its own council made up of volunteers, and each plot is maintained by one person or household. There are many challenges with the gardens, including outdated regulations, bureaucracy, and the need for more leaders. However, the gardens are highly valued by the community and are a place for education and community building. People participate in the gardens for many reasons, including social service, physical activity, and food security. They are not currently set up to address food insecurity, but there are people who rely on them to supplement their food at home. The city does not finance the gardens, they provide the land, and some gardens ask for dues from participants (to pay for things that the city should provide but there is too much bureaucracy). There is a huge demand for community gardens in Honolulu, and there is a long waitlist.

Conflict management is a crucial aspect of running community gardens. The garden officers are responsible for handling conflicts that arise among members. However, these officers are not always comfortable with conflict and may try to avoid it. For this reason, it is important to have multiple leaders in the gardens who can handle conflict in case the head of the garden is not able to do so (a situation that is common). Some conflicts may escalate to the city's involvement, and in such cases, it takes a long time to resolve the issue due to government bureaucracy. One example of a conflict that can arise in community gardens is overgrowth and weeds. If a member is not maintaining their plot, it can affect the neighboring plots and create a bad experience for other members. In such cases, the officers will issue warnings to the member and give them time to fix the problem. If the problem persists, the city issues a revocation letter, and then the member has time to appeal, and another process is done.

It is also important to note that some conflicts are not related to gardening, but rather personal or cultural differences between members. For example, some people may use language barriers as an excuse to avoid communication, which can create tension between the garden and the city. Therefore, overcommunication is best, and having more ways to receive feedback are also helpful. Effective conflict management is crucial to ensure the success of community gardens. Having multiple leaders, clear guidelines for conflict resolution, and open communication can help prevent conflicts and resolve them when they arise.

Appendix I2:

Below is the summary of our interview with Ms. Judith Robinson about the West Side Community Garden in New York City, which took place through Zoom on 2/13/2023.

Judith Robinson Interview Summary

Judith Robinson is the president of the board of directors at West Side Community Garden (there are 13 members). She started as a member with a vegetable plot and through the years became the president of the board of directors.

The West Side Community Garden in Manhattan is a non-profit organization that was started in the mid-1970s when people from the neighborhood took over an abandoned plot of land that had been left as rubble. The garden is run entirely by volunteers and has around 300 members who pay a small fee ($15 per year) to be a participant and with this membership they can get on a waiting list for a vegetable plot. The garden has two types of plots, vegetable plots for people to farm their crops and take home and flower plots for people just to enjoy nature (they are not allowed to pick any flowers). The garden is open to the public, and the mission is to be a green space where people can relax and connect with nature. While the garden may have supported food insecurity in the past, the objective of urban renewal was the top priority, and now most people who join the garden are looking for a connection with nature and the vegetable garden participants mostly just want fresh food. The financing for the garden comes from a variety of sources, including member dues, grants, private donations, and fundraising events. The garden is not self-sustaining, and there are no plans to sell to local markets. While the garden has had conflicts in the past, there is a vegetable garden committee that helps to solve these problems. The garden is active during the winter, with planning and administrative work being carried out.

Conflict management in the community garden is done through either a committee from the vegetable garden or another one from the flower garden. These two are responsible for addressing conflicts that can arise between participants, some common conflicts are overgrowth of weeds or plants, lack of maintenance or use by the assigned person, and a long waitlist. The committee members work together to resolve conflicts and if not, they escalate them to the board of directors if necessary. The community garden also benefits from a set of rules that outline what is expected of plot owners, such as taking care of their plots and not infringing on other plot owners' space. These rules are a basis for addressing conflicts and enforcing consequences, such as the possibility of being kicked out of the garden. But in practice, no one has been evicted yet, and conflicts are usually addressed through communication and collaboration.

Another approach to conflict management in the garden is to create a sense of community and belonging among garden members. The garden's open-door policy and affordable membership fees allow anyone to participate and engage in gardening. The garden also hosts events and activities that bring people together, such as concerts and festivals. This helps build a sense of community and shared ownership of the garden, making it more likely that conflicts can be resolved through open communication and a shared desire to make the garden a success.

Appendix I3:

Below is the summary of our interview with Ms. Claudia Salem about her experience with agricultural education and the Waorani women project in Ecuador, which took place through Zoom on 2/14/2023.

Claudia Salem Interview Summary

Claudia Salem is the owner and founder of *Yo Siembro Ecuador.* This organization gives environmental education to the youth of Ecuador, they work with private and public schools, and also have a TV channel. This organization began with an idea and advice from friends. She had a small garden in the balcony of her apartment around 7 years ago and she was amazed by how anyone can grow vegetables and food in their own home. With this garden she was able to introduce her kids to vegetables because as they grew the vegetables and ate something that they created, her kids loved the feeling of eating something they cultivated and took care of. She did not think of teaching to other people until some of her kids' friends started getting interested in gardening, and their mothers were amazed by how the kids were able to eat vegetables when they did not do the same at home. Two years later she was able to develop school education programs for gardening and environmental education for young kids at private schools that could afford to pay for these extra education programs. Sometime after the start of the program, there was an earthquake in Ecuador and she started thinking about how everyone should have knowledge in agriculture and the environment, so she started to give this education to public schools also, but at no cost. She also began working with other organizations around the country, these include community gardens for people of need and other agriculture focused programs.

One of the programs that Claudia worked with is the *Asociación de Mujeres Waorani de la Amazonia Ecuatoriana (AMWAE).* The Waoranis are a nomadic indigenous community in the Ecuadorian amazon that began contact with the western world fairly recently (around the 1950s). They are a community that is very basic and has a lot of traditions, these include singing, clothes knitting, and craft production. They formed the first women's association in the country, which has around 150 female members who are all heads of household.The Waorani Women's Association was created to help the women become self-sustaining and independent. They relied on the native palm chambira to make crafts, but as the palm trees became scarce due to the impact of oil plantations, the women had to look for alternative ways to sustain their community.

With the help of NGOs, the women were able to create a cacao plantation, which generates income that is reinvested in their community. They also use the money to provide training in administration and economics, as well as in the art of weaving, which helps to preserve their culture. The association also gives out plants to other women to grow in their own chakras, or plantations. The Waorani Women's Association has also successfully revived the use of the chambira palm for weaving, which is a sustainable and renewable resource that does not require the destruction of the plant. This has helped to ensure the continued growth of the palm and its use in weaving, preserving their culture.

Despite the progress they have made, the Waorani Women remain vulnerable due to the political situation in Ecuador. Some leaders of the indigenous communities want them to remain

ignorant so they can be manipulated, and the women continue to face challenges in maintaining their independence and their way of life. However, the Waorani Women's Association represents an important step forward in empowering indigenous women and preserving their culture.

Claudia Salem worked on two additional projects aimed at addressing food insecurity. The first was located in Monte Sinai, a neighborhood in Guayaquil, which is one of the poorest and most dangerous areas of the city. In Monte Sinai, a community garden was established to provide residents with access to fresh produce and combat food insecurity. This project was completed just before the start of the pandemic, and it served as a valuable source of food and a meaningful activity for residents during lockdowns. The second project was based in government-provided housing in Quito. Claudia collaborated with the municipal government to teach residents how to grow their own vegetables and food at home. This effort aimed to alleviate food insecurity by empowering residents with the skills and resources necessary to produce their own food.

Appendix I4:

Below is the summary of our interview with Mr. Christian Jochnick from Juntos project in Ibiza. He talks about his experience with regenerative agriculture and gives suggestions about the focus new agriculture projects need to have. This interview took place through Zoom on 2/24/2023.

Christian Jochnick Interview Summary

Juntos was inspired by traditional indigenous ceremonies and the realization that nature is not a material object, but the life force of the planet. Christian also felt motivated to create a better environment for his children to grow up in, and was concerned about the mental health crisis in the Western world. Juntos is a for-profit company that aims to commercialize their regenerative agricultural practices through events and product creation, while also providing a platform for other farmers to access resources and markets. They prioritize small-scale, diversified farming and seek to create synergy between different farming activities. The community is invited to participate in the farm when more hands are needed, and the seed bank is set up as a cooperative for farmers to share. The goal is to show that regenerative agriculture can be profitable and sustainable, and to increase awareness that buying regenerative products supports community and ecosystem resilience. While Juntos does not focus on addressing food insecurity in Ibiza, it provides a space for people to connect with nature and gather. Conflicts are handled by showcasing the success of their practices and investing in education, input, soil, seeds, seedlings, and distribution to help other farmers achieve similar results.

Christian also gave some advice after a short explanation of Ho'okua'aina's goal with the new plot. He suggested prioritizing regenerative agriculture practices to strengthen the ecosystem and promote biodiversity, while also creating diverse revenue streams. Showcase the success of these practices to increase awareness and incentivize government subsidies for small-scale agriculture. Invest in education, input, soil, seeds, seedlings, and distribution to help other farmers achieve similar results. Use events and product creation to commercialize regenerative agriculture practices and make them more accessible to consumers. Recognize the importance of relationships and community and use farming as a way to bring people together and connect with nature.

Appendix J: StoryMap Link and PDF

This appendix contains the link, which may be updated by Hoʻokuaʻāina after the IQP is complete and pdf version for the StoryMap which shows the state of the StoryMap prior to completion of the IQP. Unfortunately, the pdf version simplifies, or removes, interactive features and changes thematic elements, such as color, to make the document print friendly. Some of the formatting may be different or wrong when added into this document.

https://storymaps.arcgis.com/stories/18100e43660a4b2d915670e932993751

ArcGIS StoryMaps

The Pālāwai Lands

Cultivating Community

Hoʻokuaʻāina

February 16, 2023

In 2007, Hoʻokuaʻāina took the first steps in restoring resources to a small parcel of land in Kailua, on the island of Oahu. Grounded in Hawaiian tradition, we are a non-profit organization working to strengthen community bonds as we create deeper connections with the ʻāina (land).

Once overgrown and unkept, this land is now a vision of agricultural abundance and home to our current kalo farm and prosperous poi production operation. In 2020, we completed the development of our current kalo farm which allows us to provide mentoring and education opportunities to the youth, attract volunteers from all over, and produce food for the local community.

Appendix J: StoryMap Link and PDF

More About Hoʻokuaʻāina

The Pālāwai Lands is our new project here at Hoʻokuaʻāina, and our next step in expanding our outreach and positive impact. We are excited to share our journey with you!

Please check back often as this page will be updated with our project progress.

Our ʻĀina

Where are we now? Where are we going? Let us show you...

Appendix J: StoryMap Link and PDF

1 Oahu, Hawaii

We are located in Hawaii, on the Island of Oahu. Hawaiians have traditionally lived on and worked closely with the ʻāina. As such, Hawaiian culture is deeply connected to the ʻāina. However, day-to-day interactions with the ʻāina have changed dramatically in recent history. Today, a majority of the population lives in urban or suburban areas and works in the man-made environment, especially on Oahu.

2 Ahupuaʻa of Kailua

We are located in the Ahupua‘a of Kailua, on Oahu. An ahupua‘a is a section of land that extends from the mountains into the sea. There are several ahupua‘a on the island. Contained within an ahupua‘a is everything the local population needs to survive: food, water, and shelter. The modern equivalent of an ahupua‘a is a watershed. Ahupua‘a (dark blue) and watersheds (light blue) are outlined on the map.

The Makalei Mo’olelo of Kawainui is a story that defines the Ahupua‘a of Kailua. This is a story of a boy who lives with his grandmother, up by the Makawao Stream, in Maunawili. One day, the community gathers to clean the Kawainui fishpond. At day’s end, the ali’i (chief) distributes fish to all the helpers. Even though the boy helps clean, unlike the others, he does not receive any fish. When the boy returns with no fish, his grandmother is very upset. Using her makalei stick, she attracts all the fish away from Kawainui to Maunawili. The lesson of this story highlights the connections

between different lands in the ahupua‘a and exposes the nature of community interaction.

Full Story

3 Kapalai

Within the Ahupua‘a of Kailua, we are currently located in Maunawili at Kapalai. Here, we restored 3 acres of unkept and overgrown land to lo‘i kalo (wetland taro farm). These lands support our mission to help people “grow” through the growing of kalo. Our initial focus was on the youth of Oahu. Now, we are aiming to reach the larger community.

Appendix J: StoryMap Link and PDF

4 Pālāwai

We are in process of acquiring 116 acres of unkept and overgrown land at Pālāwai, just down the street from our current operation. This new land will provide the space needed to engage with the larger community. Each acre, an opportunity waiting to be discovered.

Pālāwai may be overgrown now, however Pālāwai and Maunawili have a long history as productive agricultural lands. Click and drag on the arrows below to compare Pālāwai of past and present.

Satellite imagery of Pālāwai's current condition (left) and historic map showing land use in 1908 (right). Apple Maps, 2023 and Silkscreen by Kracauer, 2022 of "Mauka Section. Kawainui Rice Land. Kailua Koolaupoko Oahu" from Kane‘ohe Ranch Archive, 1908.[1]

Agriculture in Maunawili dates back to the 1300s and remained prominent the area until the late 1900s. The land was first used to grow kalo. The kalo produced in Pālāwai was coveted by Hawaiian ali‘i (nobility). Queen Ka‘ahumanu, a powerful ruler in the early 1800s, was among those who requested kalo specifically from Pālāwai.[2]

A growing Western influence began to change land ownership practices and agriculture. Kalo patches were first replaced by rice fields and later industrial agriculture and cattle ranching. As agriculture began to decline, large portions of Maunawili were converted into subdivisions and a golf course. Today, only scattered small farms remain.

Ho‘okua‘āina strives to become the konohiki of the Pālāwai Lands, managing and maintaining the land for the benefit of the community. As such, we are developing an agriculture system inspired by the traditional Hawaiian land management practices to implement at Pālāwai.

What is a Konohiki?

A konohiki is a traditional Hawaiian land manager of the ahupua‘a. With a vast knowledge of the ahupua‘a, it is their right and responsibility to ensure continued productivity of the land. They decide where, when, and who can use the resources provided by the land and sea. Historically, this method of management respected the land and considered the natural functions of the environment which allowed the Hawaiian people to live in harmony with the land for centuries.

Our Plan

We are in the process of expanding our current operation and creating a community-based agriculture system. Our system will provide 3 pathways for community members to get involved:

1. Working in small groups to manage a farm plot
2. Volunteering on the farm
3. Purchasing products and services from the farm

Different levels of participation provide community members with a range of benefits and, in turn, support the successful operation of the system.

Working in Small Groups to Manage a Farm Plot

This method provides the most support to the organization and the

most benefits to members. In this program, participants work in groups of four to farm 3000 square foot plots and contribute hours outside their plots. In exchange, members receive a portion of the crop produced on their plot, access to organization facilities and services, and the opportunity to forge stronger connections with the community and the land.

There will be an application process to join the program. However, participants are not required to have prior farming experience. Anyone looking to form strong bonds with the community and aloha ʻāina (love and respect the land) is ideal for the program. Check back soon for more information!

Volunteering on the Farm

Volunteers from the community, and around the globe, are invited to visit and assist Hoʻokuaʻāina staff with farm activities. This may include weekly community volunteer days, or specific sign-ups for farm-related tasks. Your time and contributions will always valued be valued at Hoʻokuaʻāina. Together, we can make a real difference while enriching one another's lives!

Purchasing Products and Services from the Farm

The community will be able purchase our products at our farmers' market or in participating stores. We plan to have a variety of crops and agriculture products available. Community members will also be able to participate in our classes and

workshops for a small fee. More details to follow!

Our Impact

Pālāwai will be a space for the community to connect with the land and each other.

Hoʻokuaʻāina is excited to provide lots of fresh produce and other agricultural products to the community! We expect to have about 300 plots on the farm. In addition to farm plots, we expect to have orchards and livestock!

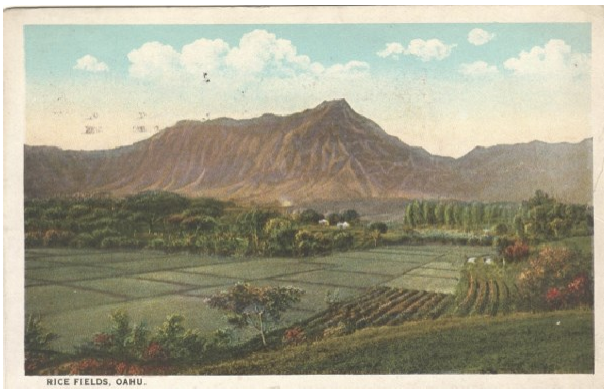
The reach of the Pālāwai project will extend far beyond the anticipated impact for our community members. When Hoʻokuaʻāina protects Pālāwai, then Pālāwai protects more that meets the eye...

Protects Cultural and Historical Sites

There are number of cultural and historical sites on the Pālāwai lands. Known sites are marked with red text on the map. A proper archeological survey has yet to be conducted and more sites are expected to be uncovered. We intend respect and protect these sites.

Silkscreen of Kawainui Riceland Map with cultural and historical sites labeled (Silkscreen by Kracauer, 2022 of "Mauka Section. Kawainui Rice Land. Kailua Koolaupoko Oahu" from Kane'ohe Ranch Archive, 1908).[1]

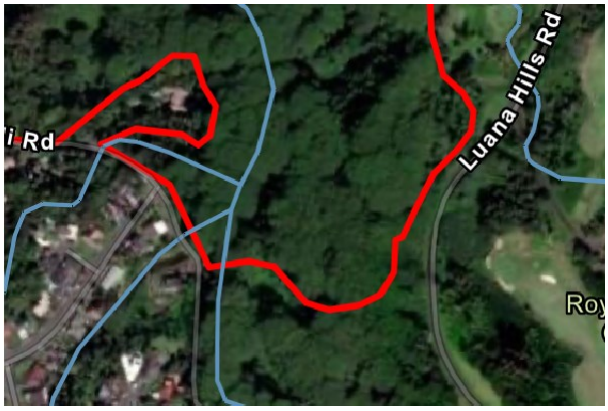
Protects Agricultural Lands



1929 postcard featuring Maunawili.[3]

Agricultural lands in Kailua are threatened by subdivision and development. From 2016 to 2019, there were four subdivision applications that would, if approved, result in the loss of half of the zoned agriculture lands in Kailua and a majority of the Hanalei soil. Hanalei soil has high nutrient levels making it ideal for agriculture, especially for cultivating kalo. Pālāwai is prime agricultural land with 68 acres of Hanalei soil.

Protects the Watershed



Expand the map to explore how water flows from the mountains to the sea.

The Maunawili Stream cuts through the Pālāwai property carrying water from 5 tributary streams (Palapū, ʻŌmaʻo, ʻAinoni, Makawao, and Olomana), 2 of which converge with the Maunawili Stream the on the property (ʻŌmaʻo, Olomana). The stream then then flows along the base of Olomana, under Kalanianaole Highway, into the Kawainui fishpond, and out into Kailua Bay. Therefore, the health of the water in Kawainui and the bay depend on the health of the Pālāwai lands.

At Pālāwai we will focus on loʻi kalo. On the property, there are 30 to 50 acres that are ideal for loʻi. Loʻi perform 3 important ecosystem services that improve the health of the watershed:

1. Loʻi slow down the flow of surface water. This increases ground water recharge and water supply. This also helps to prevent stream

erosion.

2. Loʻi cleanse the water. The loʻi work like a filter, trapping sediments carried by the stream.
3. Loʻi prevent flooding downstream. In the event of a storm, loʻi absorb and trap water.

Protects Habitat

Loʻi kalo are home to many native species including fish, snails, and birds. At Kapalai, we observed an increase in native birds on the property after establishing the loʻi. We now have ʻalae ʻula (Hawaiian mudhen), ʻalae keʻokeʻo (Hawaiian coot), koloa (Hawaiian duck), aukuʻu (black-crowned night-heron), and the endangered aeʻo (Hawaiian stilt) at Kapalai. The loʻi at Pālāwai will create additional healthy wetland habitat for these native species.

Ae'o hunting in the lo'i at Kapalai. The ae'o or Hawaiian stilt is an endangered subspecies of the black-necked stilt.

What is the Benefit of Native Species?

Native species hold important roles within their native ecosystem which help to maintain the balance or stability of the ecosystem. These roles may include maintaining another species population; clean the air, soil, or water; or transporting materials through the environment. Without native species ecosystem functions may be greatly impacted or lost.

Our Community

Hear from our community on the impact of Hoʻokuaʻāina and their hopes for the Pālāwai lands.

Notes:

1: Silkscreen Map

ʻAi Pōhaku Press. Testimony of Hikaalani. 2022. Silkscreen. 00 x 00 inches. Composite map illustrating lands described in the 1895 Supreme Court of the Republic of Hawaii testimony of Hikaalani, born in Palalupe, Kailua at about the time Hiram Bingham and the first missionaries came to Kailua (1821). “Palawai was the place where taro was planted most and that was the taro that supplied the chiefs when they called for hookupu. There were several chiefs but those that I knew were

Kalola, Kahalele, Kaahumanu, Liliu, Kauikeaouli, ... ” Map

based on a 1908 original ink and colored wash map “Mauka Section. Kawainui Rice Land. Kailua Koolaupoko

Oahu,” Kaneʻohe Ranch Archive; with added early nineteenth-century kapa pattern details, indicating wahi pana, from a kapa moe

given by Moʻiwahine Kaahumanu to Rev. Hiram Bingham. Mark and Carolyn Blackburn Collection.

Silkscreen produced by Tom Kracauer with Barbara Pope Book Design.

2: Queen Ka‘ahumanu kalo request

3: Maunawili Postcard Provided by Lynn Davi

Appendix K: Impact Interview Script and Notes

The team interviewed a total of 11 current Hoʻokuaʻāina staff and program participants to get their understanding of the impact Hoʻokuaʻāina has had in their lives. The team asked an open-ended question to get the most honest responses. All interviews, except for Becca's, were recorded on video, with permission from the interviewee, to ensure all information was gathered during the conversation. For this reason, an interview summary is only provided for Becca's interview. A photo of each participant was included as part of the interview, again with the permission of the participant. Each interview was then listened to, and the most important quotes from each were recorded. The specific quotes gathered from the interviews can be seen in Appendix G – Quotes and Images for StoryMap.

<u>Focus questions asked to all participants:</u>

- What has been the impact that Hoʻokuaʻāina has had on your life?
- What is your view on the impact that Hoʻokuaʻāina can have on the rest of the community, with specific relation to the new expansion?
    - *If the interviewee was unaware of the new expansion, the interviewers elaborated and explained what would happen on the new plot.*
- Are there any specific barriers you may have when it comes to participating in the new plot?
- What is your name and where are you from?

<u>People Interviewed:</u>

- Becca Croft
- Jade
- Justice
- Lilinoi
- Rain
- River
- Victor
- Benji
- Ari
- Kazu
- Vance

Interview with Rebecca “Becca” Croft - 2.12.23

Q: Where are you from and how did you get to Hoʻokuaʻāina?

- From a part of England called Buckinghamshire – Living in Honolulu now
- Moved there and moved to bay area in CA when 17, and went to college there and moved to Hawaii (Oahu, Honolulu),
- Started coming to Kapalai a month after moving here, central to the time living here
- Was doing sustainability research, food systems, aquaculture, other things
- Research was focused on how to integrate local communities into conservation projects, reviewing interventions around the world and looking at ecological and environmental impacts around the world
- Moved here for personal reasons
- Wanted to get involved in the projects that were doing these initiatives
- Wanted to be involved in the ʻāina projects
- Asked a friend to recommend places that had the same food systems world
- Have to come to Hoʻokuaʻāina, it’s the best place, you’re going to love it
- Turns out that her grandpa who lived here was best friends with uncle deans dad, but they had grown apart, grandpa knew the son was dean and he had a farm somewhere on the island
- Mom was born in Hawaii
- Looked on the website and knew the last name of the family, Wilhelm’s
- Grandpa was the best man at his wedding, came like a normal volunteer
- Shared in the circle up and had the family connection on the website
- Took her under her wing and made her feel like family, family is super important here

Q: What impact has working with Hoʻokuaʻāina had on your life?

- Without a family here it can feel very isolating, far away from everyone, not connected and part of the culture
- If I hadn’t found this place, the only people I would’ve been friends with other outsiders, and that hard because people are quite transient, and people move around a lot, but I think having spaces like this, and you’re just living in a bubble of people coming in and out, and it keeps you from really looking after this place, people need to give and not just take and having opportunities like this makes them feel like part of a community,
- People being here for 7 years and coming here and being part of the community
- Huge reason why she kept coming back
- Feel grounded that she had a community that felt like family
- Reasons to participate: had a sense of family outside the immediate family, and the community once you feel it and have it in your life, it’s crazy how you haven’t had that in your live before, go from an individual to a community, we are social pack creatures, found here that is so hard to find that’s not self-centered or can get weird, here is just like you’re all contributing to something bigger than yourself yet you’re nourished at the same time, self-interested but not at the same time, gotten significantly healthier since

becoming here, can't pinpoint a specific thing, the mud and earth is an anti-depressant, being connected to the earth and people, and making you feel whole in places you didn't know you were empty in

- Holistically I'm a lot healthier, think more about other people than yourself, shifting the mindset of why people would engage in a space like that it has happened to me, that I can testify to it, and every time I see someone I can bring things to others and share more of myself with others, feel more comfortable being vulnerable, if people would engage in the space, and open minded coming in, that shift could take place because it happened with me here

Q: What is anything anyone should know for coming to Hoʻokuaʻāina?

- Things they would know coming in, to come in with a posture of listening and open to receiving if they have a different mindset coming in, I didn't grow up with this mindset and culture, but If you come in with open mindset that is something that would really need to be communicated, I'm sure if they were interested in the space that would come pretty naturally.

Q: Anything else you'd like to share with us?

- I through the research I've been doing before this, it seemed very scary to live in the world we live in and our future for us young people is pretty bleak , and all the predictions that are all laid out for us, I don't know what the next 20 years are going to look like, up to this point we've been on a trajectory that's been pretty secure, now, we really are going to experience a huge shift in food systems and mass migration of people is going to be one of the hardest things for us to experience, the need for spaces like this are so important not just in terms of growing food, which is going to be a problem for us, based on the predictions scientists are putting forward, but just this idea of so many people being transient no because of rising sea levels, huge populations will be underwater soon , and when you don't have that connections to place anymore , you do need a connection to place, I couldn't turn away from these things because it was my job, thinking about a place like this feels not just nice to have but really really really critical to have right now, and having the space for ourselves is very critical right now to be establishing, and moving forward, hopefully this can be a map for other communities to be a map around the world it provides an opportunity not just for communities, and can really help other communities looking for solutions if they need them,
- It's the first time since diving into this whole realm of sustainability, I've felt like there's a solution, or an initiative that really does hit those social, ecological, and economic principles, it needs to be looked at and it's all happening right now. We have some work to do and this is a step in a positive direction