



Scaling 'Ulu Agroforestry In Hawai'i

Elemental Insights | October 2022



SUMMARY

In Hawai'i, diversified 'ulu (or breadfruit) production offers an opportunity to reverse the tide of decades of food insecurity. 'Ulu currently suffers from a lack of investment relative to Hawai'i's primary commercial crops like coffee and macadamia nuts, and in absolute terms given Hawai'i has some of the highest production costs in the US. Given 'ulu is an underutilized (yet resurgent) crop in Hawai'i, there is a significant lack of resources for farmers, including labor, equipment, appropriate marketing, and sales options. However, providing financial tools, technical assistance, and frameworks for scalable growth can enable a major agricultural inflection point for Hawai'i-based farmers.

Through a partnership funded and facilitated by Elemental Excelerator, [Hawai'i 'Ulu Cooperative](#) (HUC) and [Propagate](#) combined resources, perspectives, and unique expertise to design pilot systems that can significantly expand 'ulu agroforestry production in Hawai'i. Through their collective, community-based approach, the two companies are targeting a total of 1,000 additional acres of 'ulu production over the next five years.

HUC and Propagate found that diversified 'ulu operations can be much more profitable than monocropped systems. Integrating diversified alley cropping has the potential to decrease farmers' breakeven point to 6 years instead of 15 years, and can increase their internal rate of return by an additional 18%.

With Elemental providing the catalytic grant funding to initiate their collaboration, Propagate and HUC were awarded part of a **\$60 million federal grant** from the USDA's highly coveted Climate Smart Commodities program. The funding will enable additional hiring and the issuance of financial incentives for successful agroforestry expansion.



OBJECTIVES

Hawai'i 'Ulu Cooperative (HUC)

HUC is a farmer-owned business working to restore Hawai'i's food sovereignty by empowering farmers as changemakers in the islands' food system. 'Ulu is a traditional perennial staple crop in Hawai'i and across Polynesia, associated with resilience and abundance. Restoring 'ulu to its historical prominence in Hawai'i's food system not only revitalizes an important component of indigenous culture, but helps to strengthen statewide food security, create agricultural rural livelihoods, and restore degraded landscapes to productive agroforestry systems.

What is 'ulu?

'Ulu is a traditional perennial staple crop grown in Hawai'i and across Polynesia, associated with resilience and abundance.

What is agroforestry?

Agroforestry is practice of integrating trees and shrubs into crop and animal farming systems to maximize economic and environmental benefits.

However, economic models and demonstration sites are needed to de-risk 'ulu production in Hawai'i, and to showcase how local stakeholders can work together to implement scaled systems. HUC partnered with OK Farms, a 1,000-acre tree crop farm in Hilo, Hawai'i Island, to establish a 5-acre pilot 'ulu agroforestry demonstration system. OK Farms owner Troy Keolanui saw an opportunity to diversify the farm's offerings, produce a traditional Hawaiian staple, and help advance the mission of HUC.

Propagate

Propagate offers design and agronomic software, project development, and financing services to make it easy for farms to implement agroforestry while reducing risk through the integration of fruit, nut, and timber trees with animal or crop farming systems. The company's software platform, Overyield, enables rapid prototyping in planning, management, and finance for agroforestry.

Tree crops grown in the tropics serve as integral components of supply chains around the world. To tap into the tropical market opportunity for the first time, Propagate sought to secure local, community partners to help build its agronomic modeling, datasets, and best practices to support deployment.

The Partnership

The partnership between HUC and Propagate aligned with the short and long-term goals of each organization and took advantage of their complementary expertise. Together, they designed and implemented an ambitious agroforestry project in Hawai'i that included:

1. A 5-acre pilot demonstration system on-farm in Hilo.
2. An interactive economic model and production primer to support scaled 'ulu agroforestry in Hawai'i, with estimated OpEx and CapEx requirements.
3. A framework for ecosystem partnership with landowners, farmers and funders to rapidly scale 'ulu agroforestry adoption.

By the end of the project period in August 2022, 'ulu agroforestry production among HUC farmers had already increased by 50% from 100 to over 150 acres.



“Partnering with Propagate enabled us to develop an economic model for 'ulu agroforestry in Hawai'i that can now be shared with farmers, landowners and other stakeholders to build community confidence in these systems – as not only good for the community and 'aina, but also as a sound, long-term business decision.”

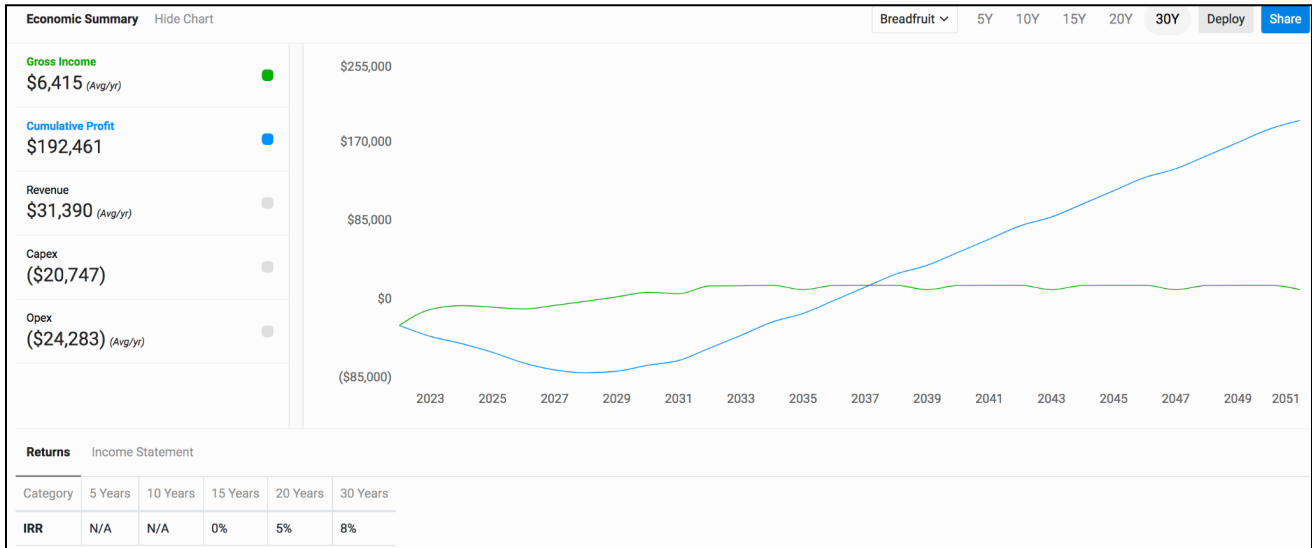
– Dana Shapiro, General Manager, Hawai'i 'Ulu Cooperative

OUTCOMES

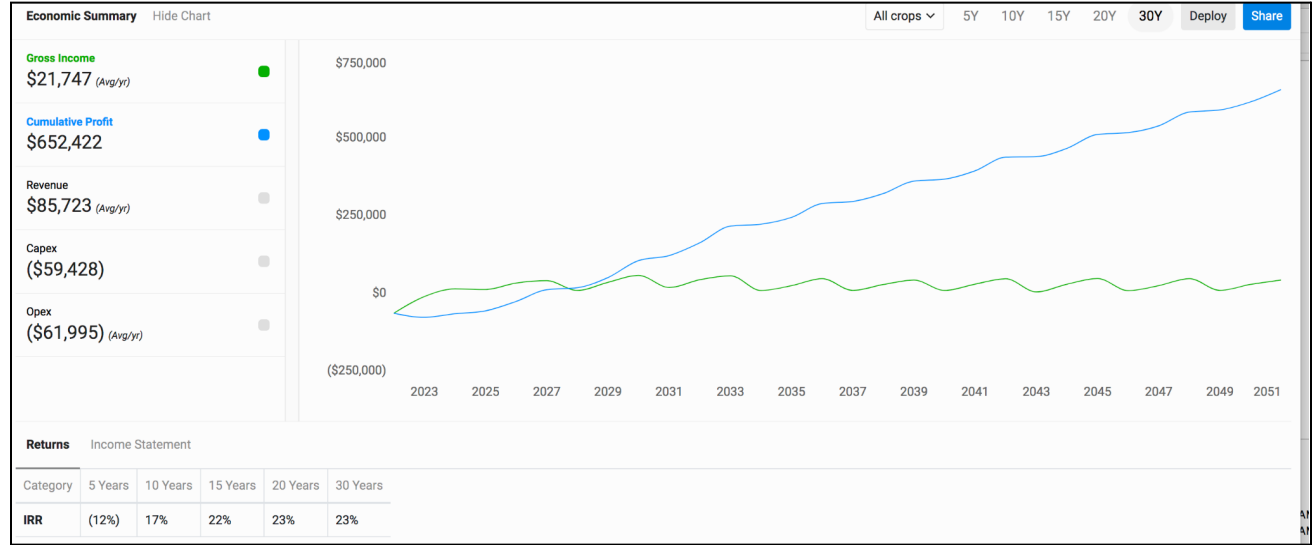
DATA & INSIGHTS

The economic outlook of integrating ‘ulu with selected co-crops is promising. A 5-acre breadfruit monocropped system provides breakeven after 15 years with a 20-year IRR of just 5%; after 30 years the IRR increases to 8%. In comparison, a 5-acre diversified agroforestry system that combines alley cropping and windbreak practices has a breakeven point 6 years after planting and a **20-year internal rate of return (IRR) of 23%**. Importantly, the system as a whole offers a much stronger economic outlook than cultivating 5 acres of breadfruit on its own, as seen in the two Overyield projections below.

Economic summary of **breadfruit-only system**:

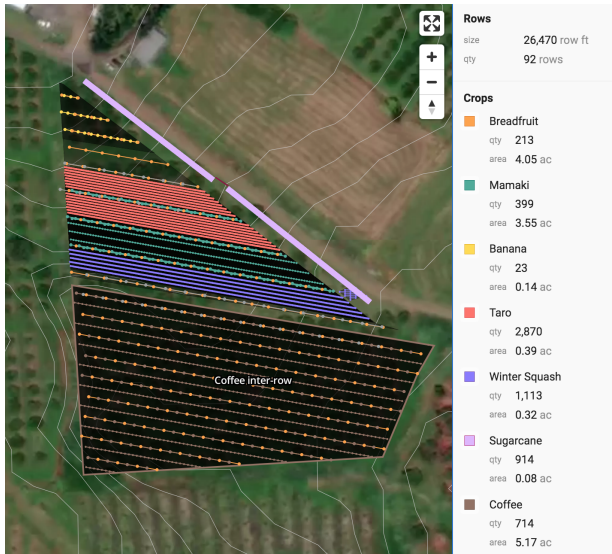


Economic summary of **diversified agroforestry system**:



HUC and Propagate created agronomic and financial models with input from Hawai'i farmers and researchers for a variety of crops that have different traits, value, and growth cycles, including:

1. Fast growth cycle (harvest in under one year): kalo (taro), pala'ai (winter squash or pumpkin)
2. Medium growth cycle (harvest in 1–2 years): sugarcane, banana, māmaki (an endemic tea in the nettle family)
3. Slower growth cycle (maturity in 4–5 years+): coffee, cacao, teak



The integration of faster-yielding crops like taro, squash, sugarcane, banana and māmaki allows growers to benefit from income generation well before the 'ulu trees mature ('ulu trees produce fruit in 5–7 years, and reach full maturity in about 11 years). However, they also require a lot more effort on the part of the farmer / manager and knowledge about multiple crops. Therefore, these crops may not be the best solution for all producers.



KEY TAKEAWAYS

The typical understanding of how to scale is not always the right approach. Scaling agroforestry in Hawai'i requires a different, more community-focused strategy.

Going into this project, HUC believed there would be support and interest among Hawai'i farmers in 'ulu agroforestry, and in expanded 'ulu production overall. They learned that the local community, while indeed interested in expanding 'ulu agroforestry production, is very cautious about large-scale systems or concentrated ownership models due to the lasting trauma of plantation agriculture in Hawai'i.

Moreover, there is a relative maximum amount of acres at which farmers might realize diminishing returns, due to the labor requirements needed for planting, tending, harvesting, processing, etc. The team found that the floor is 5 acres to be financially advantageous, and there's a ceiling of roughly 50 acres beyond which operations don't get significantly more efficient and profitable.

As such, the way to pursue "scaled" systems is very important. One appropriate way to develop "large-scale" 'ulu agroforestry would be to support the development of **regional huks** (groups, associations, or clusters). Farms 5 acres and larger could work together to reach economies of scale within a concentrated geographic area — sharing certain large equipment and infrastructure costs as well as labor during peak season months — with up to 200 acres per region conceptualized.

Developing the right set of technical resources is important to help farmers realize the financial benefits of diversified agroforestry.

As a result of the project, HUC and Propagate developed various resources to support farmers. The first is an "**Ulu Production Primer**," which provides a detailed overview of basic breadfruit production practices for prospective farmers, landowners, investors, and other community stakeholders in Hawai'i. The Primer uses information obtained from currently available literature alongside feedback from partners and practitioners, and was created in collaboration with the University of Hawai'i at Mānoa College of Tropical Agriculture and Human Resources (UH CTAHR).

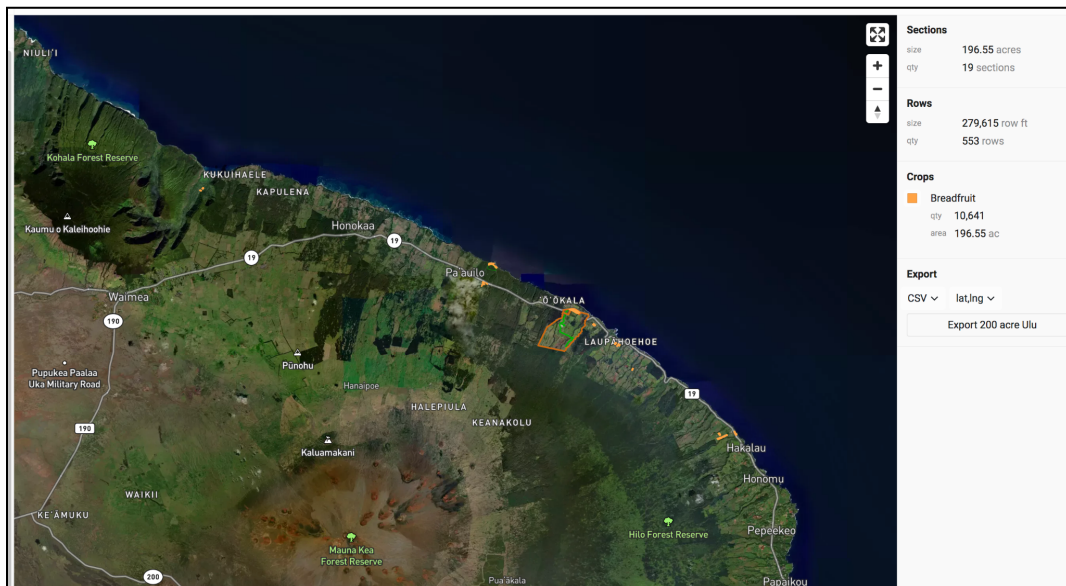
Additionally, using Propagate's existing agroforestry lease agreement as a template, project partners drafted a **Tree Asset Rights & Lease Terms Summary Sheet** specific to 'ulu agroforestry in Hawai'i. The document puts forth a suggested way for conceptualizing tree asset rights and stakeholder relationships, high level lease term considerations, and current lease rate benchmarks for agricultural land in Hawai'i.

NEXT STEPS

This project and its successes are just the beginning. There are four main components necessary to continue accelerating 'ulu agroforestry in Hawai'i.

1. Develop first large-scale hui

HUC is coordinating its first regional hui, "**Hāmākua / Hilo Palikū,**" on the east coast of Hawai'i Island, which has the largest concentration of farms at or over 5 acres today. The map below shows the extent of the Hāmākua / Hilo Palikū regional hui, with 'ulu farms in orange representing 13 farm enterprises stretching from Hakalau in the southeast to Waipio Valley in the north, and nearly 200 acres with more than 10,000 trees. When all trees reach maturity in about 11 years, **this regional hui of farms is expected to produce nearly 4 million pounds of 'ulu annually.**



2. Invest in critical infrastructure

The opportunity to create and retain a margin in Hawai'i, through value-chain development, is immense. When considering a 200-acre regional hui of farms in the ecosystem development framework, it is imperative to invest in transport, processing, distribution, marketing, and sales to ensure a guaranteed outlet for the resulting crop. This is especially true given the current food system bottlenecks in Hawai'i, and 'ulu's low shelf life of just 3-5 days after harvest.

3. Deploy expanded farmer support tools

Farmers in Hawai'i face significant challenges and require technical and financial assistance to successfully scale or implement agroforestry systems. This project played a significant role in HUC and Propagate being awarded part of a \$60 million grant from the USDA's Climate Smart

Commodities program. The funding will support these endeavors by enabling HUC to hire a full-time technical service provider to support HI farmers for five years. The initiative also 1) transition incentive payments directly to farmers implementing agroforestry practices on their land, 2) capital to finance market development and expansion, and 3) funding to develop and adopt new agroforestry certification schemes that can remain accessible and affordable for historically underserved producers in Hawai'i. HUC will be the regional lead for the Hawaiian Islands.

4. Engage the community

The broader Hawai'i community can support greater food security, made possible by 'ulu agroforestry, by identifying and participating (where possible) in stakeholder partnerships among farmers, landowners, and funders. Food manufacturers and value-added processors in Hawai'i and beyond can engage by incorporating 'ulu and co-crops into their products, so that expanded acreage has a market outlet. Funding is also needed to develop the value chain capacities identified above. Consumers can eat more 'ulu and other Hawai'i-grown starches — HUC challenges all Hawai'i residents to incorporate these nutritious heritage crops into their diet at least once per week.



Photo above courtesy of Hui Mālama i ka ala 'Ulili (HuiMAU)

About Elemental Excelerator

Elemental Excelerator is on a mission to redesign the systems at the root of climate change. Elemental fills two gaps that are fundamental to addressing climate change with the urgency required by funding first-of-a-kind projects for climate technologies in real communities and embedding equity and access into everything climate-related. Since launching in 2009, Elemental has invested in over 130 growth-stage companies, celebrated more than 20 exits, funded more than 100 technology projects, and built a platform for scaling equitable, market-driven solutions to climate change.