

# Cost of Production Estimate for a Decoupled “Fish-to-Field” Aquaponic System in Hawai‘i

## Introduction

Aquaculture producers in Hawai‘i face some of the highest electricity and feed costs in the United States. Decoupled aquaponic production systems (DAPS), also referred to as “fish-to-field” systems, offer an alternative to conventional recirculating aquaponics by utilizing nutrient-rich fish effluent as an irrigation and fertility source for field-grown crops. Unlike fully recirculating systems, water is not continuously returned to the fish tanks after crop use, reducing pumping requirements and allowing crop production in conventional field soils.

This enterprise budget provides an illustrative estimate of annual operating costs for a one-acre decoupled aquaponic system modeled after the system evaluated by Honest Greens LLC and the University of Hawai‘i. The estimate is intended as a planning tool for producers and should not be interpreted as a guaranteed cost structure for all operations.

## Assumptions

- Production area: 1 acre
- Fish culture component: Nine 1,000-gallon tanks
- Species: Tilapia and/or catfish
- Electricity rate: \$0.38 kWh<sup>-1</sup> (Hawai‘i commercial average, June 2026)
- Labor rate: \$25.00 hour<sup>-1</sup> including benefits and payroll burden
- Capital life: 10 years
- Crop: Feed-grade sweet potato (‘Uala Kea) irrigated with fish effluent
- Yield: 44,000 lb acre<sup>-1</sup>
- Fish effluent serves as the primary nitrogen source
- One production cycle per year

## Estimated Annual Costs

Cost Category	Annual Cost (\$)
Electricity (54 kWh day <sup>-1</sup> )	7,490
Fish feed	6,000
Fingerlings	1,000
Water	500
Repairs and maintenance	1,500
Water quality monitoring supplies	500
Crop planting material	1,500

Cost Category	Annual Cost (\$)
Harvest and packing supplies	1,000
Labor – fish management (365 hr)	9,125
Labor – crop management (300 hr)	7,500
Labor – harvest and processing (120 hr)	3,000
Insurance, permits, administration	1,500
Annualized tank/plumbing infrastructure	3,000
<b>Total Estimated Annual Cost</b>	<b>43,115</b>

## Estimated Production Costs

### Feed-Grade Sweet Potato

Assumed yield: 44,000 lb acre<sup>-1</sup>

Cost per pound:

$$\$43,115 \div 44,000 \text{ lb} = \mathbf{\$0.98 \text{ lb}^{-1}}$$

### High-Yield Scenario

Assumed yield: 58,000 lb acre<sup>-1</sup>

Cost per pound:

$$\$43,115 \div 58,000 \text{ lb} = \mathbf{\$0.74 \text{ lb}^{-1}}$$

## Comparison with Conventional Recirculating Aquaponics

The project demonstrated several economic advantages of the decoupled design:

Cost Factor	Recirculating System	Decoupled System
Continuous power demand	~3.0 kW	~2.25 kW
Annual electricity cost	\$9,985	\$7,490
Engineered grow beds	Required	Not required
Estimated annualized grow-bed cost	~\$2,500	\$0
Water use	Lower	Higher
Root crop productivity	Lower	Higher

The decoupled system is estimated to reduce annual operating and capital expenses by approximately \$4,000–\$5,000 per acre while simultaneously improving suitability for root crops such as taro and sweet potato.

## Economic Considerations

The largest annual expenses were labor (46%), fish feed (14%), and electricity (17%). As a result, management strategies that reduce labor requirements or partially replace commercial feed with locally produced ingredients may substantially improve profitability.

Sweet potato appears particularly promising as a feedstock crop due to its high biomass production (22–29 tons acre<sup>-1</sup>) and demonstrated suitability as an aquaculture feed ingredient. Taro remains an important cultural and specialty crop but is less competitive on a cost-per-pound basis for feed production.

# Decoupled Aquaponics: Key Economic Findings



**25% Lower Electricity Use**

Compared with recirculating aquaponics

↓ 25%



**\$25,000 Less Infrastructure Investment**

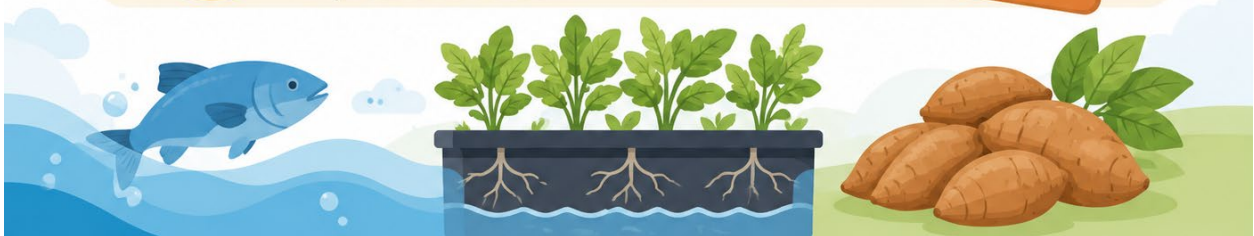
No engineered grow beds required



**\$0.74–\$0.98 per lb**

Estimated feed-grade sweet potato production cost

\$0.74–  
\$0.98  
per lb



## Conclusions

This analysis suggests that a one-acre decoupled aquaponic system can produce feed-grade root crops at approximately \$0.74–\$0.98 per pound under Hawai'i conditions while reducing energy use and infrastructure costs relative to conventional recirculating aquaponics. The

economic advantages arise primarily from lower pumping requirements, elimination of engineered grow beds, and the ability to use fish effluent directly as a fertility source.

## Disclaimer

This budget is intended as an educational planning tool and is based on observed project results, industry estimates, and Hawai'i cost conditions in 2026. Actual costs and returns will vary among farms depending on labor efficiency, electricity rates, feed costs, yields, management practices, financing, and local market conditions. Producers should develop site-specific enterprise budgets before making investment decisions.

## Acknowledgments

This work was supported by the Western Sustainable Agriculture Research and Education (Western SARE) Farmer/Rancher Grant Program through project FW24-012, Piloting an Integrated, De-coupled Aquaponics System for Sustainable Feed Production, awarded to Honest Greens LLC. Additional technical support was provided by the University of Hawai'i at Mānoa College of Tropical Agriculture and Human Resilience.

