
Elyse Butler Mallams

Economic Feasibility of Producing Oysters Using a Small-Scale Hawaiian Fishpond Model

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May 22, 2015

College of Tropical Agriculture and Human Resources
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UA MAU KE EA O KA 'ĀINA I KA PONO

Sea Grant
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“Local” is everywhere

Image: hdoa.Hawaii.gov

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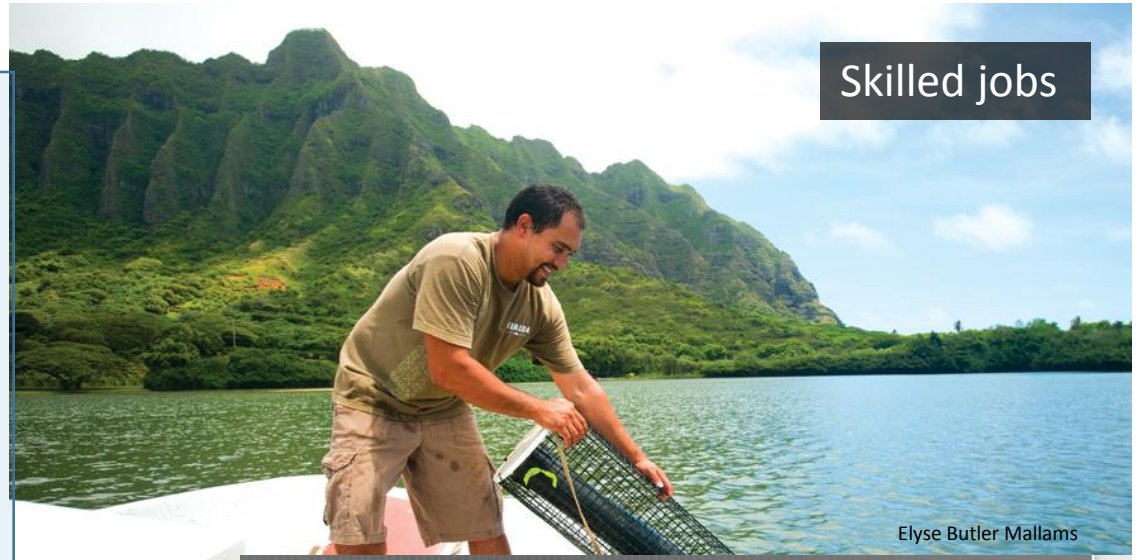
Here at Foodland, we are passiona e about buying local.

Why local matters

State of Hawaii
Animal Industry Division

"By producing more seafood locally we can generate more revenues, create more high-wage, skilled jobs, reduce our reliance on imported seafood, and we can have better control of the product quality. It is also in line with the State's food self-sufficiency initiative and will help redevelop a strong regional food system in Hawaii."



Hawaiian farmed seafood

Image: Blue Ocean Mariculture

Chinese Catfish

What is missing?


Moi

Image: Bryan Harry


Pacific White Shrimp

Image: Kauai Shrimp


Limu

Image: Hawaii.edu

Bivalve shellfish: Clams, oysters

Image: Elyse Butler Mallams

Pacific Oyster

Image: Kauai Shrimp

Clams

Missing oyster industry

- Last bivalve shellfish operation in the state closed gates in 1997 for “financial reasons”
  - Possibly due to high labor and utility cost share of Hawaiian aquaculture, estimated at 42% and 14%, respectively (Naumasa, Arita, Tamaru, & Leung, 2013)
- DOH laboratory certification lapsed in 2000

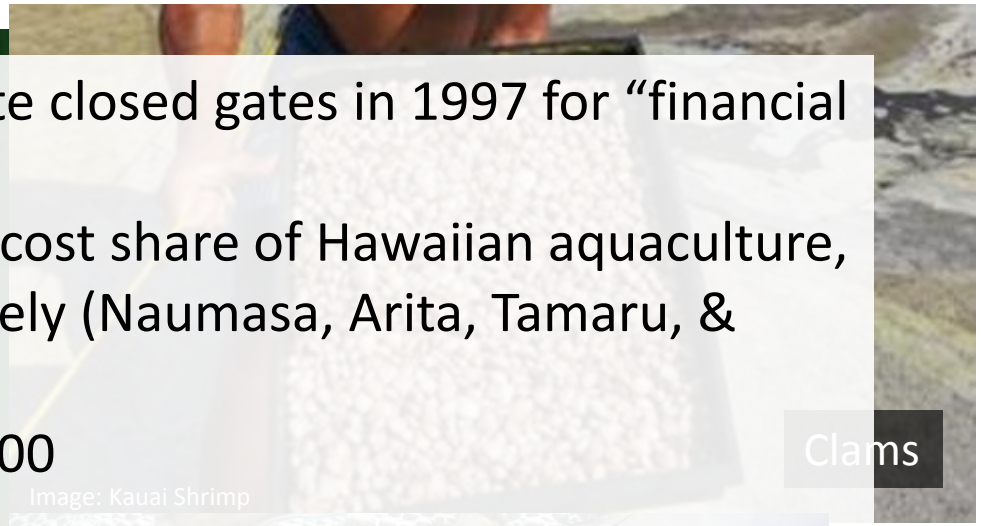
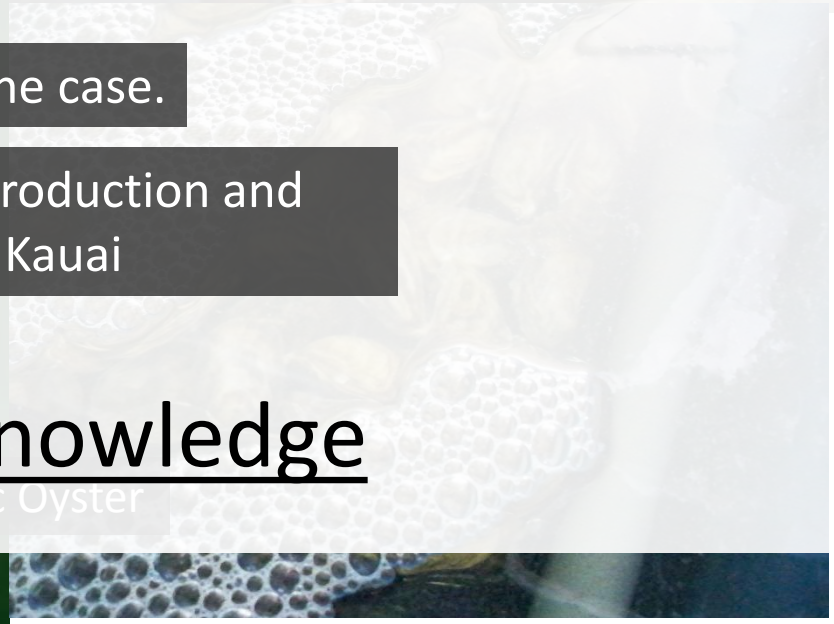


Image: Kauai Shrimp

This is no longer the case.

In 2014 DOH approved the production and sale of clams at a location in Kauai



Major gap in knowledge

Image: Elyse Butler Mallams

Resident consumption

"We're not going to be able to supply our own need for a while. We import close to 400,000 oysters every month in Hawaii. That's a heck of a lot of oysters," (Haws, 2013)

740,755 pounds per year

Top 10 Hawaii[1] and U.S.[2] per capita seafood consumption by species, edible pounds.

Hawaii without noncommercial catch	Edible lb	U.S.	Edible lb
Tuna (yellowfin, bigeye, other)	7.36	Shrimp	4.08
Salmon	4.23	Canned tuna	2.80
Mollusks, crustaceans, & aquatic invertebrates	3.92	Salmon	2.12
Shrimp	1.85	Pollock	1.48
Billfish	1.01	Catfish	0.97
Swordfish	0.80	Tilapia	0.93
Mahimahi	0.79	Crab	0.62
Cod/Pollock	0.53	Cod	0.49
Catfish	0.46	Clams	0.45
Tilapia	0.37	Pangasius[3]	0.38
Total Top 10	21.32	Total Top 10	14.32
Total	28.46	Total	16.14

5.3 million pounds

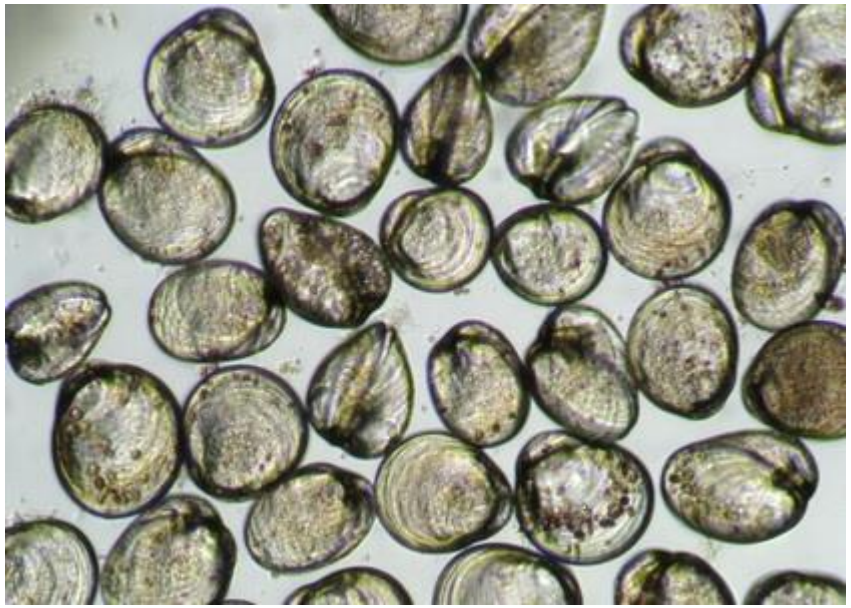
139 million pounds of clams

[1]Annual average for 2000–09.
[2]Annual average for 2002–10.
[3]For Hawaii, *Pangasius* is included in catfish.

Loke, Geslani, Takenaka, & Leung (2012)

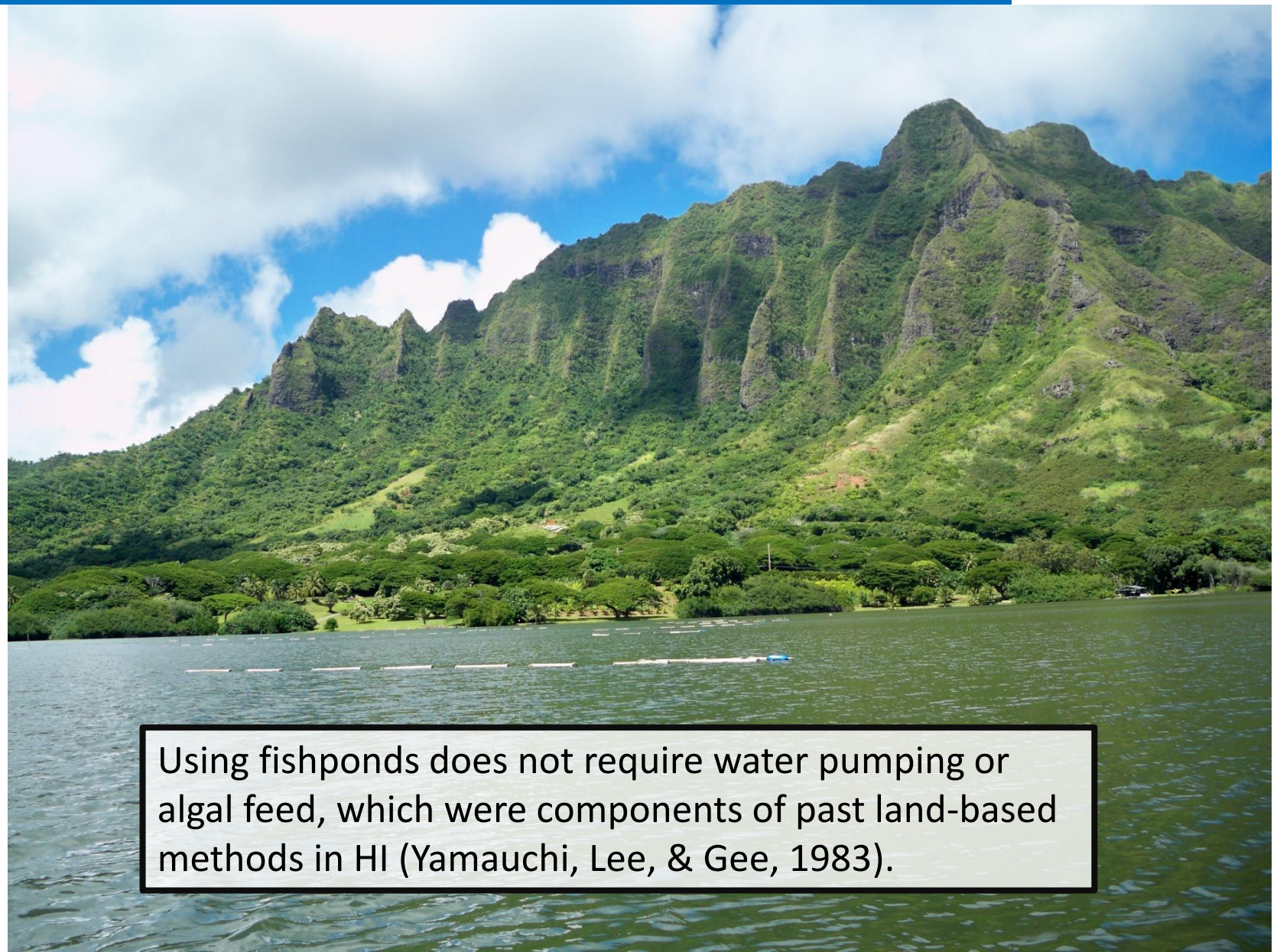
Advantages of growing in Hawaiian fishponds

Louisiana has continually seen decreased harvests of Eastern oysters, compared to historical figures (Gothreaux & Banks, 2014).



Larval oyster death correlated to high energy expenditure, a problem exacerbated by attempts to sequester calcifying agents from mineral-poor, acidified ocean water (Waldbusser et al., 2013).

Advantages of growing in Hawaiian fishponds



Using fishponds does not require water pumping or algal feed, which were components of past land-based methods in HI (Yamauchi, Lee, & Gee, 1983).

Objectives

1. Calculate pre-tax return
2. Determine sensitive input parameters affecting MIRR
3. Provide information to stakeholders on viability of a Hawaiian oyster industry


Floating oyster cages in fishpond


Depuration tank for final treatment


Sorting and grading

<u>Hypothesis</u>: Oysters grown in Hawaiian fishponds are economically competitive to those grown in other areas, in terms of production costs and profitability.

Methods

Collect “farm-gate” cost data from currently operating small-scale oyster producer

defined as 50,000 - 250,000 market-ready specimens per year (Hudson et al., 2012)

Methods

Construct spreadsheet-based enterprise budget for model case

Assumptions:

- 50% mortality rate
- Target sales of 156,000 individuals (3000/week)
- Market price of $1.25
- Operates 10 years
- At 3X current production

Methods

Conduct sensitivity analysis to address parameters affecting MIRR

Assumptions:

- 6% reinvestment rate
- 6% finance rate

Methods

Conduct budget evaluation to identify major costs

Results: Net pre-tax return

	$195,000.00	→	Income
-	$153,529.44	→	Operating Expenses
-	$34,433.22	→	Fixed Costs
-	$16,506.50	→	Permitting Costs
	-$9,469.16		

Net pre-tax return

Results: Major costs

Full-time labor: 23.9%
Part-time labor: 17.9%
Fringe Benefits: 20.9%
Total: **62.7%**

2. Operating Expenses	
Triploid Oyster Seed	5.3%
Full-time labor (owner/operator)	23.9%
Part-time labor	17.9%
Fringe Benefits	20.9%
Shipping	0.2%
Fuel (boat and truck)	1.4%
Artificial Seawater	1.7%
Maintenance (vehicle and equipment)	0.6%
Expendable Supplies	0.0%
Misc Supplies	0.6%
Electricity	0.7%
Water	0.3%
General Excise Tax	0.0%
Additional Rent on Gross Proceeds	1.4%
TOTAL	75.1%
4. Fixed Costs	
Annual Interest on Loan (Barge, Motor, Hoist)	0.0%
Insurance (boat,truck,business)	0.5%
Business Entity Structuring fees	0.0%
Other Taxes and fees	0.6%
Rent	12.2%
Annualized Equipment Expenses	
Vehicles (Boat and truck)	0.8%
Cages	1.5%
Refrigerator	0.0%
Sorting Table	0.0%
Dep tank and components	0.4%
Driveway	0.2%
AC unit, Coldbot converter, and building materials	0.1%
Metal trailer office	0.2%
Tent frame	0.2%
TOTAL	16.8%
5. Permitting & Leasing Costs	
Ground and Waters Leasing (Annualized start-up co	3.5%
Private laboratory meat and dep tank quality test (A	0.2%
DOH certification testing	4.4%

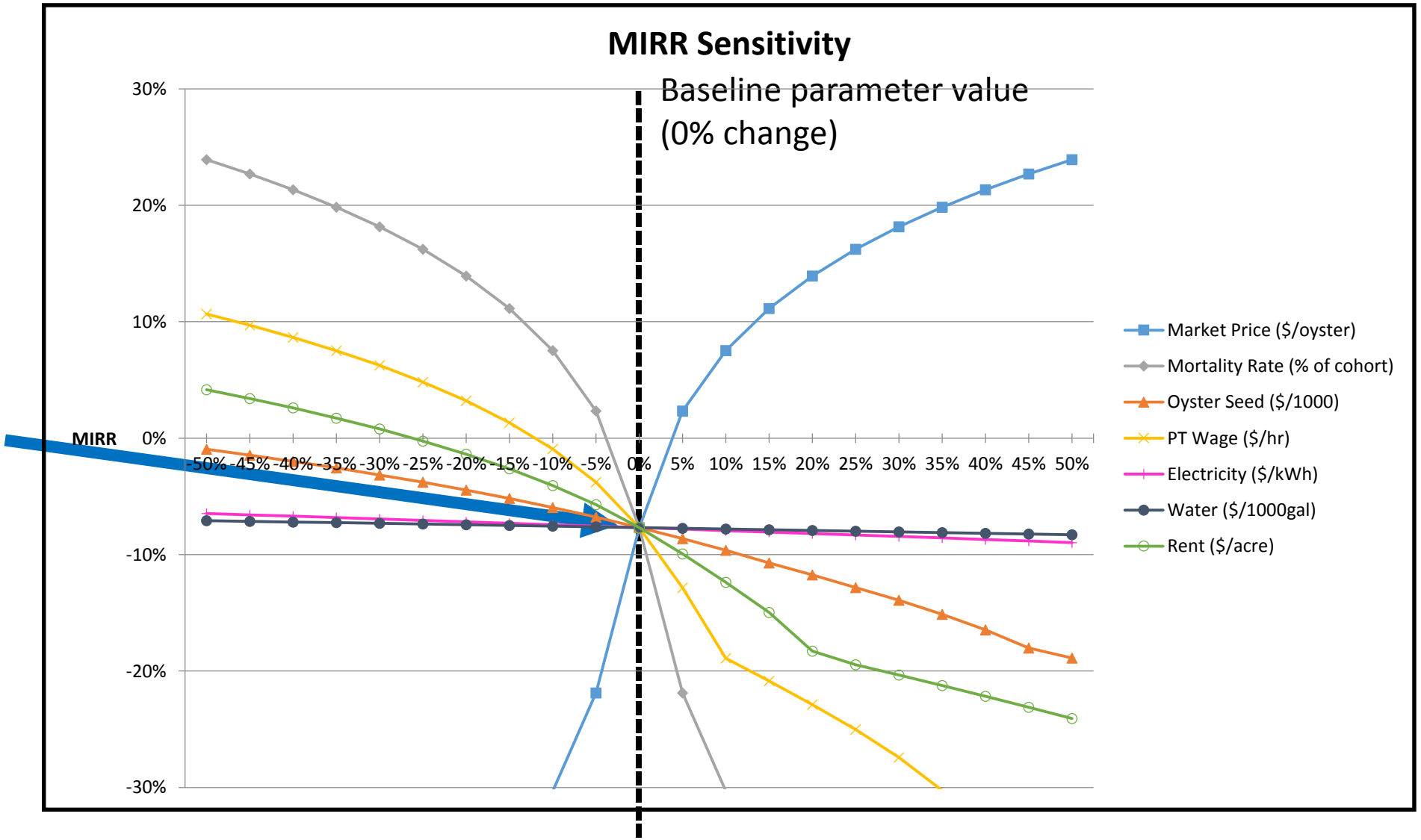
Triploid oyster seed: **5.3%**

Rent: **12.2%**

Ground/water lease: 3.5%
Private testing: 0.2%
Fringe Benefits: 4.4%
Total: **8.1%**

Results: Sensitivity analysis

MIRR: -7.7%



Results: Decision Reversal Analysis

Parameter	Baseline	Decision Reversal: MIRR = 6%	% Change from baseline
Market Price ($/oyster)	1.25	1.35	8.00%
Mortality Rate (% annually)	50	45.86	-8.28%
Oyster Seed ($/1000)	35.00	-15.92	-145.49%
PT wage ($/hr)	13.00	9.24	-28.92%
Electricity ($/kWh)	0.21	-2.064133	-1067.64%
Water ($/1000 gal)	4.96	-105.49	-2226.89%
Rent ($/acre)	500.00	182.32	-63.54%

Discussion

The model farm appears unprofitable, but marginally

Profitability is highly dependent on 3 key variables:

- Mortality rate
- Market price
- PT labor rate

Labor continues to represent the highest cost share in budget.

Electric and water costs represent smaller portion of total budget than in past aquaculture operations

Conclusion

- Farming in fishponds is distinct from past, land-based methods of oyster culture
  - No need for feed facilities; cost avoidance suggests an advantage over past operations

- A successful threefold expansion of production does not triple total costs, suggesting economy of scale – expansion as next step?

- Addressing most sensitive parameters is key to profitable enterprise
  example: Ability to capture price premium on differentiated, “Hawaii-grown” oyster is key

Mahalo!

Many thanks to Dr. PingSun Leung, Dr. Maria Haws of the University of Hilo, and Dr. Quentin Fong of the University of Alaska, Fairbanks, who have provided invaluable insight and support.

Mahalo to the employees at the fishpond for allowing us to observe their operations.

Mahalo to the UH Sea Grant, Project R/SS-11, for their generous funding, and for believing in this project.

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