



COMMERCIAL SCALE AQUAPONICS: PROFITABILITY AND SUSTAINABILITY PRELIMINARY FINDINGS



Aquaponics in Hawaii Conference

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Kanae Tokunaga*^{1,2}, Clyde Tamaru³, Harry Ako³, and PingSun Leung²

¹Department of Economics; ²Department of Natural Resources and Environmental Management; ³Department of Molecular Biosciences and Bioengineering

University of Hawaii at Manoa

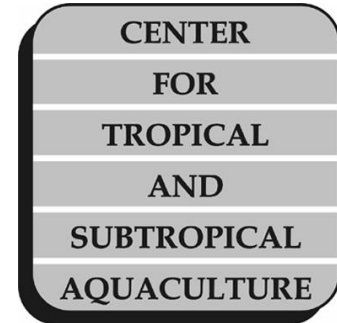
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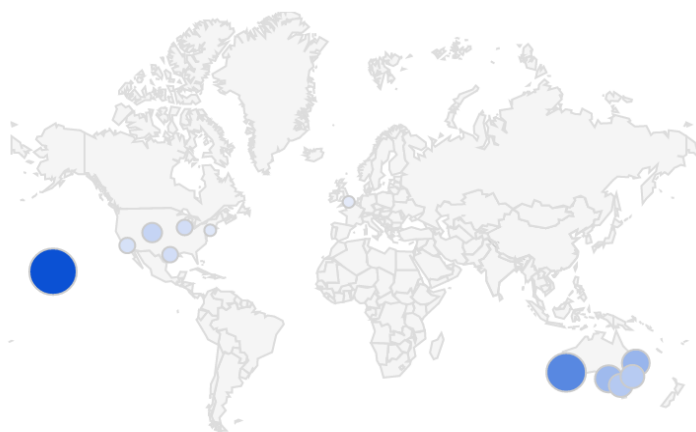
Interest over time ?

The number 100 represents the peak search interest

News headlines Forecast ?



Regional interest ?



0 100

Region | City

Honolulu	100	
Perth	65	
Brisbane	36	
Adelaide	33	
Melbourne	23	
Sydney	22	
Denver	16	
Chicago	10	
Houston	10	
Los Angeles	8	

Source: Google Trends
May 18, 2013



Why Aquaponics?

- Aquaponics does not require soil.
- Aquaponics can utilize marginal land.
- Aquaponics can supply both vegetable and fish.

– 89% of lettuce is imported¹

– 44% of fish is imported²

} More room for local production!

Sources:

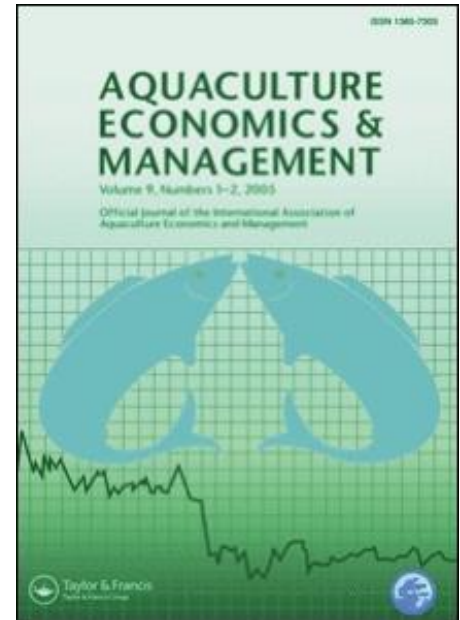
¹Hemachandra, Dilini, Shawn Arita, and PingSun Leung. “Economic Analysis of Hawaii’s Vegetable Sector.” *Working Paper*. (2013)

² Loke, Matthew, Cheryl Geslani, Brooks Takenaka, PingSun Leung. “An Overview of Seafood Consumption and Supply Sources: Hawaii Versus U.S.” *CTAHR Economic Issues*. (2012)



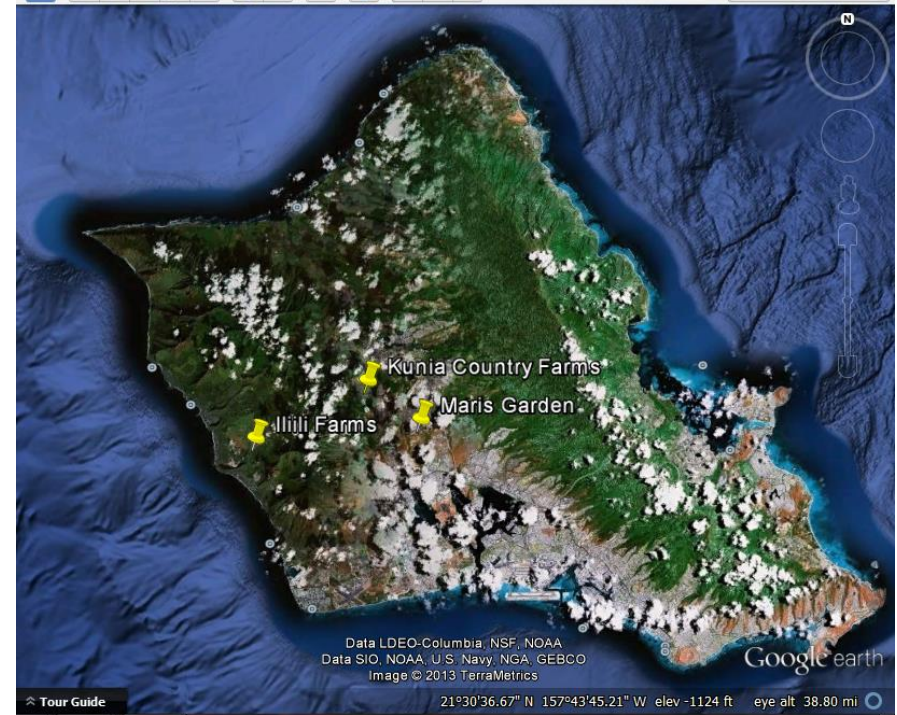
Is commercial scale aquaponics economically feasible?

- Hawaii is at the forefront of commercial scale aquaponics in the world.
- No previous studies on economics of functionally operating commercial aquaponics farms.
- We want to understand the economic backbone of aquaponic farms:
 - Investment cost (building the system, set up the operation logistics, etc.)
 - Operational cost
 - Profitability of the operation



Commercial Scale Aquaponics in Hawaii

- 3 farms on Oahu
- All are Food safety certified
- 2 of 3 are organic certified
- Communication method: on-site initial interview, email, telephone call, meetings

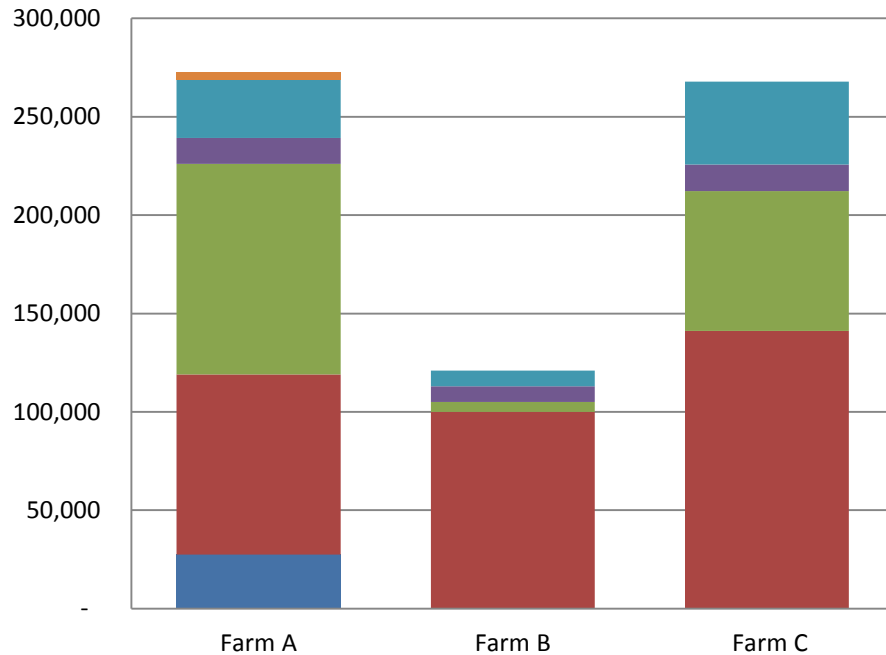


Overview of the Farms

	Range	Mean
Land	1 - 3 acres	2 acres (= 0.81 ha)
Raceway surface area	11,520 – 28,600 ft ²	17,469 ft ² (= 1,623 m ²)
Fish tank sizes	6,000 - 77,000 gallons	32,667 gallons (= 124 m ³)
Vegetable crops	Lettuce, Tomato, Cucumber, and Beets	
Fish	Tilapia	



Total Investment Cost



- Other
- Machinery and equipment for operation
- Machinery and equipment for building facility
- Labor
- Facility component
- Land

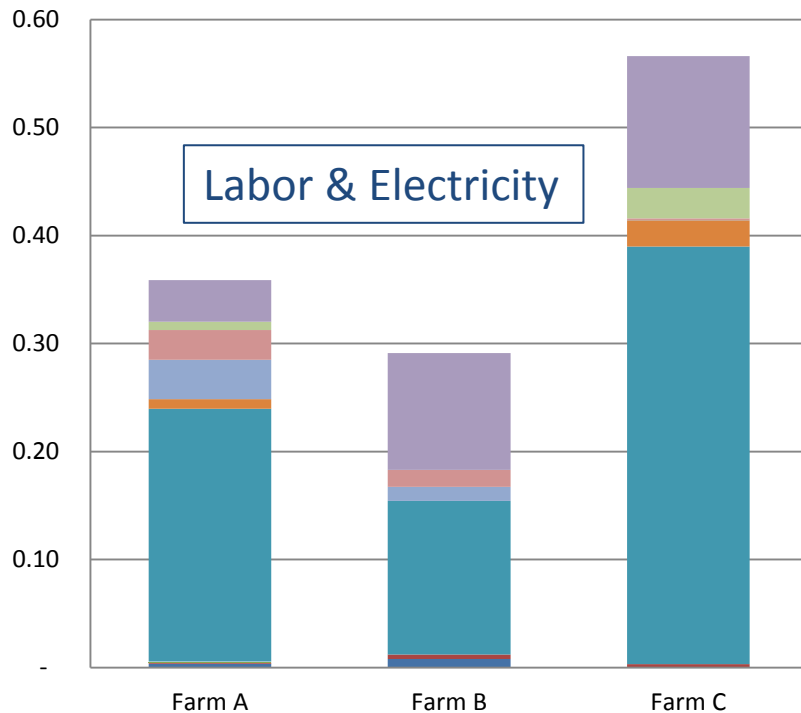
Investment Costs

- **Facility component** (materials needed to build the system) and **labor cost** are the major cost components.

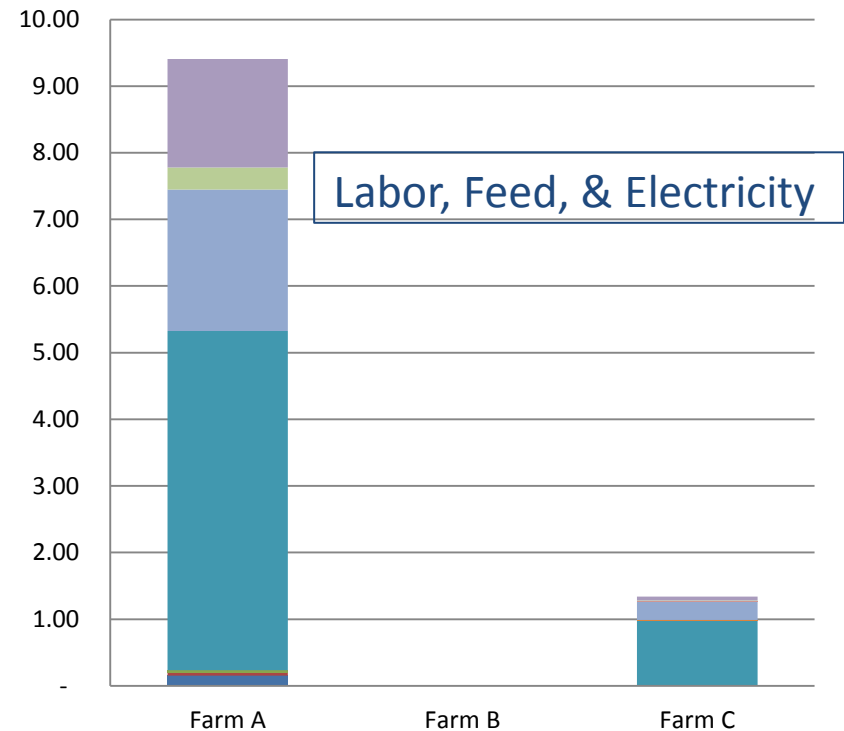


Operational Cost per \$1 of Sales

Vegetable



Fish



- Land rental cost
- Insurance and tax
- Other fixed cost
- Labor cost
- Machinery and equipment cost
- Fertilizer and other chemicals
- Seed and seed bed
- Water
- Electricity
- Other variable cost

- Land rental cost
- Insurance and tax
- Other fixed cost
- Labor cost
- Machinery and equipment cost
- Feed
- Seed and seed bed
- Water
- Electricity



Economic Performance

	Agriculture Vegetable Sector ¹	Aquaculture ²	Aquaponics ³
Return on Asset/ Internal Rate of Return	ROA = 10%	ROA = 11%	IRR = 27%
Gross Profit	\$3,460 per acre	\$178,858 per farm	\$43,065 per acre or \$86,130 per farm
% of Farms with Gross Profit	75%	58%	100%

Gross Profit = Sales Income – Variable Cash Expenditures

Sources:

¹Hemachandra, Dilini, Shawn Arita, and PingSun Leung. “Economic Analysis of Hawaii’s Vegetable Sector.” *Working Paper*. (2013)

²Naomasa, Emiko, Shawn Arita, Clyde Tamaru, and PingSun Leung. “Assessing Hawaii’s Aquaculture Farm and Industry Performance.” *Aquaculture Economics & Management* 17 (2013).

³ Tokunaga, Kanae, Clyde Tamaru, Harry Ako, and PingSun Leung. “Preliminary Findings from Economic Analysis of Commercial Scale Aquaponics.” *Working Project* (2013).



Preliminary Finding 1

- Our first look indicates that commercial scale aquaponics is **economically feasible**.
- Aquaponics may be more profitable than terrestrial agriculture and aquaculture.
- Aquaponics is **labor intensive**.



Preliminary Finding 2

- Vegetable production is the driving force of economic success.
- There may be some price premium for locally produced aquaponic vegetables.
- Appropriate pest management procedures will need to be refined.



Preliminary Finding 3

- Fish production is currently not profitable for all farms.
- Is fish merely nutrient source for plant? Or, can fish be profitable enterprise of the system?
- Fish growth rate has to improve for the fish enterprise to yield profit.

→ *Technological advancement in this area plays a role in economic success of the fish production.*



Golden tilapia, *O. mossambicus*



Golden tilapia, *O. honorum*



THANK YOU