COMMERCIAL SCALE AQUAPONICS: PROFITABILITY AND SUSTAINABILITY
PRELIMINARY FINDINGS

Aquaponics in Hawaii Conference
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Interest is growing!: Google Trends “aquaponics”
Why Aquaponics?

• Aquaponics does not require soil.
• Aquaponics can utilize marginal land.
• Aquaponics can supply both vegetable and fish.
  – 89% of lettuce is imported\(^1\)
  – 44% of fish is imported\(^2\)

Sources:

More room for local production!
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

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land</strong></td>
<td>1 - 3 acres</td>
<td>2 acres (= 0.81 ha)</td>
</tr>
<tr>
<td><strong>Raceway surface area</strong></td>
<td>11,520 – 28,600 ft²</td>
<td>17,469 ft² (= 1,623 m²)</td>
</tr>
<tr>
<td><strong>Fish tank sizes</strong></td>
<td>6,000 - 77,000 gallons</td>
<td>32,667 gallons (= 124 m³)</td>
</tr>
<tr>
<td><strong>Vegetable crops</strong></td>
<td>Lettuce, Tomato, Cucumber, and Beets</td>
<td></td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td>Tilapia</td>
<td></td>
</tr>
</tbody>
</table>
Facility component (materials needed to build the system) and labor cost are the major cost components.
Operational Cost per $1 of Sales

**Vegetable**

- Farm A
- Farm B
- Farm C

**Fish**

- Farm A
- Farm B
- Farm C

Legend:
- Land rental cost
- Insurance and tax
- Other fixed cost
- Labor cost
- Machinery and equipment cost
- Fertilizer and other chemicals
- Seed and seed bed
- Water
- Other variable cost
- Feed
- Seed and seed bed
- Other fixed cost
## Economic Performance

<table>
<thead>
<tr>
<th></th>
<th>Agriculture Vegetable Sector(^1)</th>
<th>Aquaculture(^2)</th>
<th>Aquaponics(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on Asset/ Internal Rate of Return</td>
<td>ROA = 10%</td>
<td>ROA = 11%</td>
<td>IRR = 27%</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>$3,460 per acre</td>
<td>$178,858 per farm</td>
<td>$43,065 per acre or $86,130 per farm</td>
</tr>
<tr>
<td>% of Farms with Gross Profit</td>
<td>75%</td>
<td>58%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Gross Profit = Sales Income – Variable Cash Expenditures

Sources:


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