GOFARM
HAWAIʻI
UNIVERSITY OF HAWAIʻI

GoFish Cohort 3
“Penciling it Out”

What is GoFarm Hawai‘i?

GoFarm Hawai‘i is a University of Hawai‘i College of Tropical Agriculture and Human Resources (CTAHR) Extension program, with statewide business advisory services and farmer training.

Farmer Training Program

A statewide Beginning Farmer Training Program with sites on O‘ahu, Kaua‘i, Maui, and Hawai‘i Island. GoFarm Hawai‘i is a 9 month phased program that provides production and business training.

Our mission is to enhance Hawai‘i’s food security and economy by increasing the number of sustainable, local agricultural producers by providing hands-on commercial farm and business training.

AgBusiness Consulting

The GoFarm Hawai‘i's AgBusiness Team helps new and existing agribusinesses strengthen their business models with technical support in areas of finance, marketing, business planning and resources. Business assistance and consultations are available to discuss goal setting, business strategy, financial analysis, market opportunity and more.

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What are we discussing today?

- Financials
- Marketing
- Farmer Panel
- Wrap Up/Evaluation

Aquaponics – At a Glance

- Not necessarily new technology but commercially, aquaponics is a rapidly growing industry still in a state of discovery
- Popular with individuals, entrepreneurs, educators, and governments
- Total revenue: $90 million (2023), up 12% from 2022
- Total number of farms: ??

What info do I need to decide if this is financially viable for me?

- Start up costs
- Operating costs
- Revenue potential

Start up Costs

Will vary based on the size and complexity of the system

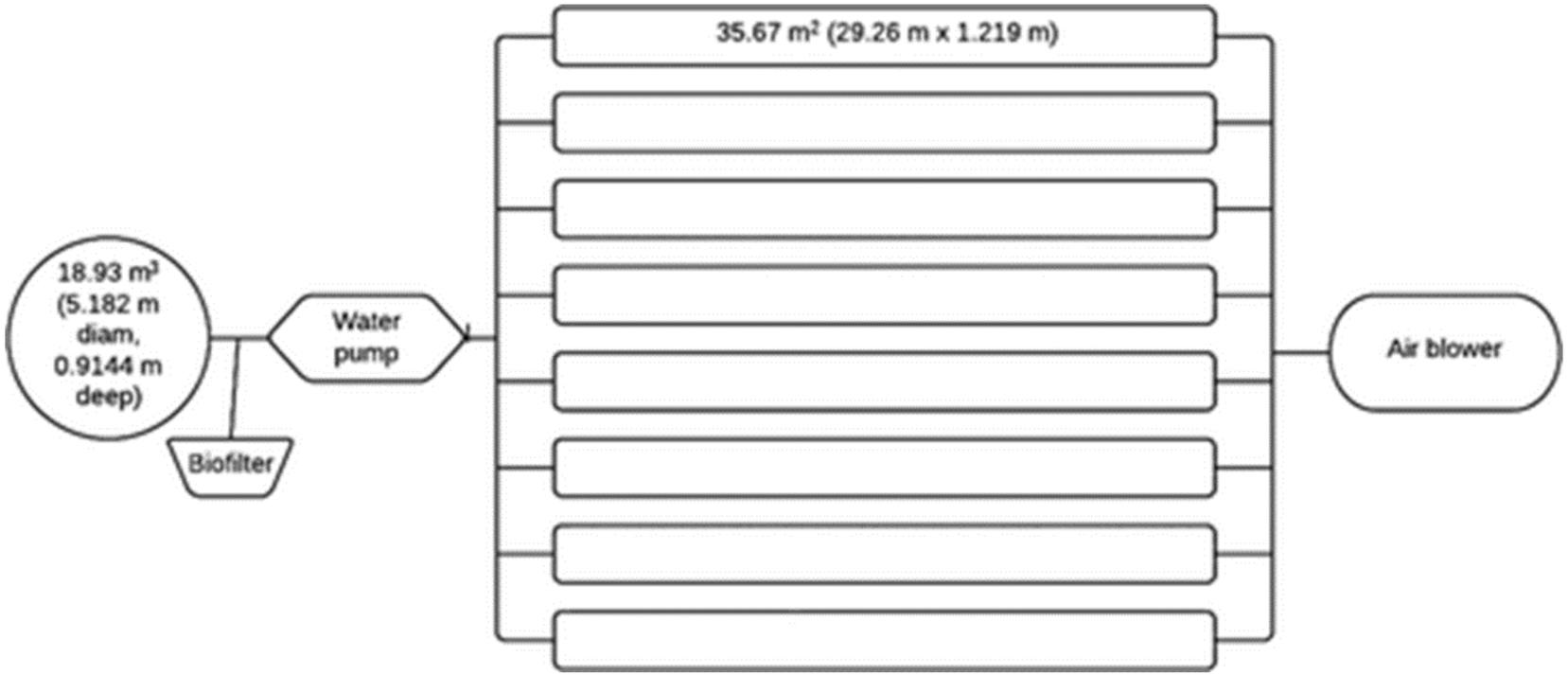
Farm Models

- Economics of Small-scale Commercial Aquaponics in Hawai‘i published in the Journal of the World Aquaculture Society; Kanae Tokunaga, Clyde Tamaru, Harry Ako, PingSun Leung

- Waimanalo Recirculating System

Example of a Model Farm

- Study analyzed 3 farms (Iliili Farm, Kunia Country Farm, and Mari's Gardens) and constructed a model farm to present financial/operational projections.
- Four separate aquaponic systems, each consisting of one 18.93 m3 fish tank, eight 35.67 m2 raceways, a biofilter, a 0.2 kW water pump, and a 0.4 kW air blower.



Model Farm – Start Up Costs

	Vegetable		Fish		Total	
1. Facility component	$ 105,121	46%	$ 34,725	61%	$ 139,846	49%
2. Labor	$ 40,483	18%	$ 11,770	21%	$ 52,254	18%
3. Machinery & Equip (rental and fuel cost)	$ 52,778	23%	$ 10,874	19%	$ 63,652	22%
4. Operational machinery & equip purchase cost	$ 30,792	13%	$ -	0%	$ 30,792	11%
Total	**$ 229,173**	**100%**	**$ 57,370**	**100%**	**$ 286,543**	**100%**
Per "System"	*$ 57,293*		*$ 14,342*		*$ 71,636*	
Per "System" (excluding 2&3)	*$ 33,978*		*$ 8,681*		*$ 42,659*	

- The facility component includes cost of materials used to build the system. Detailed on next slide.
- The vegetable production part of the system makes up 80% of total cost.
- $1 in 2015 is equivalent in buying power to about $1.32 today

Model Farm – Facility Component

	Category	Cost	% of Total
Vegetable raceway	Vegetable	$ 70,720	51%
Fish tank	Fish	$ 15,576	11%
Breeding tank	Fish	$ 9,768	7%
Air blowers	Shared	$ 3,168	2%
Water pump	Shared	$ 6,600	5%
Reefer	Shared	$ 10,560	8%
Office and warehouse	Shared	$ 23,454	17%
Total		**$ 139,846**	**100%**
Per "System" (excluding O&W, reefer and breeding tank)		*$ 24,016*	

Waimanalo Recirculating System

Single 1,000 gallon tank feeding two 4'x48' grow beds (total of 384 square ft of growing area, comparable to one system in the model farm).

Waimanalo Recirculating System

- Estimated total cost for the system is approx. $11,500:
  - $8,500 for materials and
  - $2,000-$3,000 for labor (assuming $300/day and 7-10 days to complete.

- The two 1000 gallon tanks that are part of the systems are meant to be "grow out" tanks where the fish are grown from ¼ pound to 1-1½ pounds. Commercial sales of fish would require additional tanks as support for breeding (alternatively, purchase fingerlings from someone else who specializes in breeding)

Operational Costs

Model Farm projections based on:

Journal of the World Aquaculture Society, Vol. 46 Issue 1, Feb 2015; Economics of Small-scale Commercial Aquaponics in Hawai‘i - Tokunaga; Tamaru; Ako; Leung

Model Farm – Operational Costs

	Lettuce		Fish		Total	
	US$	%	US$	%	US$	%
Labor	39,500	57%	2,532	14%	42,031	48%
Electricity	15,695	23%	4,279	24%	19,974	23%
Water	4,310	6%	1,175	6%	5,485	6%
Seed and seed bed	1,481	2%	0	0	1,481	2%
Feed	0	0	9,525	52%	9,525	11%
Chemicals	1,596	2%	0	0	1,596	2%
Machinery and equipment fuel cost	4,121	6%	0	0	4,121	5%
Land rental cost	2,474	4%	675	4%	3,148	4%
Total	69,176	100%	18,186	100%	87,362	100%
Per "System"	*17,294*		*4,546*		*21,840*	

- Labor and electricity are #1 and #2 which is corroborated by other research studies we've seen
- Feed cost is the largest cost component for fish production. (68 kg of feed per week to meet weekly tilapia production of 37 kg)
- Lettuce makes up 79% of total operational costs

Weekly Labor Breakdown

	Weekly hours	%
Lettuce production		
Plant seeds	4.68	10
Move plants from nursery bed to raceway	4.68	10
Spraying	1.66	4
Pest control	1.39	3
Harvest	5.78	13
Processing and packaging	19.86	44
Delivering	4.00	9
Tilapia production		
Stocking fish tank	0.50	1
Feeding fish	0.50	1
Breeding		
Breeding fish	1.38	3
Feeding fingerling	0.31	1
Total	44.74	100

Observations

- The largest component of total operational cost is labor, followed by electricity.
- The most significant impact on costs must come from either:
  - Decreasing labor costs through more efficient operations, automating where possible,
  - Increased productivity, more skilled labor,
  - Utilizing energy efficient or renewable energy alternatives

Potential Revenues

Produce sales depends on:

- Variety of crops produced
- Growing area
- Achievable production yields
- Customer: Retail vs. Wholesale

Fish sales depends on:

- Tank capacity
- Species of fish raised
- Achievable survival rates
- Customer: Retail vs. Wholesale

Revenue Potential From Model Farm

	Lettuce	Tilapia
Price	$3.00/lb	$5.99/lb
Annual production (kg)	16,248 kg 35,746 lbs	1,905 kg 4,191 lbs
Annual sales income	$107,000	$25,000
Per "System"	*$26,750*	*$6,250*

Revenue Potential From Fish Sales

- Tank capacity is approximately 300 pounds of fish. Larger examples of fish tend to bring higher prices, smaller, skinnier fish, much less.
- Your food conversion ratio should be 1.5:1 (1.5 pounds of feed per 1 pound of whole live fish).
- Assuming feed prices approximating $0.90/lb projected cost for feed alone is $1.35 to produce a 1 pound fish just in feed before taking into account cost of electricity and labor.

Final Analysis for Model Farm

	Lettuce	Tilapia	Total
Annual sales income	$107,000	$25,000	$132,000
Operating costs	$69,176	$18,186	$87,362
Gross Profit	$37,824	$6,814	$44,638
Per "System"	*$9,456*	*$1,704*	*$11,160*

	Total
Start Up Costs	**$ 286,543**
Per "System" (excluding labor & equip rental)	$ 42,659

Based on the Start up costs of $286,543 (from study adjusted) and the gross profit of $49,271 noted above it would take 6.4 years to recover costs (3.8 years for one "system")

Key Factors

- ❑ Efficient operations to minimize costs and maximize yields
- ❑ Consider how aquaponics impacts costs of your traditional operations
- ❑ Combination of production and marketing skills
  - Need to find markets that reward sustainable production of fish/produce (more likely to accept higher prices)
  - Consider additional non-food revenue streams (i.e. training, workshops, system designs, consulting services)

Available Resources

- GoFish Website https://gofarmhawaii.org/gofish-hawaii/
- US EPA Aquaponic Business Plan User Guide and supporting worksheets: https://www.epa.gov/land-revitalization/aquaponics-business-plan-user-guide
- **Aquaponics Production Manual: A Practical Handbook for Growers –** Kentucky State University (Feb. 2021)

Q & A

Our supporters and collaborators

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