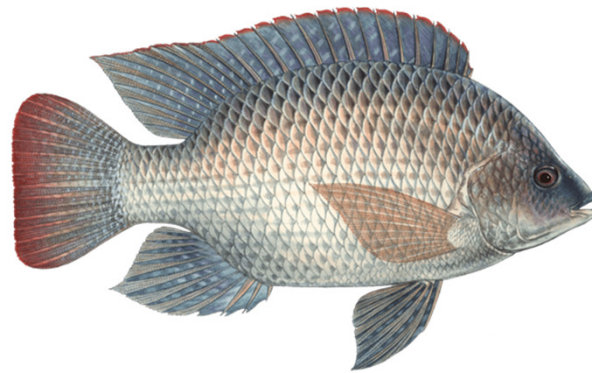


Emerging Sectors in BC: Aquaponics



Myron Roth, Ph.D., P.Ag.

Team Lead Aquaculture & Marine Fisheries

Sector Development Branch



What we will cover today...

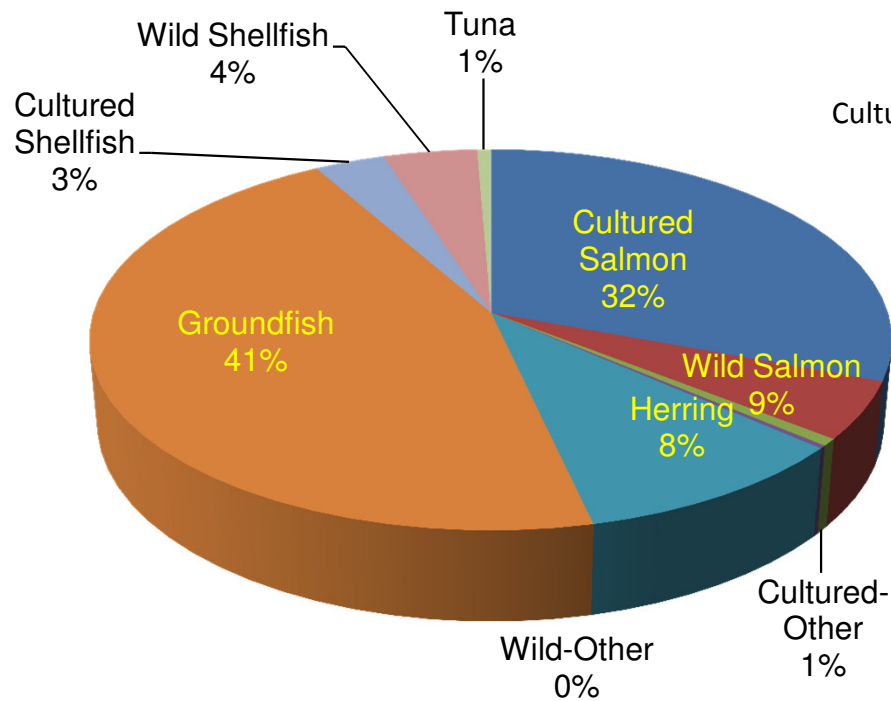
1. Aquaculture in BC
2. Aquaculture Systems
3. Land-Based Recirculating Aquaculture Systems
4. Aquaponics Methods/Systems
5. Why Aquaponics Can Help Feed the World!



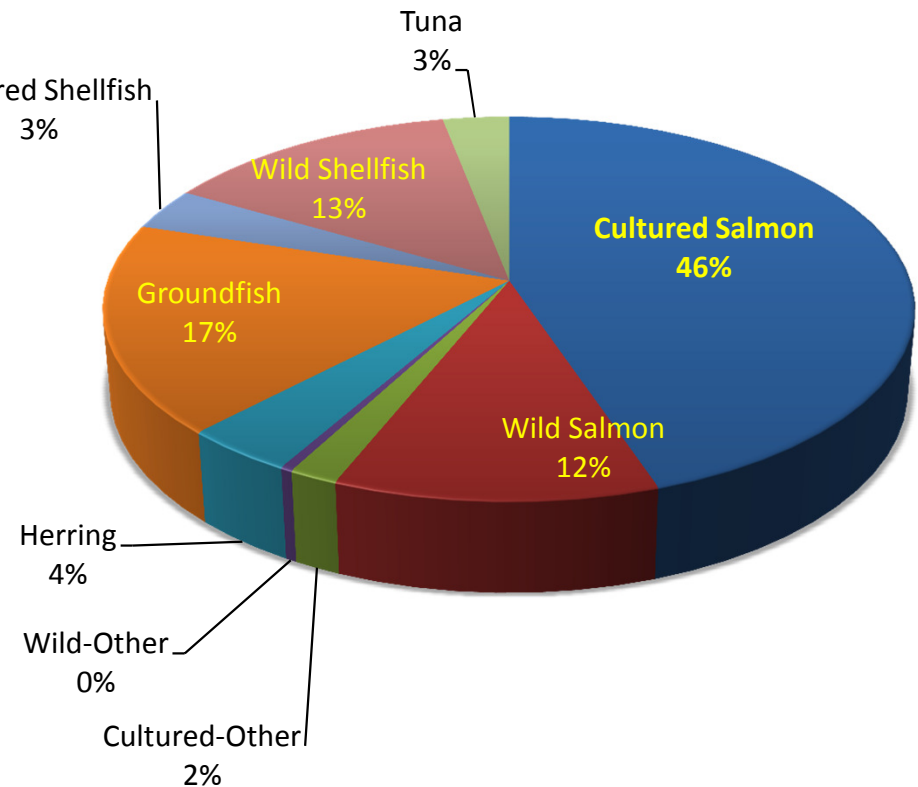
Source: Summerfelt/Superior Fresh

BC Seafood Production: 2017

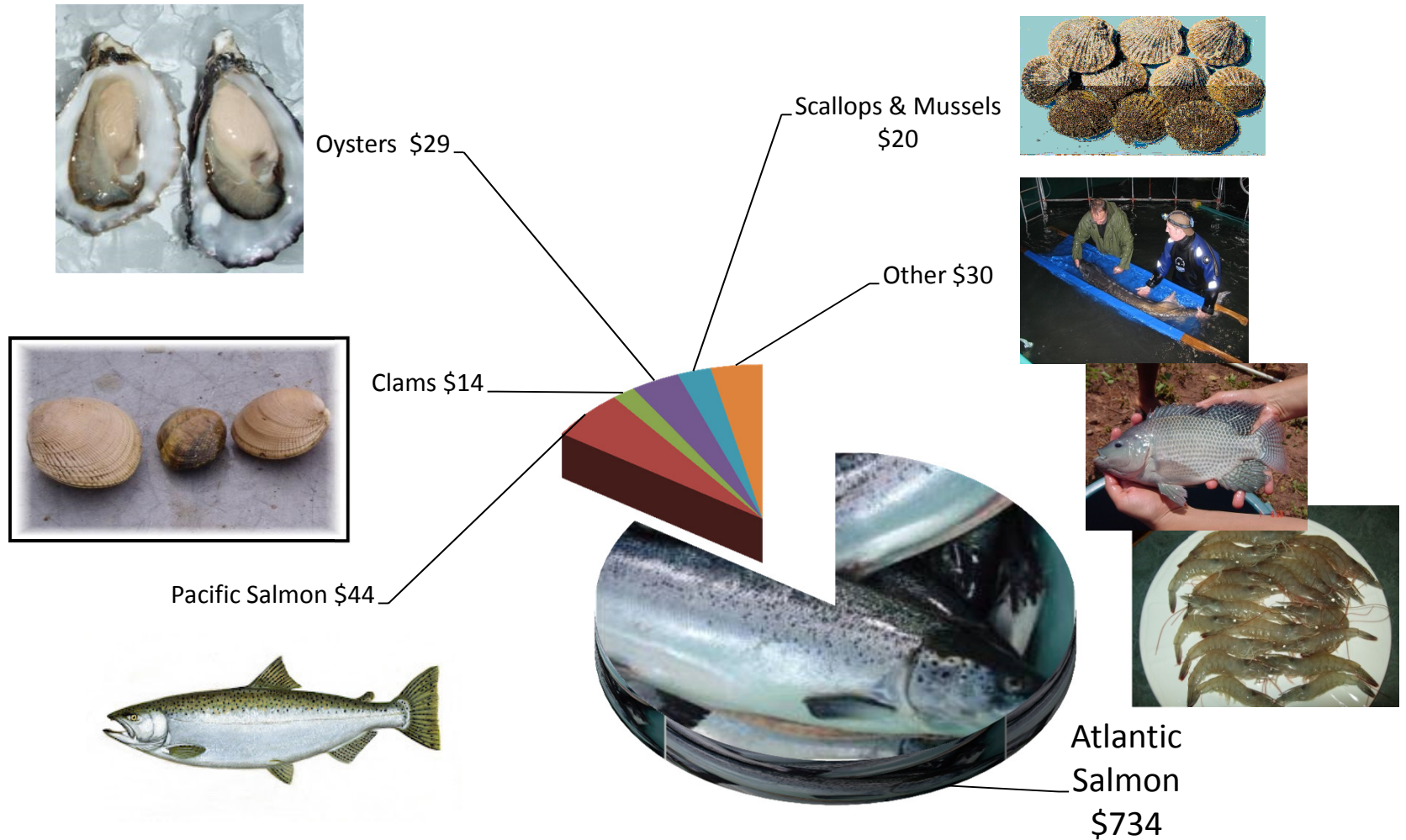
Volume
Total – 279,400 Tonnes



Wholesale Value
Total - \$1,748,700,000

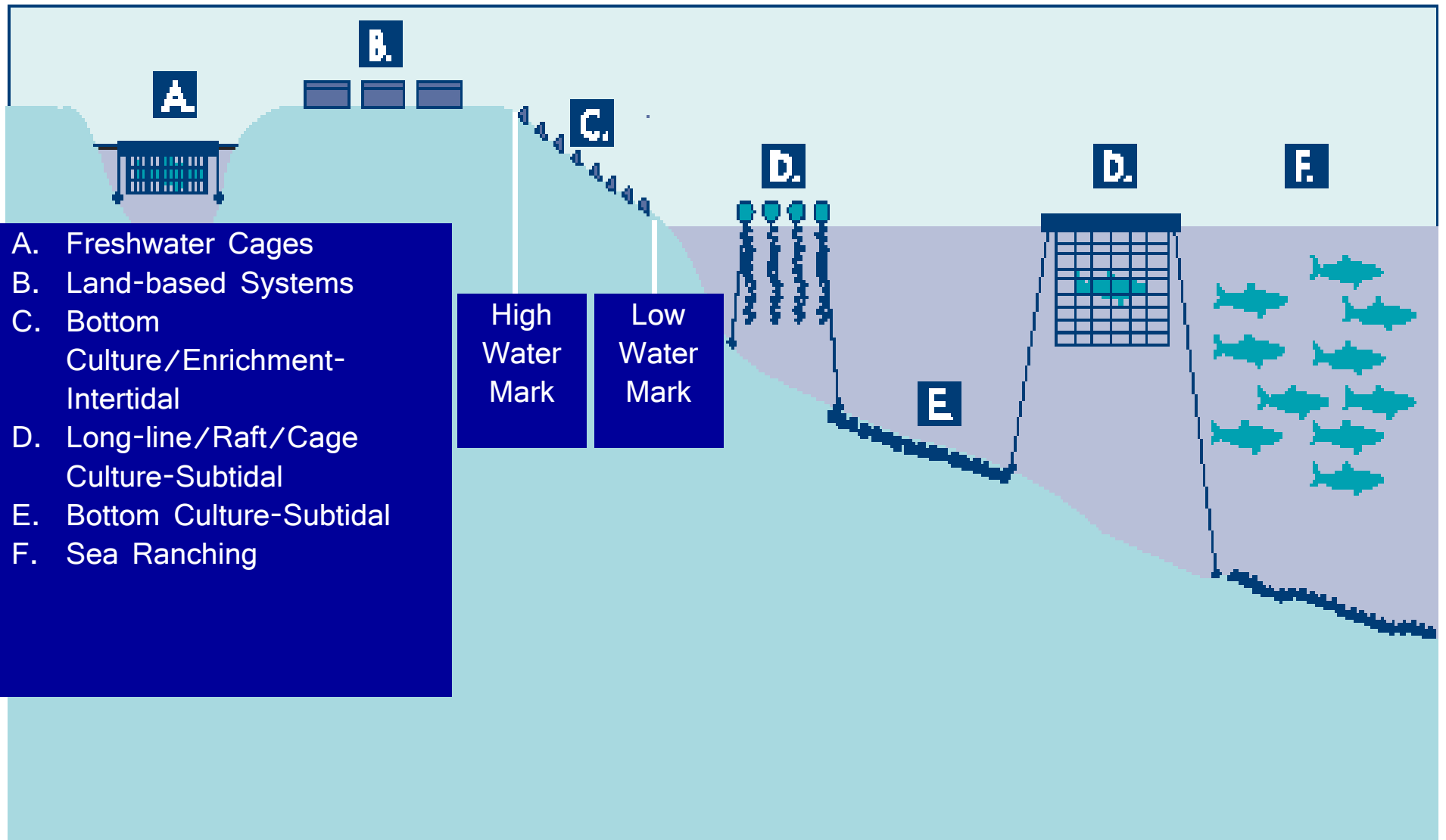


Aquaculture Species



Wholesale Value – 2017 – \$871 M

Ministry of Agriculture





Ministry of Agriculture



What is Aquaponics?

aquaculture

= growing animals (usually fish) in water

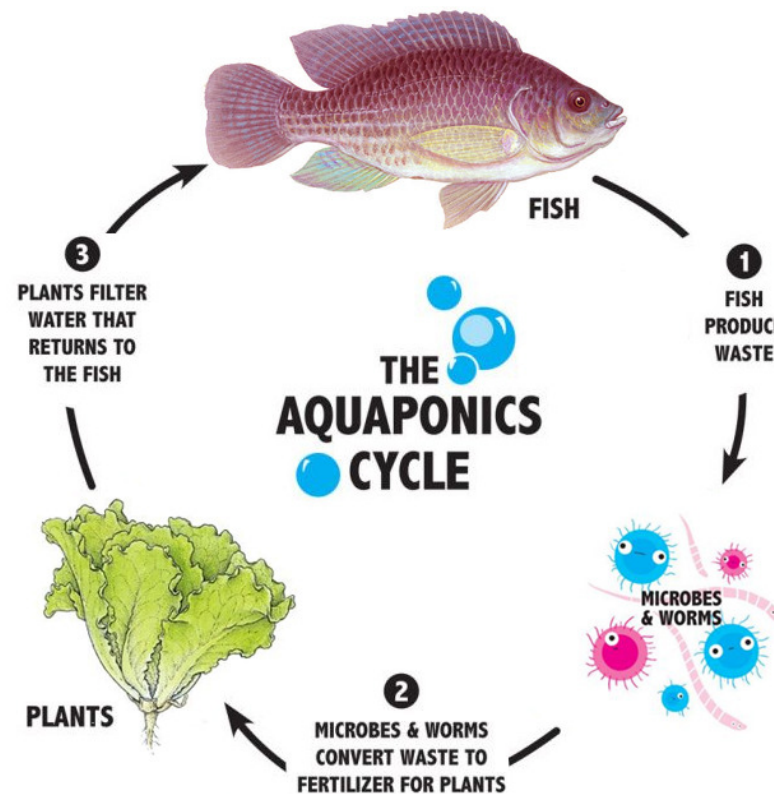
+

hydroponics

= growing plants in water (without soil)

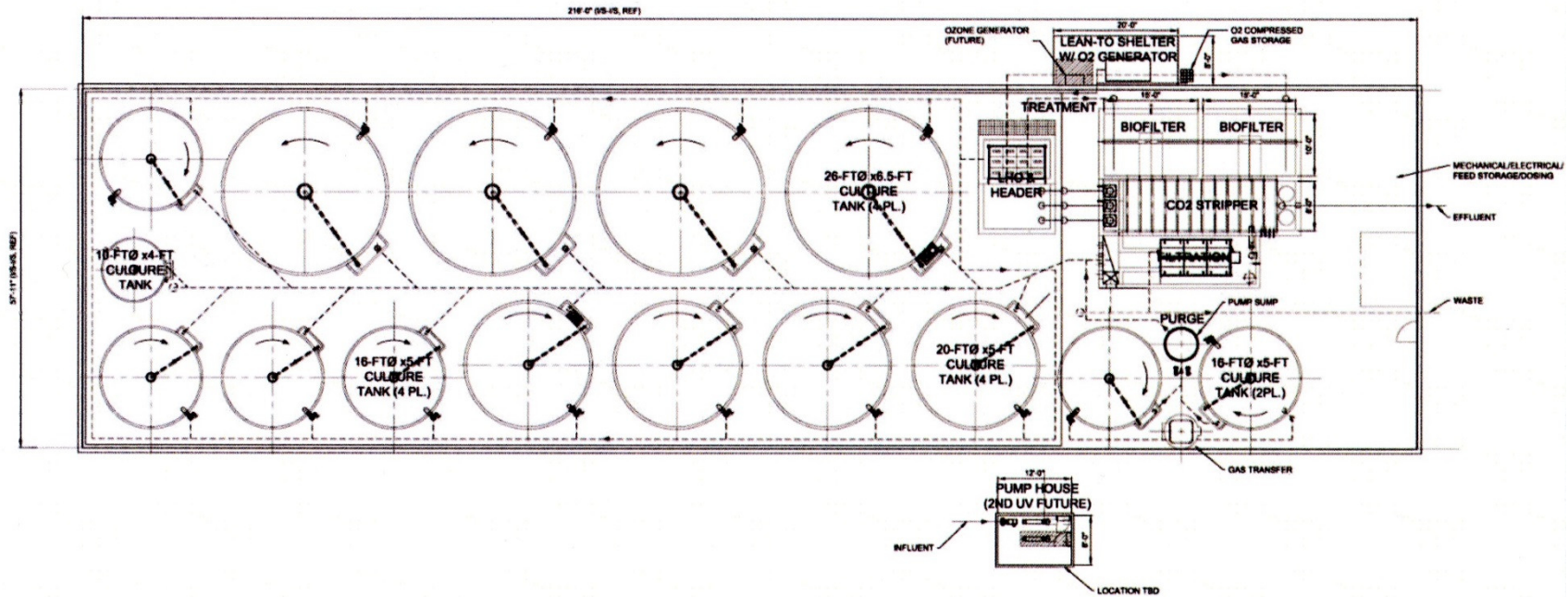
Aquaponics grows 2 foods (fish and produce) with 1 input – fish food

1. Fish eat fish food and produce ammonia
2. Ammonia is transformed into nitrate by micro-organisms
3. Plants “eat” the nitrate (plant food) in the water



Source: <http://aquaponyhof.de/aquaponics/>

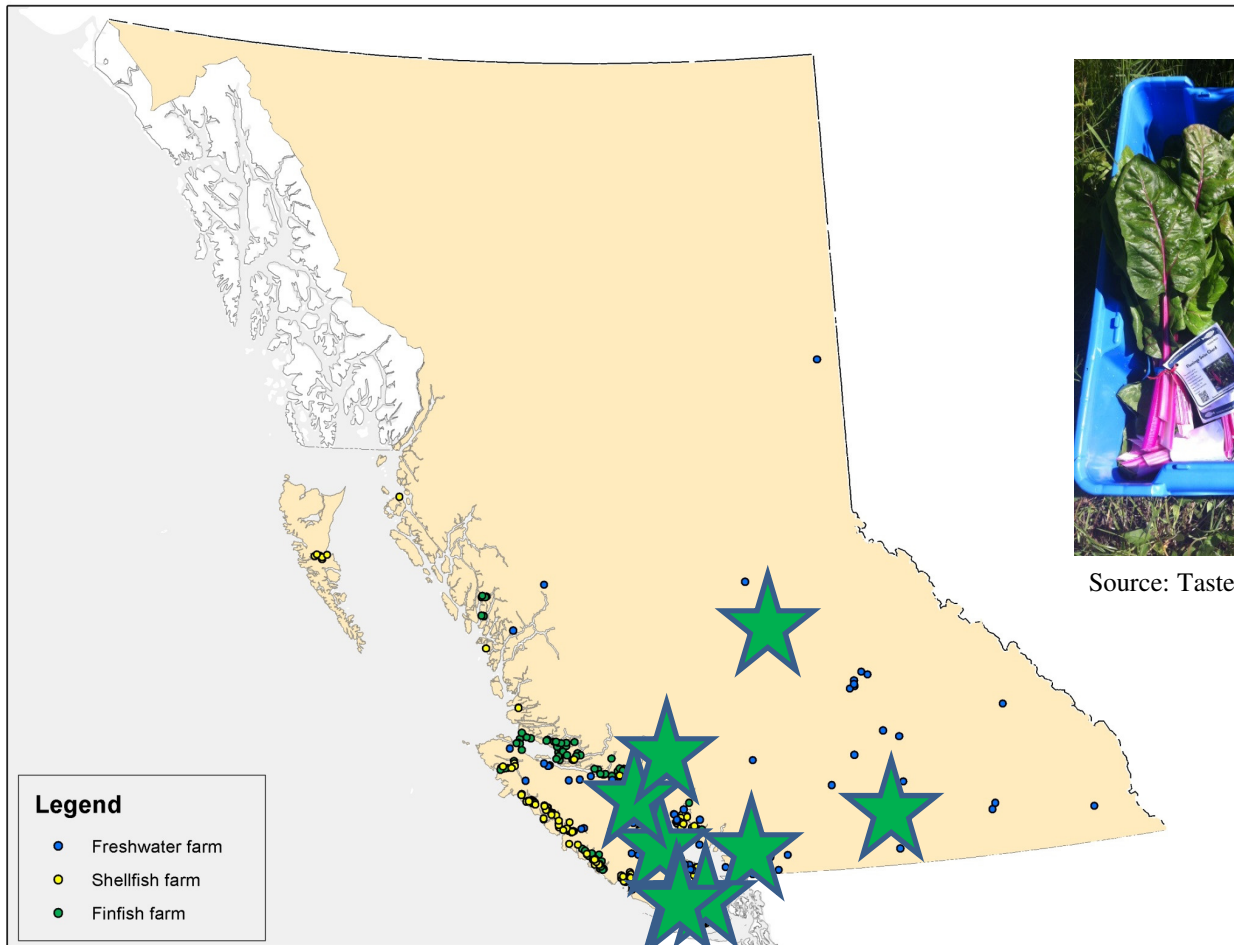
Land-Based Fish Farming



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Distribution of B.C. Aquaculture Industry



Source: Taste of BC Aquafarms

Why Aquaponics

- Currently, agriculture uses 70% of freshwater resources, and food shortages are linked to water scarcity.¹
- Aquaponics uses a mere 10% of the water required by soil based agriculture and less water than hydroponic agriculture.²
- Based on population trends, world food demand will increase by 30% by 2050.
- Aquaponics can grow food almost anywhere since fertile soil is not a requirement and can produce a much higher yield (up to twice as fast as soil and higher densities per sq. ft. of land)

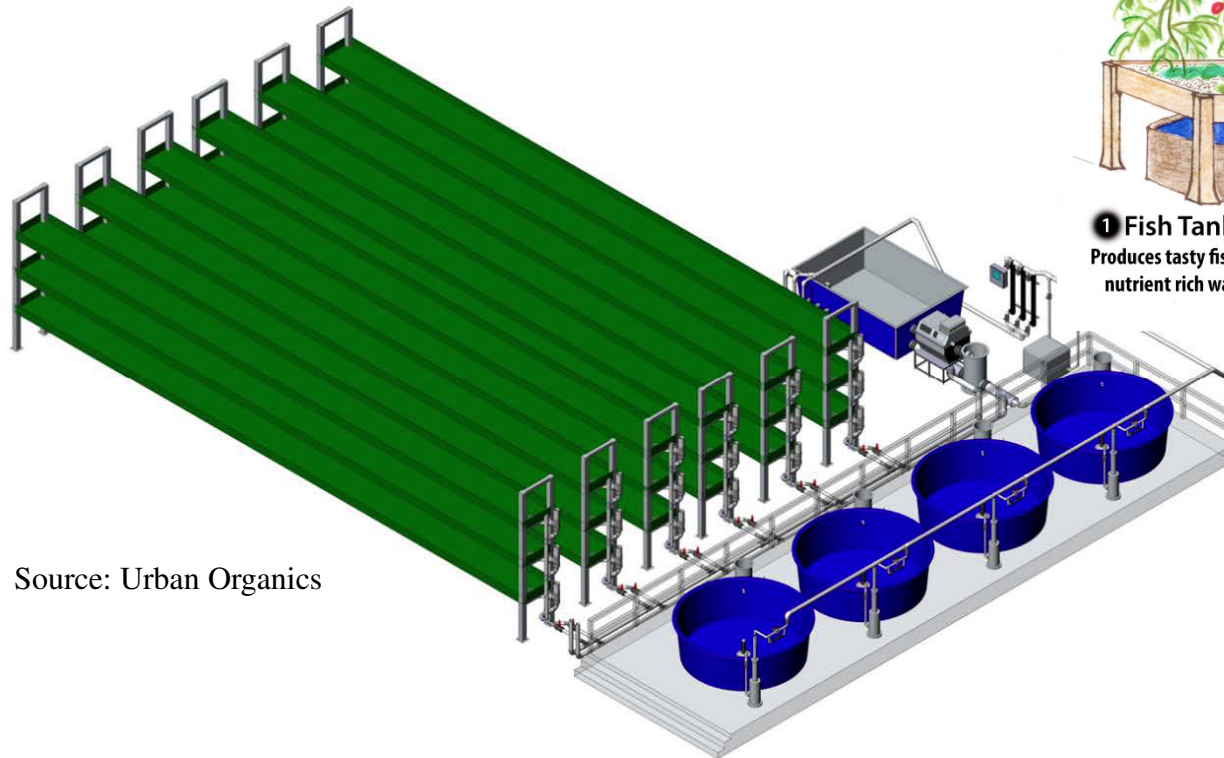
1. U.N. News, November 28, 2011 (<https://news.un.org/en/story/2011/11/396332-land-degradation-and-water-shortages-threaten-global-food-production-un>)

2. Geoff Wilson, Convenor, Aquaponics Network Australia. February 17, 2006.

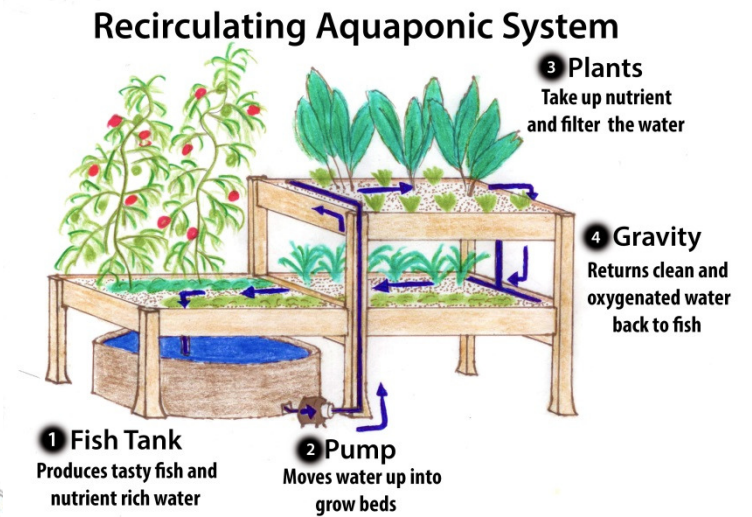
Why Aquaponics – Continued...

- Almost 80% of the world's fisheries are fully-exploited, over-exploited, depleted, or, in a state of collapse.
- Global demand for seafood will continue to rise and will require farming of fish and other seafood
- Aquaponics provides a closed containment system that utilizes most of its residual nutrients and poses little to no impacts to wild fish stocks

System Configuration



Source: Urban Organics



Source: Mason Street Farms

Traditional System

University of the Virgin Islands

- Fish culture tanks
- Solids removal (settling tanks/filters)
- Fine solids remove within the roots of floating plants
- Nutrient removal by plants
- Aeration provide in fish tanks
- Annual Yield
 - 5,000 kg of fish
 - 1,400 cases of lettuce
 - 5,000 kg basil
 - 2,900 kg okra
- Plant area to fish area ~ 7:1



Plant Culture Methods

1. Nutrient Film Technique (NFT)



Plant Culture Methods

2. Vertical Columns



Source: VIU/AEG

Plant Culture Methods

3. Deep Water Trays



Source: Urban Organics



Source: VIU/AEG

Plant Culture Methods

4. Media Beds



Source: VIU/AEG

VIU – Aquaponics Experimental Greenhouse

Success with:

Fruiting veggies: tomatoes, cucumbers, peppers

Leafy greens: lettuce, kale, Swiss chard

Herbs: basil, parsley, cilantro,

Root veggies: radish

Grains: quinoa



Lettuce and Basil

Peppers



Radish



Tomatoes



Quinoa





Source: Mason Street Farms



Source: Northern Bioponics

Licensing (BC)

No



Yes

- Ornamental Fish
 - No discharge to fish bearing waters
 - Bio-secure
- Food Fish
 - For personal consumption
 - May be gifted dead or if live to a non-licensed facility

- Food Fish
 - Any sales
 - Any fish gifted to a licensed aquaculture facility

Note-Risk Assessment is required when:

- Prohibited Species
- Ornamental fish if systems discharges to fish bearing waters
- Ornamental fish held in a uncontained environment

When in Doubt – Consult with DFO Aquaculture Management

Resources



<https://scitech.viu.ca/fisheries-aquaculture>



<https://raincoastaquaponics.com/>

The book cover for "The Aquaponic Farmer" features a large, illuminated, arched greenhouse in a snowy landscape. The authors' names, "ADRIAN SOUTHERN & WHELM KING", are at the top. The title "THE AQUAPONIC FARMER" is prominently displayed in the center. Below the title, it says "A COMPLETE GUIDE TO BUILDING AND OPERATING A COMMERCIAL AQUAPONIC SYSTEM". At the bottom, there are three small images: a man's face, a hydroponic system, and a plate of food.

ADRIAN SOUTHERN & WHELM KING

THE AQUAPONIC FARMER

A COMPLETE GUIDE TO BUILDING AND OPERATING A COMMERCIAL AQUAPONIC SYSTEM

was C\$39.99
C\$30.00
Save 25%

Buy Now

Standard Operating Procedures
(downloadable PDF)

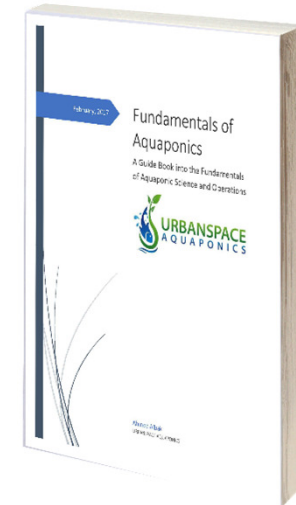
All of our operational checklists, logs and procedures, including daily and weekly tasks, fish stock tracking, vegetable production, emergency protocols and more. The downloadable PDF can be printed and laminated for easy reference on your aquaponic farm.

C\$10.00 | Buy Now

Resources



<https://urbanspaceaquaponics.com/>



How to Use the UAP 5-in-1 Calculator to Design ...

Greenhouse and System Dimensions				Recommended Calculations Standards					
Imperial			SI	Media	Size in	Specific surface area (SA) ft ² /ft ³	Void ratio %		
Grow Bed Area	4 ft		1.2m	Sand	0.12	270	40		
Bed Width	4 ft		1.2m	3/4 Crushed gravel	0.75	50	35		
Bed length	16 ft		4.9m	River rock	1	23	40		
Per Grow Bed Area	64 ft ²		5.9m ²	Zeopore matrix	1/8"	260-290	91		
Number of grow beds	2			Bio Surface are (BSA)	2.5	R2 irrigation water		Recommended at 10	
Total Grow bed area	128 ft ²		11.8m ²		350	R2/No fish		Recommended at 5	
Grow Bed Volume	256 ft ³		7.3m ³		10	R2 irrigation water			
Per Grow Bed Area	64 ft ²		5.9m ²						
Total Grow bed volume	128 ft ³		36.6kL						
System Calculations									
Sliding Feed Rate				Feeding rate (T/total)	30	g/m ² /day	0.006144429	lb/ft ² /day	
Feed per day	0.2 lbs/day		0.09 kg/day	Fish per grow area	1	lb fish/ ft ² area		Recommended fish or grow	
Fish mass needed (% FFB)	13 lbs		5.93 kg	Feed Per Biomass (FPB)	3.5	%		Assuming fish >100 g, 2 fish less than 100	
Maximum Capacity									
Feed per day	0.2 lbs/day		0.09 kg/day						
Fish mass needed (% FFB)	13 lbs		5.93 kg						
Stocking density Theoretical	2.5 gal/ft ²		26.9 L/ft ²						
Stocking density Actual	3.0 gal/ft ²		31.8 L/ft ²						
Water needed	32.37 gal		124.0 L						
	40.00 gal		151.4 L						
	40 gal		151.4 L						
	30.2 gal		114.1 L						
	13								
Total grow bed to tank volume	1.86								
Grow bed needed for tank volume	0.83								

MORE VIDEOS
Play (k)

0:01 / 9:43



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- 100 mt salmon
- 600 – 1,000 mt:
 - Micro greens
 - Baby greens
 - Head lettuce
 - Power Mix
 - Spring Mix



Source: Summerfelt/Superior Fresh

SUPERIOR
fresh

Thanks...

Kevin Romanin: Senior Fisheries & Seafood Policy Analyst,
BC Ministry of Agriculture

Dr. Dan Baker: Professor, Fisheries & Aquaculture Programs, VIU



Questions?



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