WAUBETEK
Business Development Corporation
Investing in the Aboriginal Business Spirit
A Community Futures Development Corporation

Getting Started in Aquaculture Information Session

Overview of Technologies & Practices

CANADIAN AQUACULTURE SYSTEMS INC.
BIOENGINEERING TECHNOLOGIES & BUSINESS MANAGEMENT SOLUTIONS

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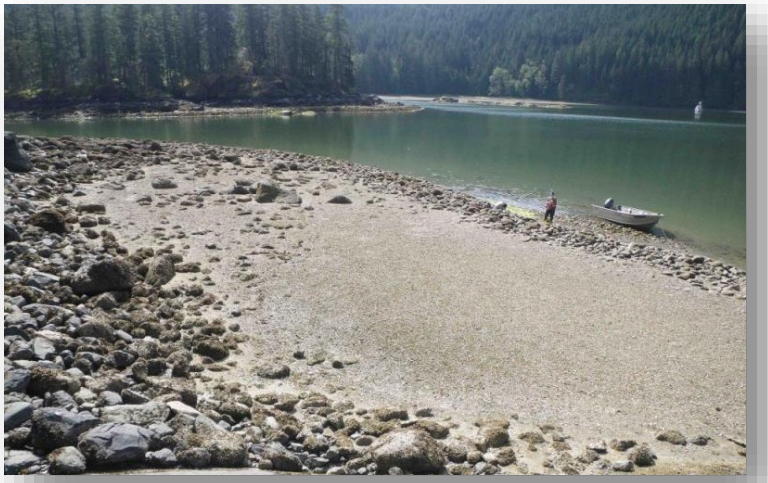
Aquaculture – In the Beginning

- Aquaculture has been practised in some form for thousands of years primarily in freshwater ponds and impoundments with minimum technical intervention but low yields
- Culture had two purposes
  - to provide food for the producer
  - for trade
- First Nations in British Columbia built clam gardens thousands of years ago to create habitat for clam production
  - Building a rock wall at the low tide mark creates an ideal beach habitat for clams



Bottom Photo: Underwater Archeological Society of BC

Aquaculture – Emergence of Net Pen Culture

- Modern (for-profit) phase of finfish aquaculture began in the 1970s
  - Development of large-scale net pen operations
  - Countries saw the advantage of growing fish in the oceans and in large bodies of freshwater
  - Technology and economics became favourable
- This strategy has been highly effective on a global scale; e.g.
  - Salmon in Norway, Scotland, Chile, Canada, Australia
  - Sea bream and sea bass in Mediterranean countries
  - Trout in Ontario

Aquaculture – Evolution of RAS

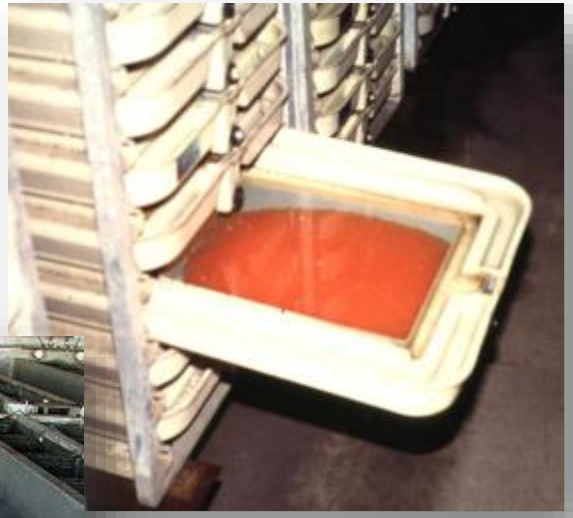
- More sophisticated rearing strategies such as re-circulating aquaculture systems (RAS) have been developed
  - Suited to production of high-value species and juveniles
  - Advantage in areas with limited water supplies
- These systems are more expensive (capital and operating costs) and some can be technically complex
- Can be deployed anywhere there is a modest supply of water and access to power and other infrastructure
- For the most part, they are isolated from the natural environment

Egg & Fingerling Supply

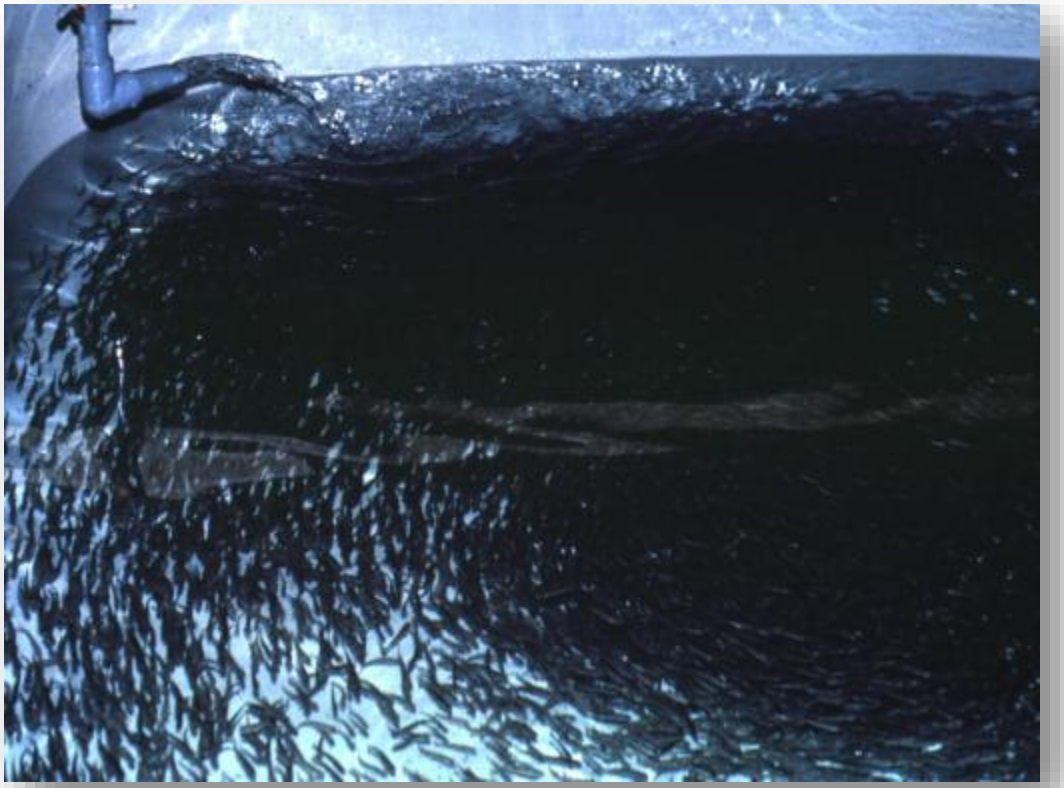
- Several commercial hatcheries throughout Canada produce eggs and fingerlings for sale to on-growers
  - Many have own broodstock
  - Some import eggs from Troutlodge, Riverence and others
  - Eggs available 12 months per year
  - Canadian rainbow trout broodstock program is being planned

Hatching

- Eggs are typically hatched in troughs, tray incubators or bell jars

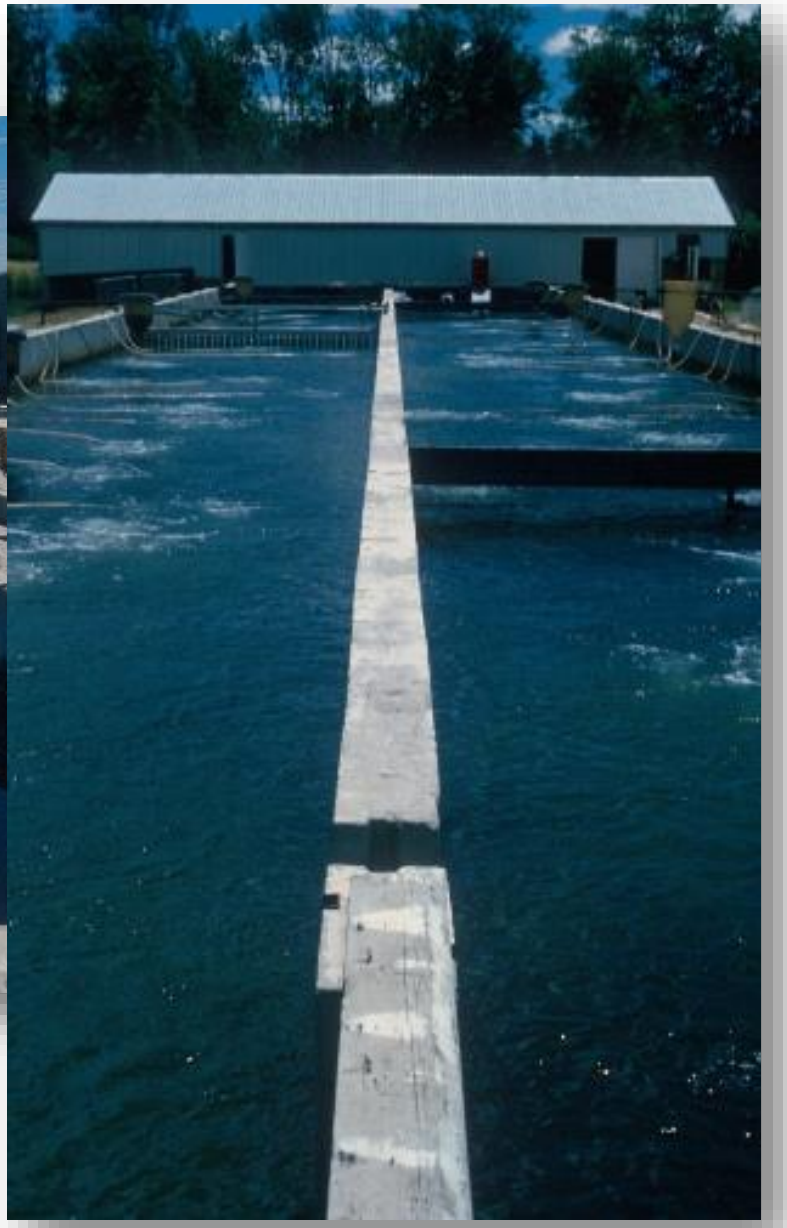


Fingerlings

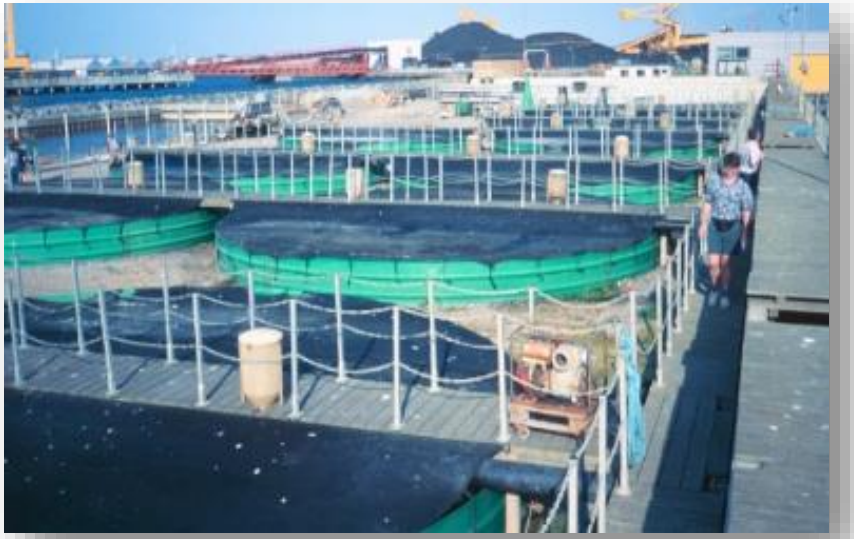


Pond Production

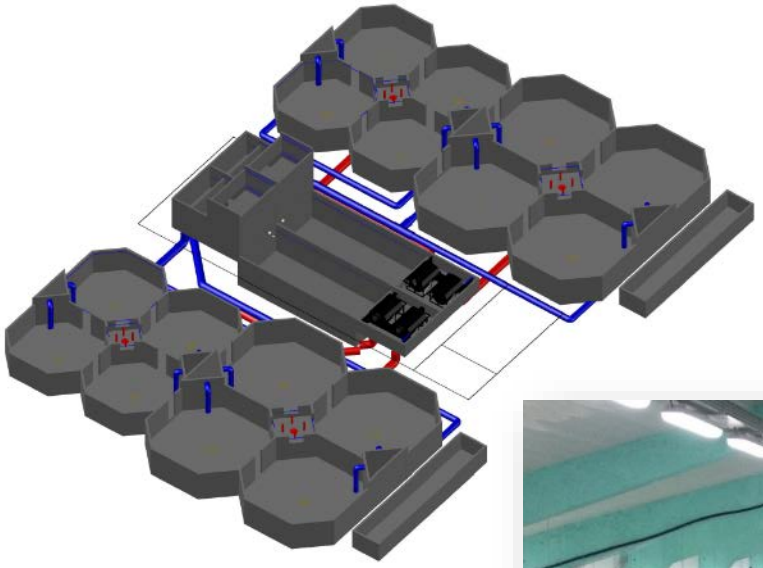
Raceway Culture



Circular Tanks



Octagonal Tanks



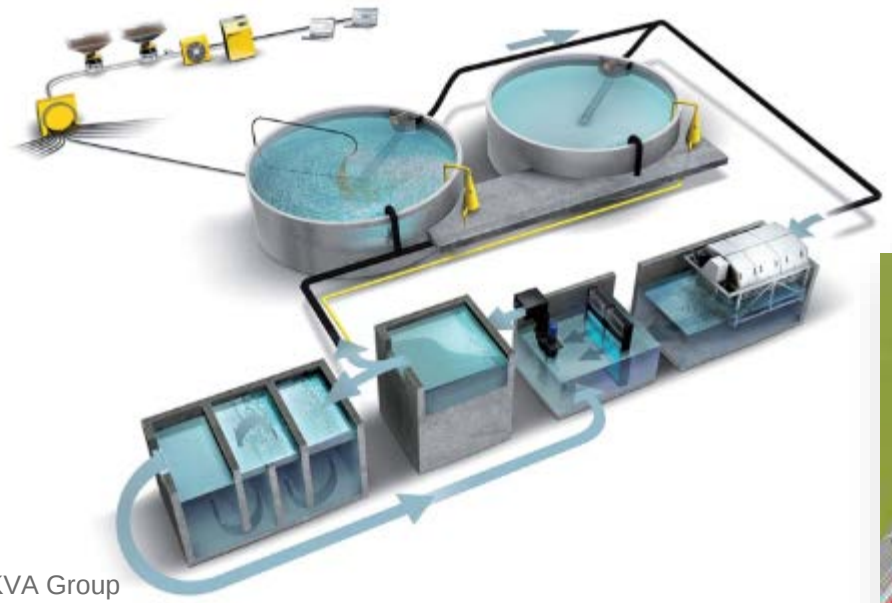
Floating Containment Systems

Land-Based Facility Design

- Unlike in traditional animal production systems and in net pen aquaculture, there is a lack of standardization in land-based aquaculture

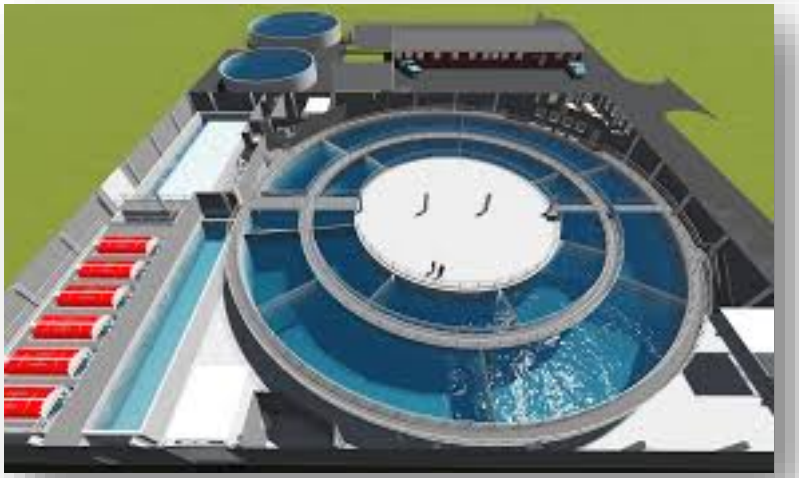
Various Land-Based Designs

- Most systems will grow fish, but...
- The objective is to grow fish and make money.....



AKVA Group

Atlantic Sapphire



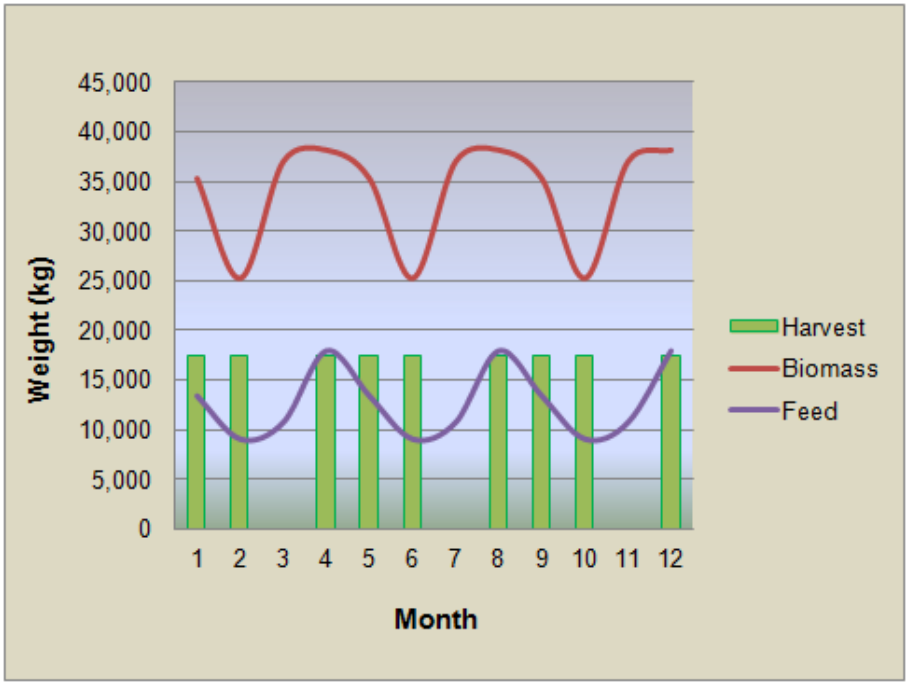
Veolia Water Technologies

Key Factors

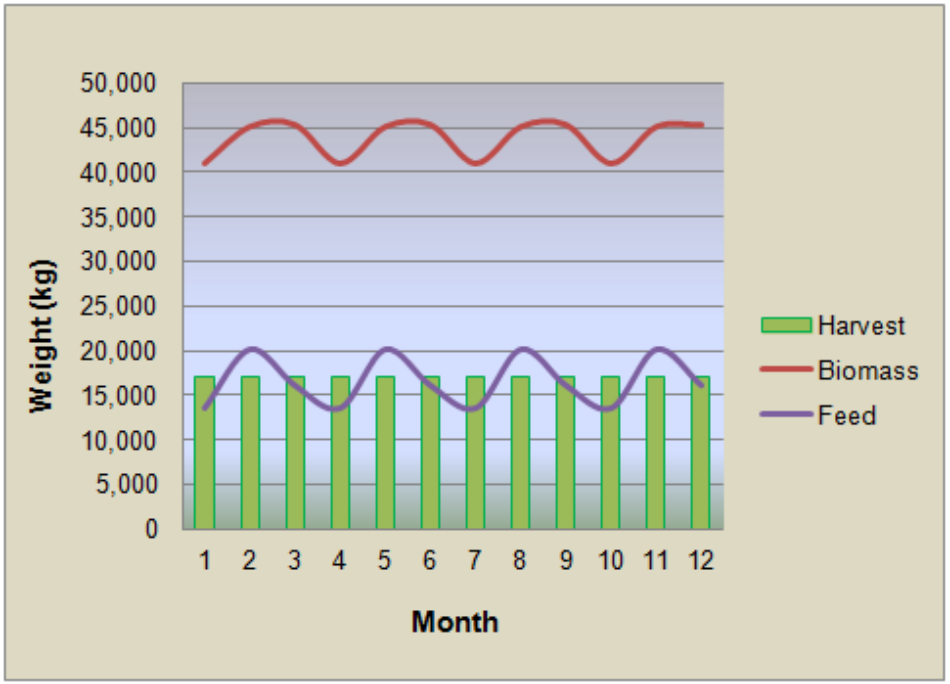
- Capital cost matters
  - These vary widely according to design and location
- Maximum daily feed ration is fundamental
  - RAS units are designed to process metabolic by-products
- It really doesn't really matter what kind of fish you're feeding
  - FCR
- Inventory turnover does matter
  - Time to reach market size
  - Number of cohorts per year
- Average annual selling price does matter
  - Atlantic salmon
  - Rainbow trout
  - Salmon smolts

Production Modeling

- It is more productive and efficient to schedule multiple cohorts per year



3 cohorts / year

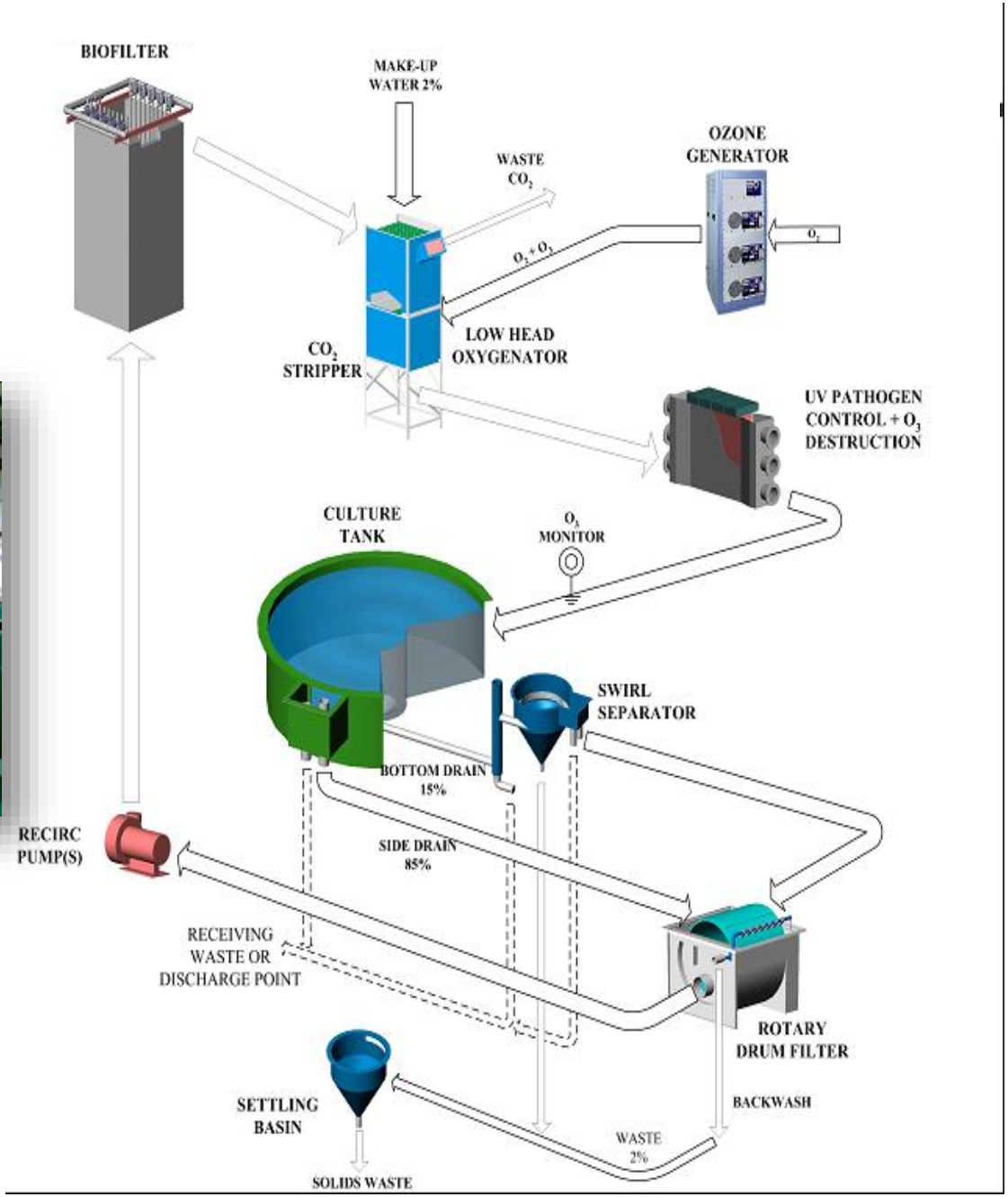


4 cohorts / year

- Approximately 30% more production in the same system with 4 cohorts per year
- More stable loading on the systems

Recirculating Aquaculture Systems

PRAqua

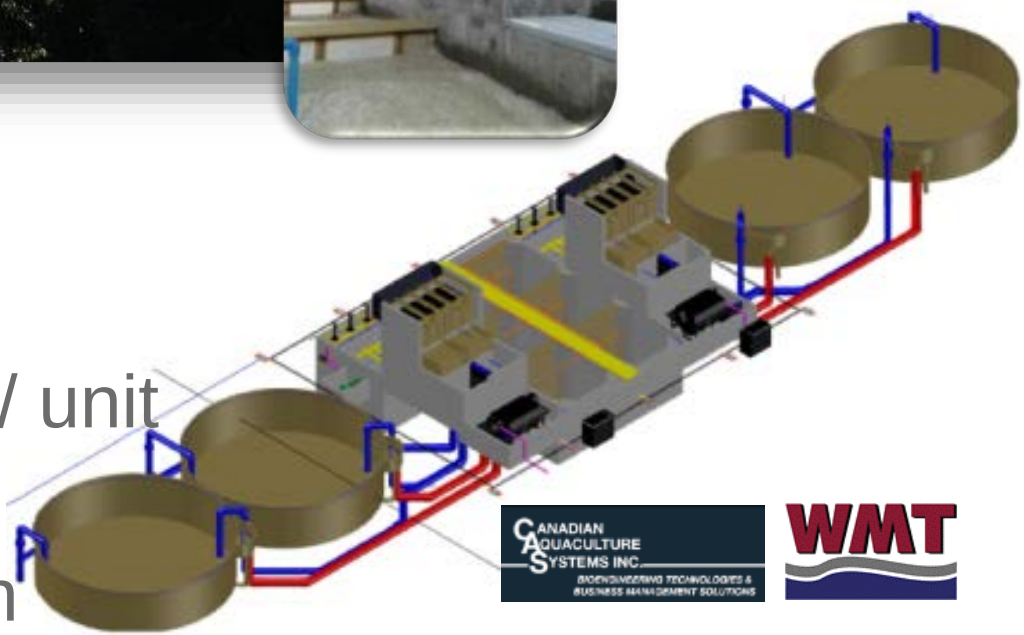


Sand Plains AquaCulture

Smolt Production

Production

- 14 million smolts / year
- Up to 850 kg feed / day / unit
- 99% recirculation
- Simple, low-head design



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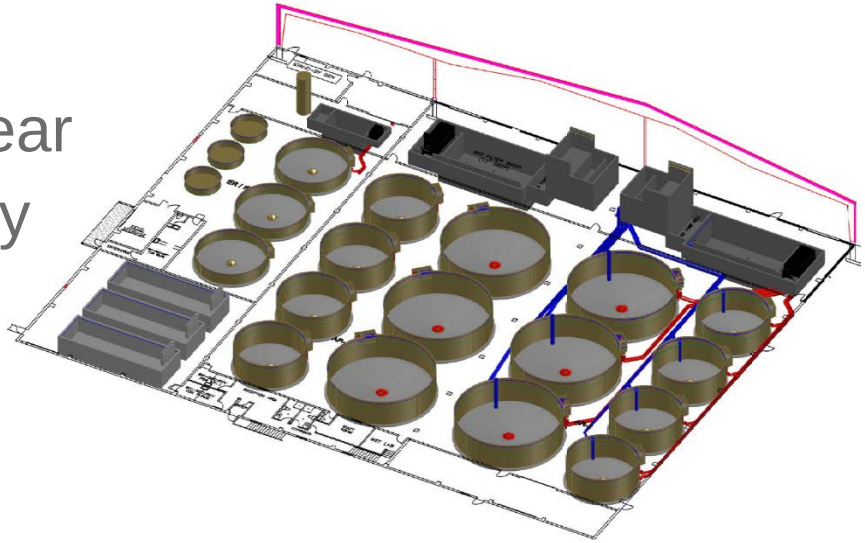
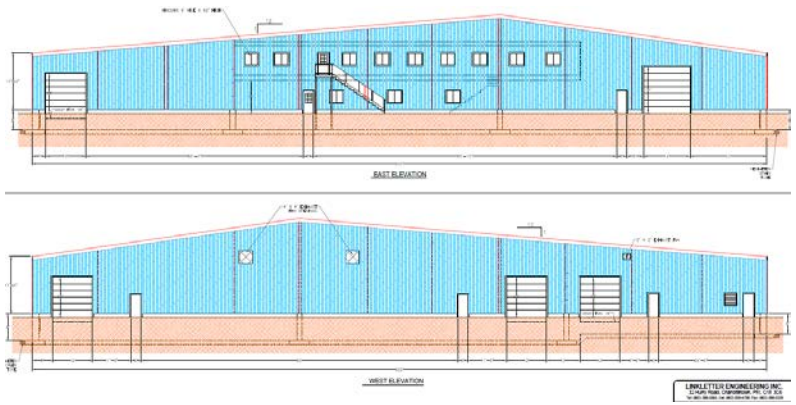
WMT

Danish Model Farm Program

Land-Based Salmon Farm

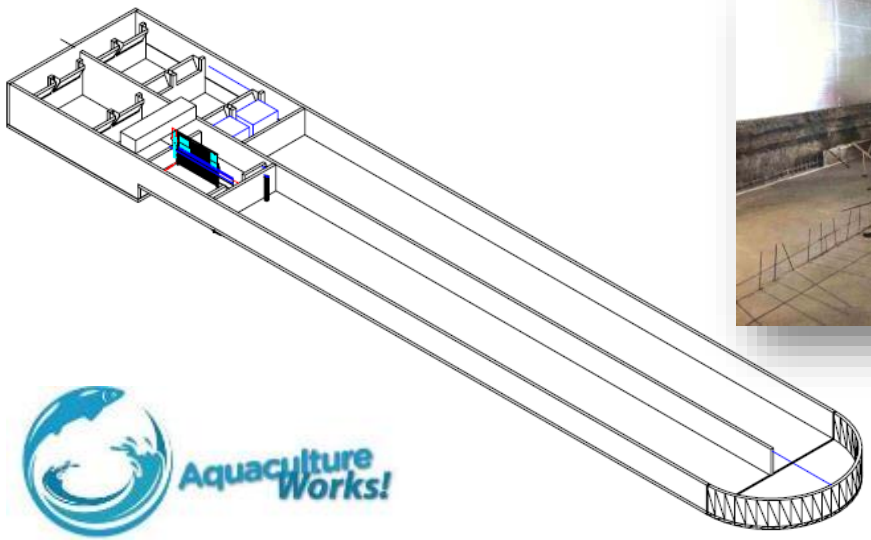
- 250 tonnes Atlantic salmon / year
- Independent brood stock facility
- 7 RAS units with up to 890 kg feed / day
- >99% recirculation





Canadian Model Aqua-Farm

- 130 tonne trout farm
- 99% recirculation
- Simple, low-head design
- 430 kg feed / day



Canadian Model Aqua-Farm Program

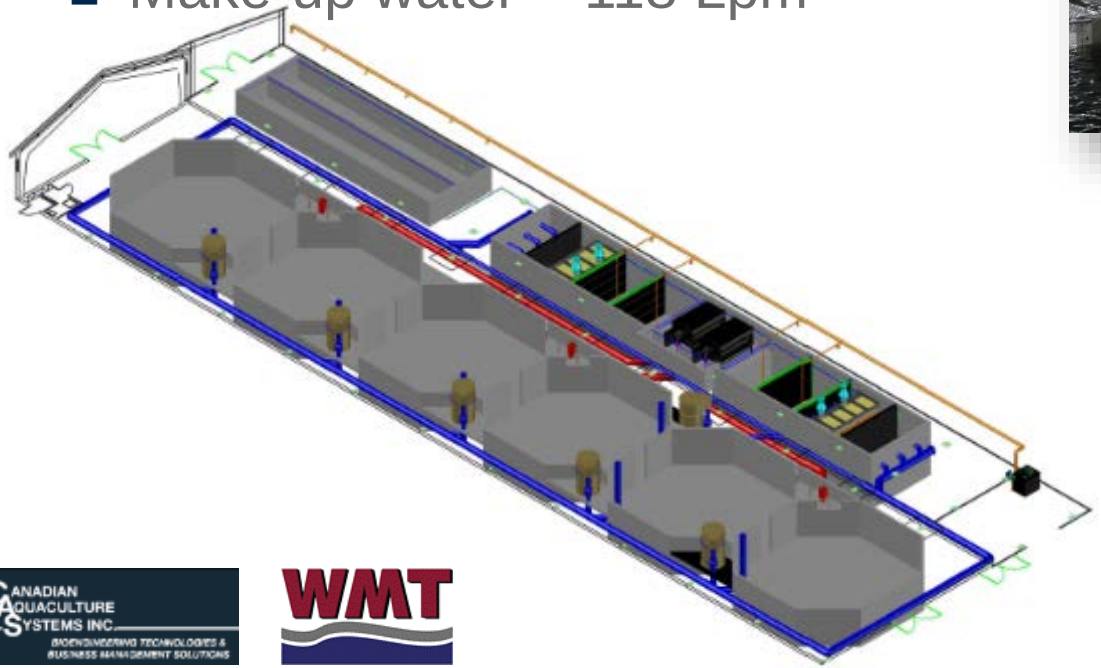
TASTE OF BC
Aquafarms Inc.

LITTLE CEDAR FALLS

Commercial RAS

Production

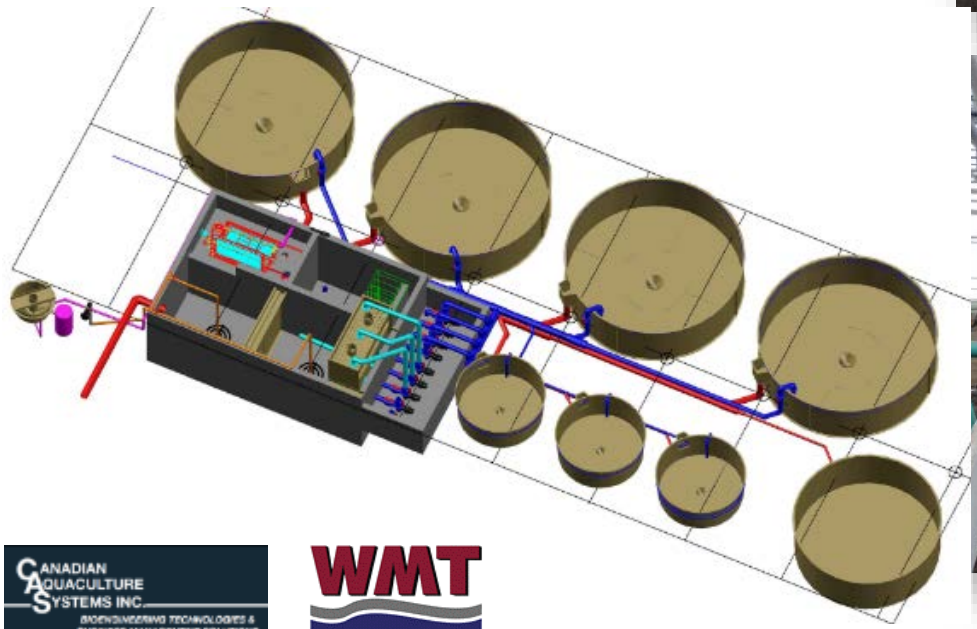
- Hatchery, early rearing & grow-out
- 200 tonnes coho / year
- 725 kg feed / day
- 99.7% recirculation
  - System flow = 34,000 Lpm
  - Make-up water = 118 Lpm



Trend AquaFresh

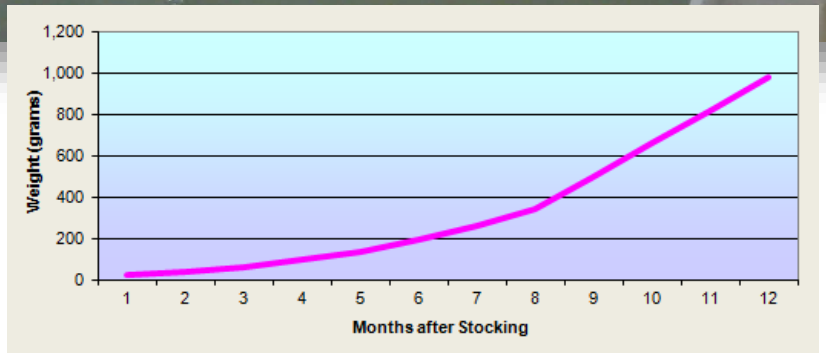
Production

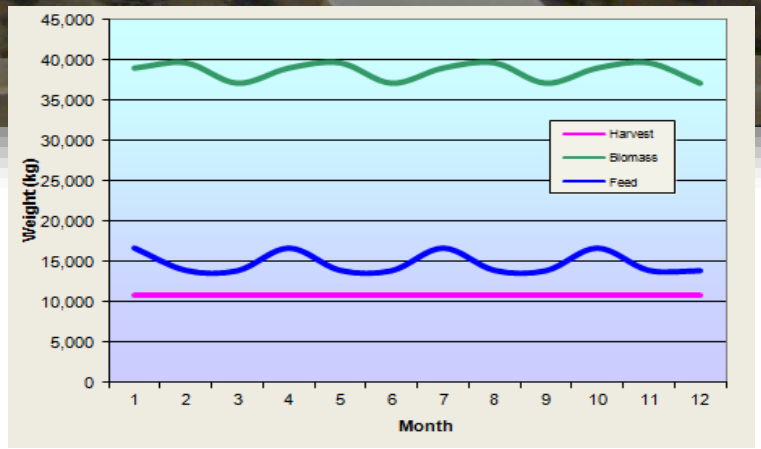
- 50 tonnes fish / year
- 200 kg feed per day



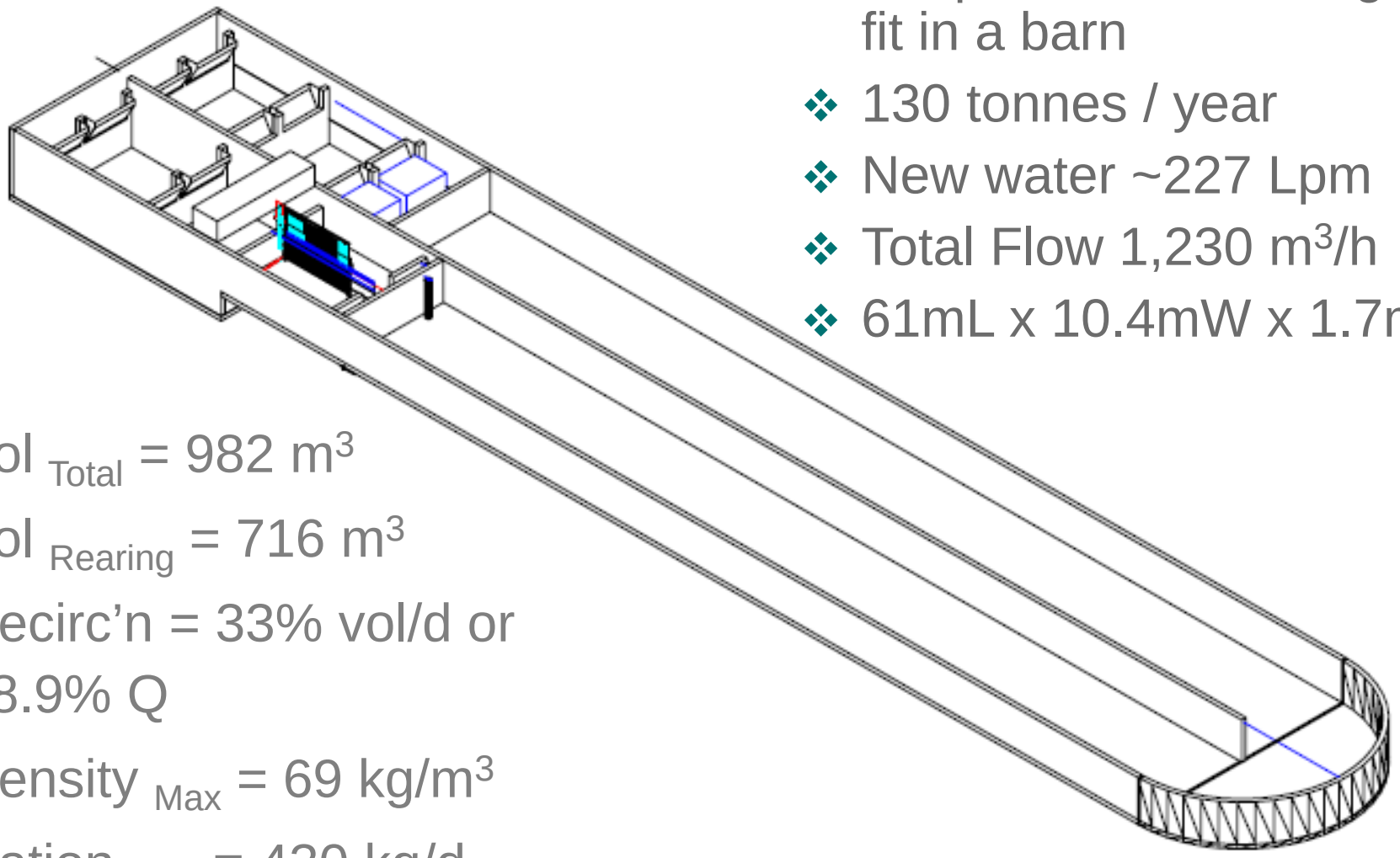
Canadian Model Aqua-Farm

- Year-round production
  - 40,000 20g fry every 3 months
  - 12 months to ~1200g @ ~10°C
  - Harvest ~10,800 kg per month
  - Harvest at 900 – 1000 g





Model Farm Layout



- Simple, efficient design to fit in a barn
- 130 tonnes / year
- New water ~227 Lpm
- Total Flow 1,230 m^3/h
- 61mL x 10.4mW x 1.7mD

- Vol $_{Total}$ = 982 m^3
- Vol $_{Rearing}$ = 716 m^3
- Recirc'n = 33% vol/d or 98.9% Q
- Density $_{Max}$ = 69 kg/m^3
- Ration $_{Max}$ = 430 kg/d

Financial Metrics

- Capital Cost
  - Does not include barn, well, manure lagoon (sunk costs)
    - $6,317 per tonne of production capacity
  - Total investment and financial results will vary according to site-specific factors

	Budget	Actual	Variance	Rationale
Infrastructure	$ 46,200	$ 127,047	$ 80,847	Upgraded electrical supply
Raceway & Purge Tank	$ 173,000	$ 157,243	$ -15,757	
RAS Equipment	$ 405,000	$ 464,901	$ 59,881	Sludge cones, microparticle filter, inflation, currency exchange
Fish Culture Equipment	$ 30,360	$ 30,360	$ 0	
Other Equipment	$ 38,500	$ 46,746	$ 8,246	Over-tank walkways
Total Capital Cost	$ 693,080	$ 826,296	$ 133,216	D = 19%

Financial Metrics

- Working Capital
  - Feed, Fingerlings, Power, Supplies, etc.

	Budget	Actual
Feed ($/tonne)	$1,582	$1,416
Electricity ($/ month)	$4,185	$3,300
Fingerlings ($/ 20g)	$0.28	$0.335
Selling price ($/ kg)	$3.97	$4.18

  - Notes:
    - Selling price in 2017 is $5.40 / kg
    - Feed cost in 2017 is $1,866 / tonne

Cost of Goods Sold (2017 Update)

		$/kg	% Sales
Harvest (kg)	130,800		
TOTAL REVENUES	**$706,320**	$5.40	100.0%
Cost of Production			
Opening Inventory	$136,727	$1.05	
Feed	$317,352	$2.43	44.9%
Fingerlings	$62,212	$0.48	8.8%
Electricity	$50,224	$0.38	7.1%
Labour	$31,200	$0.24	4.4%
Maintenance & Repairs	$11,574	$0.09	1.6%
Supplies	$5,556	$0.04	0.8%
Stock Insurance	$7,157	$0.05	1.0%
	$622,001	$4.76	
Closing Inventory	$136,723	$1.05	
Cost of Sales	**$485,279**	$3.71	**68.7%**
Gross Margin	**$221,041**	$1.69	**31.3%**

Indirect Costs (2017 Update)

Indirect Costs			
Depreciation	$52,718	$0.40	7.5%
Professional Services	$6,000	$0.05	0.8%
Insurance	$3,600	$0.03	0.5%
Interest	$24,547	$0.19	3.5%
Telecommunications	$2,400	$0.02	0.3%
Office Expense	$600	$0.00	0.1%
Vehicle Expenses	$6,000	$0.05	0.8%
Total Indirect	**$95,866**	$0.73	**13.6%**
Profit/(Loss) before taxes	**$125,176**	$0.96	17.7%
Taxes	**$19,403**	$0.15	2.7%
Profit/(Loss) after taxes	**$105,772**	$0.81	15.0%

Total CF = Labour + Net Cash Flow = $137,380

EBITDA = 28.7%

Financial Metrics

- Capital Cost
  - ~$10,000 to $15,000 per tonne of production
- Working Capital
  - Feed, Fingerlings, Labour, Power, Supplies, etc.
  - ~$2,000 to $5,000 per tonne of production
- Revenue
  - ~$5,000 to 7,000 per tonne (round weight, farm gate)
- Return
  - Net Cash Flow ~$1,100 to $1,800 per tonne (before tax)
  - EBITDA = 23% to 28%

Creating Prosperity – One Client at a Time

- ✓ Understanding the circumstances
- ✓ Developing innovative solutions
- ✓ Delivering results – on time, on budget, no surprises

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