

AN ECONOMIC MODEL OF COMMERCIAL OFFSHORE AQUACULTURE PRODUCTION SYSTEM IN THE GULF OF MEXICO



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Objectives

- Develop a hypothetical commercial offshore aquaculture production system (COAPS) in the Gulf of Mexico
- Estimate annual costs and returns of COAPS.
- Develop annual cash flows for COAPS.
- Evaluate the economic and financial feasibility of COAPS under different economic and biological scenarios.

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Data Sources

- Offshore aquaculture production system
 - Offshore Aquaculture Consortium (OAC)
- Offshore cage design & operation
 - Ocean Spar and OAC
- Gulf of Mexico ex-vessel prices
 - National Marine Fisheries Service (NMFS)

Offshore Aquaculture Production System

- Aquaculture Service Vehicle (ASV)
- 3,000-m³ Ocean Spar Sea Station (OSSS) cages
- Moorings, feed distribution system and net cleaners
- Service boats

Land-based Support Facilities

- 2-ha base camp
- Office building and trailers
- Trucks and service vehicles
- Fish transport vehicle

Initial Fixed Investment (12-cages or 36,000 m³)

<i>Item</i>	<i>Total Cost (US\$)</i>	<i>US\$/m³</i>
<i>Onshore support facilities</i>	0.33	9
<i>Offshore facilities</i>	3.52	98
<i>Total investment</i>	3.85	107

Costs and Returns Estimation

- Recommended management practices
- Biological knowledge of candidate fish species
- Estimated input usage and prices
- Established ex-vessel fish prices

Investment Analysis

- Payback period (yr)
- Net present value (US\$M)
- Internal rate of return (%)
- Base model assumptions
- Improved growth (+25%)
- Enhanced market (+US\$1/kg)
- Enhanced market + improved growth

12- Cage COAPS Base Model

Item	Unit	COBIA12	SNAP12	DRUM12
Stocking density	Fish/m ³	7	83	41
Growth rate	G/month	583	37	80
Ex-vessel price	\$/kg	4.25	4.50	3.75
Harvest size	Kg/fish	5.25	0.45	0.97
Fish production	1000 mt/yr	1.08	1.08	1.08
Net returns	\$/yr	0.83	-0.64	-0.19
NPV	\$/M	3.17	<0	<0
IRR	%	29	<0	<0
Investment decision		Feasible	Infeasible	Infeasible

12- Cage COAPS Enhanced Market Model

Item	Unit	COBIA12	SNAP12	DRUM12
Stocking density	Fish/m ³	7	83	41
Growth rate	G/month	583	37	80
Ex-vessel price	\$/kg	5.25	5.50	4.75
Harvest size	Kg/fish	5.25	0.45	0.97
Fish production	1000 mt/yr	1.08	1.08	1.08
Net returns	\$/yr	1.87	0.39	0.84
NPV	\$/M	8.87	0.76	3.24
IRR	%	59	15	30
Investment decision		Feasible	Feasible	Feasible

12- Cage COAPS Improved Growth Model

Item	Unit	COBIA12	SNAP12	DRUM12
Stocking density	Fish/m ³	6	67	33
Growth rate	G/month	729	46	100
Ex-vessel price	\$/kg	4.25	4.50	3.75
Harvest size	Kg/fish	6.57	0.56	1.21
Fish production	1000 mt/yr	1.08	1.08	1.08
Net returns	\$/yr	0.87	-0.17	0.05
NPV	\$/M	3.39	<0	<0
IRR	%	30	<0	2
Investment decision		Feasible	Infeasible	Infeasible

Summary

- These simulation results are based on experimental or “best guess” scenario.
- Simulation results indicate that the economic viability of COAPS depends on the following:
 - better fish
 - faster growing fish
 - cheaper costs of production

Limitations

- ASV is still under development
 - capacity (?)
 - costs (?)
- Environmental monitoring
 - equipment, supplies and manpower
 - costs (?)
- Permitting process
 - length of time (?)
 - costs (?)

Further Economic Research

- Verify simulation model assumptions
 - logistical problems: fingerling, feed, fish, manpower, supplies
 - pilot scale experiments: fish growth, feed type, feeding, FCR, treatment, stocking, harvest, transport
- Integrate the element of RISK in the model
- Conduct sensitivity analysis
- Conduct economic impact analysis
- Develop economic-environmental trade-off model