Economic Analysis of a Commercial and Experimental Feed Used in Biofloc-Dominated, Super-Intensive, *Litopenaeus vannamei* Growout Raceway System – The 2013 Trial

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Introduction

- Indoor super-intensive recirculating systems continues to attract attention
  - High quality shrimp
  - Produced under controlled conditions
- Drawbacks
  - High initial investment
  - Volatile shrimp and feed prices
- Economic analyses performed on:
  - Effect of one commercial and one experimental diet on shrimp performance and cost of production
  - Conducted at the Texas AgriLife Research Mariculture Lab at Flour Bluff, Corpus Christi, Texas

Presentation

- 2013 Study
  - Summary of Production Results
  - Economic Analysis Summary
    - Cost of Production, Net Returns, Net Present Value, Internal Rate of Return, Payback Period
- Summary and Conclusions

Objective

- To economically evaluate the use of a commercial feed (HI-35) and an experimental feed (EXP) formulated for super-intensive biofloc-dominated shrimp production systems for Litopenaeus vannamei under no water exchange

Earlier Study Findings

- Many factors affect the COP and financial viability
- Some are more controllable than others
  - More controllable
    - Location choice & its impact on investment, inputs & costs
    - Increasing stocking density and juvenile size
    - Reducing crop duration => more crops per year
    - Nursery and growout survival
    - FCR
    - Water usage
  - Less controllable
    - Growout and juvenile feed cost
    - Year round supply of PLs
    - Shrimp selling price

Economic Analysis

- 2013 Study Comparing Commercial and Experimental Feed
  - Two diets (Zeigler Brothers); three replicates
    - Hyper-Intensive (HI-35) 35% protein: $ 0.874/lb or $ 1.92/kg
    - Experimental (EXP) 40% protein: $ 0.884/lb or $ 1.94/kg
  - Each treatment conducted in three 40 m^3 RWs
    - Filled with mixture of biofloc-rich and natural seawater
    - Salinity adjusted to 30 ppt
  - Juveniles stocked at 324/m^3 (4.7 g) from a cross between Taura Resistant and Fast-Growth genetic lines developed by KAVA Farms, Los Fresnos, FL
  - 77 day study duration
  - No water exchange

2013 Study Results

HI-35 versus EXP Feed Diets

		HI-35	EXP
Stocking	Juveniles/m^3	324	324
Survival	%	93.1	83.4
Growth	g/wk	2.05	2.16
Stocking size	g	4.7	4.7
Final weight	g	27.2	28.8
FCR		1.59	1.72
Length of crop	days	77	77
Production	kg/m^3	8.21	7.79

Economic Analysis

- Performed a 10-year cash flow analysis to estimate:
  - Cost of production, Net returns to land, Net present value, Internal rate of return, and Payback period
- Prices/Costs used in analysis
  - Shrimp sales price: averaged $7.20/kg ($3.27/lb) and $8.82/kg ($4.00/lb)
  - Grow-out feed: Zeigler Brothers
    - Hyper-Intensive (HI-35): $1.92/kg = $ 1,920/MT or $0.87/lb = $ 1,741/ton
    - Experimental (EXP): $1.94/kg = $1,940/MT or $0.88/lb = $1,760/ton
  - Juveniles (4g) production cost: $ 8/1,000
  - Interest rate for loans: 8%
- Initial investment = $991,997

Economic Analysis

- Study results extrapolated to:
  - One greenhouse system (GH)
  - Each GH consists of eight 500 m^3/m^2 grow-out tanks and two 500 m^3/m^2 nursery tanks
- Budget results are based on production figures

Summary of Production and Sales for Super-intensive Recirculating Shrimp Production Systems 2013 Trials

English Units

	HI-35%	HI-35%	EXP (HI-40%)	EXP (HI-40%)
Selling price, $/lb	3.27	4.00	3.27	4.00
Production, lb/crop	71,924	71,924	68,077	68,077
Crops per year, no.	4.7	4.7	4.7	4.7
Production, lb/year	338,044	338,044	319,960	319,960
Production ton/year	169	169	160	160
Total Sales per year $ million	1.1	1.4	1.0	1.3

Summary of Production and Sales for Super-intensive Recirculating Shrimp Production Systems 2013 Trials, $/lb

	HI-35%	HI-35%	EXP (HI-40%)	EXP (HI-40%)
Gross Receipts	3.27	4.00	3.27	4.00
Variable Costs	2.47	2.47	2.67	2.67
Income Above Variable Cost	0.80	1.53	0.60	1.33
Fixed Cost	0.58	0.58	0.61	0.61
Total of All Specified Expenses	3.05	3.05	3.28	3.28
Net Return Above All Costs	0.22	0.95	(0.02)	0.72
Payback period, years	4.5	2.0	11	2.5
Net present value ($ mil.)	0.1	1.7	-0.7	1.1
Internal Rate of Return (%)	12	38	-1	29

Opportunities for the Future

- High feed cost that result in good production parameters combined with a good shrimp selling price = profitability
- Assumptions included in analysis that need to be addressed:
  - 1. Must have year-round PL supply!
  - 2. Research must show back-to-back-to-back… production is possible
- Financial analyses are a tool to focus research toward appropriate technologies

Beginning or End!? Questions?