Market Conditions Today

Lower Prices

Tilapia: -9%  
Shrimp: -14%

Higher Costs

Fishmeal (Peru)

Disease

160 tonnes of dead fish found in farms along Johor Straits

Source: USDA, Index Mundi, JFD Analysis
Shrimp prices - the long view

Conversion: Monodon to Vannamei
Prices struggling to find a supply demand balance

- EMS hits Thailand, production drops 50%
- Thai production drops again to only 218,000 tons
- India, Indonesia and Ecuador respond to high prices with increased production
- High prices reduces demand resulting in build-up of inventory going into 2015
- Production declines in India, Vietnam and China reduces supply back in line with demand
Monodon prices - why lower than vannamei?

**Some views:**

- Not true in all markets, e.g. Thailand where farmers switched from vannamei to monodon to get higher price.

- Indian processors have supply commitments for vannamei which they struggle to fill due to vannamei production declines - temporary blip in vannamei prices?

- Consumers trading down from monodon to vannamei?

- Monodon no longer marketed as much as before?
Market Conditions Today

Lower Prices

Tilapia  Shrimp
- 9 %  - 14 %

Higher Costs

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Source: USDA, Index Mundi, JFD Analysis
Fishmeal prices and volatility permanently increasing

Prices increase ~$108/year

Volatility $188/year

Peruvian Fishmeal Price since 2000 USD / Ton

Fishmeal Price Volatility USD / Ton

\[ y = 8.9324x + 358.6 \]

\[ R^2 = 0.8824 \]
Fish available for non food uses declining
We can expect continued raw material price volatility

<table>
<thead>
<tr>
<th>El Nino</th>
<th>Uncertain anchoveta quota and harvest</th>
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<tbody>
<tr>
<td></td>
<td>Corn, soy and wheat harvest also uncertain</td>
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<tr>
<td></td>
<td>Drier weather in SE Asia</td>
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<td>More extreme weather</td>
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<tr>
<th>Regulatory enforcement</th>
<th>Fishing block out periods in Thailand</th>
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<td>Anti-slavery campaign</td>
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<td>Illegal fishing in Indonesia</td>
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<tr>
<th>China</th>
<th>Economic uncertainty affects demand for raw material</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Potentially affects demand for finished goods</td>
</tr>
</tbody>
</table>
Manufacturing costs rising

**Indonesia: 2015 vs 2014**

- **Fish Meal (Local):** 23%
- **Minimum Wage:** 22%
- **Electricity:** 13%
- **Fuel:** 6%
- **IDR:USD:** 20%

**CAGR 2013-2015:** 28%

Feed prices will continue to increase over time
Market Conditions Today

Lower Prices

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</table>

Higher Costs

Fishmeal (Peru)

Source: USDA, Index Mundi, JFD Analysis

Disease

160 tonnes of dead fish found in farms along Johor Straits

Jun-00, Jan-02, Aug-03, Mar-05, Oct-06, May-07, Dec-09, Jul-11, Feb-13, Sep-14, 08
“Environmental” pathogens new threat to aquaculture

**ONCE THERE, ALWAYS THERE**

**Direct Impact:**

**Harmful Algal Blooms (HAB)**

160 tonnes of dead fish found in farms along Johor Straits

China’s largest algal bloom turns the Yellow Sea green

The algae, which can suffocate marine life, is thought to be caused by pollution from agriculture and industry

**Potential implications for Asian aquaculture:**

- Diseases more pervasive than viral outbreaks of the past
- Net pen aquaculture exposed to novel pathogens from polluted water bodies
- Environmental pathogens more difficult to control, can spread more broadly

**Indirect Impact:**

**Aquatic eutrophication promotes pathogenic infection in amphibians**

Johnson et al (2007)

Two effects:

1) Increased growth of intermediate hosts
2) Increased production of larvae (cercariae)

**Are current shrimp diseases environmental pathogens?**

- AHPND - vibrio (environmental pathogen)
- White Faeces - unknown cause
- EHP - parasitic fungus, intermediate host?
WARNING: What happens when you don’t farm sustainably

Thai Shrimp Production (‘000 tons)

- Actual Feed Sales
- 45% Drop due to EMS
The Right Approach: IMNV improved Indonesia shrimp farming

After IMNV outbreak in mid 2000s:

- Weaker farms closed
- Successful farms implemented better management practice (BMP):
  - Fully lined, plastic or concrete
  - Central drain
  - Inbound water treatment
  - SPF PL
  - Responsive feeding
  - Biolab on site
- Government controls on movement of live animals into and within country

Indonesia in 2015:

- High stocking density (500+)
- Pioneers in ultra-high density pond culture
- Leaders in application of biofloc
- Still facing disease (IMNV, WSSV, White Faeces) but “dealing with it”
Additional Observations
Observations on the economics of shrimp farming

**Focus on PRODUCTION MAXIMIZATION, not cost minimization**

- Value of the shrimp much higher than primary cost inputs (esp. feed)
- Non-linear price curve - higher value for larger shrimp
- Production maximization a function of:
  - High quality PL
  - High performance feed
  - Good farm management / husbandry
  - Good farm conditions (equipment in good condition, ponds in good condition)
Performance advantage from better feed and genetics

**Weight Gain (g/week) - Monodon (Australia)**

- Growth Selected Broodstock: **Advanced Feed**
- Growth Selected Broodstock: Basic Feed
- Wild Broodstock: **Advanced Feed**
- Wild Broodstock: Basic Feed

Source: Glencross et al 2004
Observations on the economics of shrimp farming - Example

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Basic Feed</th>
<th>Advanced Feed</th>
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</thead>
<tbody>
<tr>
<td>PL Stocked</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Growth / Week (g)</td>
<td>0.61</td>
<td>1.25</td>
</tr>
<tr>
<td>Weeks of Growth</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Avg Size of Shrimp (g)</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Total Biomass (Kg)</td>
<td>1,220</td>
<td>2,500</td>
</tr>
<tr>
<td>Value per KG</td>
<td>5.50</td>
<td>7.00</td>
</tr>
<tr>
<td>Total Value at Harvest (USD)</td>
<td>6,710</td>
<td>17,500</td>
</tr>
<tr>
<td>Cost of Feed: USD/Kg</td>
<td>1.15</td>
<td>1.45</td>
</tr>
<tr>
<td>FCR</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Total Feed Used (kg)</td>
<td>1,830</td>
<td>3,250</td>
</tr>
<tr>
<td>Feed Cost USD</td>
<td>2,105</td>
<td>4,713</td>
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</tbody>
</table>

**Economic Assessment**

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<table>
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<tbody>
<tr>
<td>Difference: Harvest Value</td>
<td>10,790</td>
</tr>
<tr>
<td>Difference: Feed Cost</td>
<td>2,608</td>
</tr>
<tr>
<td>Return on Investment</td>
<td>414%</td>
</tr>
</tbody>
</table>
Suggestions for Sri Lanka Shrimp Farming

- Secure your long term future by establishing and maintaining sustainable practices
- Establish a national brand for sustainable, clean, traceable monodon shrimp
- Do not introduce vannamei - at least until vannamei disease issues are resolved