PARTIAL HARVEST WITH BFT, A PROMISING SYSTEM FOR PACIFIC WHITE SHRIMP

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Acknowledgements

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I would also like to thank Dr. Shahridan Faiez (CEO) and Mr. Christopher Lim (COO) of Blue Archipelago for their support for me to participate at the meeting.
Introduction

Shrimp farming has become competitive and as such the technology utilized needs to be efficient in all aspects – productivity, quality, sustainability, bio-security and to be in line with market demand.

BFT (bio-floc) appears to be the solution for efficiency in terms of energy and feed utilization. The basic system of bio-floc technology was given by Avnimelech (2000, 2005a&b). The system was successfully applied in commercial culture of shrimps by McIntosh (2000a,b & c, 2001), McNeil (2000), Nyan Taw (2005, 2006), Nyan Taw & Saenphon Ch. (2005); Saenphon Ch. et.al. (2005). Most recently a study on BFT in combination with partial harvest was carried out by Nyan Taw, et. at (2008).
Indonesia
Shrimp Farm Location

Global Shrimp Farm, Medan

Map of Indonesia showing the location of Global Shrimp Farm, Medan.
Farm Modules’ Layout with Reservoirs and Culture Ponds
Farm Biosecurity

1. SPF Post larvae
2. Module system
3. HDPE lined ponds
4. Control inlet & discharge gates (no leakages)
5. Clean pond & equipments
6. Screen & treat water
7. Correct aeration system
8. Crab Fence
9. Bird scare lines
10. Control workers & their movement
11. Control visitors
# Pond Preparation

<table>
<thead>
<tr>
<th>POND PREPARATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Harvest</strong></td>
</tr>
<tr>
<td>Remove sludge and barnacle, Washing pond bottom, Maintenance Aerators and other pond equipment</td>
</tr>
<tr>
<td><strong>Exposed to sunlight repair pond bottom</strong></td>
</tr>
<tr>
<td><strong>Hydrated lime 500 kg</strong></td>
</tr>
<tr>
<td><strong>FILL - UP sea water</strong></td>
</tr>
</tbody>
</table>

- HDPE lined ponds
- Placing paddle wheels in pre-determined position in pond
- Placing air diffusers in pre-determined position in pond

Setting paddle wheel aerators 0.47 ha HDPE ponds

Setting air diffusers aeration system 0.25 ha HDPE pond
Paddle wheels and air diffusers – set to have a circular motion of pond water to concentrate bio-floc at center of ponds. One or two paddle wheels were set directed to the center to re-suspend bio-floc to be actively suspended in the pond.
Pond Water Preparation

WATER PREPARATION

Fill-up sea water to maximum depth to maximum depth

$\text{CuSO}_4$ (1.0 ppm)

Crustacide (1.0 ppm)

<table>
<thead>
<tr>
<th>DAY</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Urea 8 kg/pond, TSP 1 kg/pond, Grain pellet 30 kg/pond &amp; Dolomite 50 kg/pond</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Tea Seed Cake 15 ppm</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Grain pellet 30 kg/pond &amp; Dolomite 50 kg/pond</td>
</tr>
<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Grain pellet 30 kg/pond &amp; Dolomite 50 kg/pond</td>
</tr>
<tr>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Grain pellet 50 kg/pond, Molasses 8 kg/pond &amp; Kaolin 50 kg/pond</td>
</tr>
<tr>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Grain pellet 50 kg/pond, Molasses 8 kg/pond</td>
</tr>
<tr>
<td>12&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Kaolin 50 kg/pond</td>
</tr>
</tbody>
</table>

HDPE lined 0.5 ha production ponds
Standard Feeding Rate

<table>
<thead>
<tr>
<th>MBW (g)</th>
<th>Feeding rate/day (%)</th>
</tr>
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<tbody>
<tr>
<td>4 - 6</td>
<td>4.40</td>
</tr>
<tr>
<td>6 - 8</td>
<td>3.80</td>
</tr>
<tr>
<td>8 - 10</td>
<td>3.30</td>
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<tr>
<td>10 - 12</td>
<td>2.90</td>
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<tr>
<td>12 - 14</td>
<td>2.50</td>
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<tr>
<td>14 - 16</td>
<td>2.25</td>
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<tr>
<td>16 - 18</td>
<td>2.00</td>
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</tbody>
</table>
Bio-floc sample

Measuring procedure

1 liter / 2 places / 15 cm deep / between 10-12 am

Let it settled for 15-20 minutes
Read density of flocs in cone (ml/l)
Culture Operation with Biosecurity

1. Paddle wheels & air diffuser positions
2. Crab fence & bird scare lines

Siphoning pond bottom
Control Biofloc

Bio-floc volume controlled at maximum 15 ml/Litre
Application of Feed - Phytoplankton

Weeks:
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19

Kg/Day:
- 0
- 50
- 100
- 150
- 200
- 250

Pond Size 0.59 ha

Feed (Kg/day)
Application of Feed & Grain BFT and Biofloc control

Pond Size 0.59 ha
Application of Feed & Grain BFT and Biofloc control

Pond Size 0.47 ha

- Biofloc Vol (ml/L)
- Grain (kg/Day)
- Feed (kg/Day)
Application of Feed & Grain BFT and Biofloc control

Pond Size 0.25 ha

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Bioflok Vol (ml/L)</th>
<th>Grain (kg/Day)</th>
<th>Feed (Kg/Day)</th>
</tr>
</thead>
<tbody>
<tr>
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Partial Harvesting with Cast Nets

Paddle wheels & air diffusers were kept in operation during partial harvest – maximum two hours
Partial Harvests – 0.47 ha Pond

```
<table>
<thead>
<tr>
<th>Description</th>
<th>Partial Harvest Program</th>
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<tbody>
<tr>
<td>Pond Area</td>
<td>m²</td>
</tr>
<tr>
<td>Sticking Density</td>
<td>pcs/m²</td>
</tr>
<tr>
<td>Initial Stock</td>
<td></td>
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<tr>
<td>Aerator</td>
<td>hp</td>
</tr>
<tr>
<td>Productivity Limit/ha</td>
<td>kg/ha</td>
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<tr>
<td>Final Productivity Limit/ha</td>
<td>kg/ha</td>
</tr>
<tr>
<td>Production Limit/Pond</td>
<td>kg/ha</td>
</tr>
<tr>
<td>Final Productivity Limit/Pond</td>
<td>kg/ha</td>
</tr>
<tr>
<td>Production Increase</td>
<td>%</td>
</tr>
<tr>
<td>Harvest</td>
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</tr>
<tr>
<td>Dry Harvest</td>
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<tr>
<td>Wet Harvest</td>
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<tr>
<td>SIH</td>
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<tr>
<td>Population</td>
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<td>Pct</td>
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<tr>
<td>Biomass Harvest</td>
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</tr>
<tr>
<td>Area</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td></td>
</tr>
<tr>
<td>Spatial</td>
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</tr>
<tr>
<td>Size</td>
<td></td>
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<tr>
<td>Penuritan</td>
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</tbody>
</table>

| Program Partial harvest A          |                         |
| Doc 112                            | 285/1 kg 17.75 gr       |
| Doc 113                            | 478/1 kg 19 gr          |
| Doc 116                            | 333 kg 16.83 gr         |
| Doc 117                            | 11/1 kg 1.09 gr         |
| Doc 118                            | 12/1 kg 1.31 gr         |
| Doc 119                            | 13/1 kg 1.66 gr         |
| Doc 120                            | 22/1 kg 1.31 gr         |

```

Graph showing partial harvest data with various harvest metrics.
Partial Harvests – 0.25 ha Pond

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<td>Pond Area m</td>
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<tr>
<td>Sticking Density pC/m</td>
<td>280</td>
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<tr>
<td>Initial Stock</td>
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<tr>
<td>Aerator hp</td>
<td>12</td>
</tr>
<tr>
<td>Proxidfree limit/kg</td>
<td>650</td>
</tr>
<tr>
<td>Final Productivity Limit kg/ha</td>
<td>1984.956717</td>
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<tr>
<td>Proxidfree limit/kg/ha</td>
<td>650</td>
</tr>
<tr>
<td>Final Productivity limit/pond</td>
<td>1984.956717</td>
</tr>
<tr>
<td>Production Increase %</td>
<td>8119</td>
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</tbody>
</table>
Partial Harvest Performance with Bio Floc Technology

Partial Harvests

Day of Culture (DoC)

Production (kgs/Pond)

Pond 0.47 ha

Pond 0.25 ha

DoC

10.7 g
13.3 g
16.1 g
17.9 g
18.9 g
21.3 g
20.0 g

11.6 g
13.5 g
16.4 g
17.5 g
18.5 g

0.47 ha
0.25 ha

1
2
3
4
5
6
## Environment (Pond water quality)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
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<tr>
<td>Dissolved Oxygen (DO)</td>
<td>3.7 – 5.3</td>
</tr>
<tr>
<td>pH</td>
<td>7.0 – 8.4</td>
</tr>
<tr>
<td>Salinity (ppt)</td>
<td>20.0 – 35.0</td>
</tr>
<tr>
<td>Temperature (C)</td>
<td>27 – 31</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>80 – 156</td>
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<tr>
<td>Total Ammonia Nitrogen (TAN)</td>
<td>0.5 – 2.5</td>
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</table>
# Harvest Performance Summary ATP Sei Buluh


<table>
<thead>
<tr>
<th>Description</th>
<th>Average</th>
<th>PD</th>
<th>PN</th>
<th>Total Average</th>
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<tr>
<td></td>
<td>Flush Out DOC &lt; 43</td>
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<tr>
<td></td>
<td>DOC 43 - 104</td>
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<tr>
<td></td>
<td>DOC &gt; 104</td>
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<tr>
<td>Number of Pond</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pond Size (M²)</td>
<td>3748.2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PL Source (Hatchery/Nursery)</td>
<td>KPP / ATP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FULL HDPE</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>FULL HDPE</td>
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<td>Number of PWA</td>
<td>13.30</td>
<td>13.30</td>
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<td>Stocking Density (Pls/m²)</td>
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<td>182.80</td>
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<td>DOC</td>
<td>123.40</td>
<td>123.40</td>
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<tr>
<td>SR (%)</td>
<td>84.35</td>
<td>84.35</td>
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<tr>
<td>MBW Actual Harvest (gr)</td>
<td>20.43</td>
<td>20.43</td>
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<td>FCR Pellet</td>
<td>1.24</td>
<td>1.24</td>
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<tr>
<td>ADG (gr)</td>
<td>0.16</td>
<td>0.16</td>
<td></td>
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</tr>
<tr>
<td>Productivity (Kg/Pond)</td>
<td>10430.56</td>
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<tr>
<td>Productivity (Kg/Ha)</td>
<td>27878.78</td>
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<tr>
<td>Productivity/Power Input (Kg/hp)</td>
<td>763.22</td>
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<tr>
<td>Tot. Production</td>
<td>93.875</td>
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Performa Panen berdasarkan Densitas Tebar

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<thead>
<tr>
<th>Keterangan</th>
<th>Kolam A1</th>
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<th>Kolam A3</th>
<th>Kolam A4</th>
<th>Kolam B1</th>
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<th>Kolam B5</th>
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<td>5986</td>
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<tr>
<td>ADG (gr)</td>
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<td>0.13</td>
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<td>0.07</td>
<td>0.14</td>
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<td>Produktivitas (kg/pond)</td>
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## Harvest (Partial) Performance

Partial Harvest Performance with Bio Floc Technology (February - July 2008)

<table>
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<tr>
<th>Pond/size</th>
<th>System</th>
<th>Energy Input (Pond)</th>
<th>Energy Input (Ha)</th>
<th>Density (M2)</th>
<th>Partial</th>
<th>Harvest</th>
<th>Production</th>
<th>FCR</th>
<th>SR (%)</th>
<th>Energy Efficiency -kg/HP</th>
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<td>1 5896 m2</td>
<td>Phyto</td>
<td>16 (PW)</td>
<td>27 (PW)</td>
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<td>118</td>
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<tr>
<td>2 5896 m2</td>
<td>Bio Floc</td>
<td>18 (PW)</td>
<td>31 (PW)</td>
<td>145</td>
<td>1</td>
<td>108</td>
<td>2,092</td>
<td>59</td>
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<tr>
<td>7 2500 m2</td>
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</tbody>
</table>

**Notes:**
- **DoC** refers to dry matter content.
- **Biomas** (Kg) refers to biomass in kilograms.
- **MBW** (gr) refers to mean biomass weight.
- **FCR** refers to feed conversion ratio.
- **SR** (%) refers to specific growth rate.
- **Energy Efficiency -kg/HP** refers to energy efficiency in kilograms per horsepower.

*Standard Capacity* and *Efficiency* are calculated based on the performance metrics.
Thank you

P. vannamei

Nyan Taw
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