**Biofloc Tank Culture**

An integrated agriculture system for the intensive farming of tilapia with water reuse for vegetable crop production.

- Fish production occurs on a small land area
- Waste removed from the fish tank is used to irrigate and fertilize vegetable crops
- Continuous aeration
- Mixing to maintain suspension of bacterial floc
- Biofiltration in water column
- Settleable solid waste removal once daily
- Feed twice daily with floating feed (32% protein)
- Feed ad libitum for 30 - 40 minutes
- Monitor pH daily, maintain pH 7 - 7.5 with Ca(OH)$_2$
- Add CaCl$_2$ to prevent nitrite toxicity

**Tilapia Production**

- **Stocking:**
  - Nile tilapia
  - 25 fish/m$^3$ @ 50-g each (5,000/tank)
- **Harvest:**
  - ≅ 720 g each
  - 95% survival
  - 7,500 lbs per crop, 15,000 lbs annually

**Vegetable Production**

Marketable yield from crops fertilized and irrigated with fish culture water, sludge, or inorganic fertilizer (mt/ha)

<table>
<thead>
<tr>
<th></th>
<th>Culture water</th>
<th>Sludge</th>
<th>Inorganic Fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pak choi:</td>
<td>41.0</td>
<td>40.9</td>
<td>35.2</td>
</tr>
<tr>
<td>Bell pepper:</td>
<td>3.7</td>
<td>5.0</td>
<td>4.6</td>
</tr>
<tr>
<td>Forage grass:</td>
<td>-</td>
<td>12.9</td>
<td>6.4</td>
</tr>
</tbody>
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**Fingerling Production**

- Stocking:
  - 11-m$^3$ rearing tank
  - 370-L clarifier
  - 1/2 HP blower
- Harvest:
  - 4,400 fry (1-g each)
  - Reared for 8 weeks
  - Harvested at 50-g
  - 90% survival
  - Fed 4 times each day (30 minutes ad libitum)

**Future Research**

- Fish production strategies
  - staggered stocking and partial harvests
  - fingerling rearing in cages
  - polyculture
- Different fish species
  - Sludge
  - characterization
  - application techniques
- Water quality management
  - denitrification tank for removal of nitrate
  - flow rate for optimal removal
  - flowers for added economic benefits
  - aeration methods
  - paddleswheels
- Scaling up

**System Design**

- One fish rearing tank, 200 m$^3$
- 16 m diameter, 1 m mean water depth
- Block wall, 30 mil HDPE liner
- One external cylin-dro-conical clarifier, 1.4 m$^3$
- One 1/2 HP pump for horizontal circulation
- One to three 1/2 HP pumps for vertical aeration
- One solids collection pond
- One water distribution pump
- One bird deflection device
- Land area - 0.02 ha (1/20 acre)

**Water Treatment**

- Aeration
  - 3 vertical lift pumps
- Base addition Ca(OH)$_2$
pH 7.5 maintained
- Sludge removed daily

**UVI Biofloc Fish Culture System**

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